



GRADUATION PROJECT

Degree in Dentistry

Knowledge of Dentistry Students in Managing Dental Trauma.

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RESUMEN (Español)

Introducción: Los traumatismos dentales representan una preocupación creciente en odontología, pudiendo ocurrir por accidentes, deportes o caídas. **Objetivos:** Este estudio evaluó los conocimientos y actitudes de estudiantes de odontología y de otras facultades sobre la gestión de avulsiones dentales. **Materiales y Métodos:** Se realizó una encuesta transversal a 109 estudiantes (60 odontología, 49 no odontología) con preguntas sobre escenarios de dientes avulsionados, experiencia previa y confianza en manejo de urgencias dentales. **Resultados:** Los estudiantes de odontología mostraron mayores conocimientos que sus pares no odontólogos, especialmente en identificar dientes permanentes, reimplantar dientes avulsionados y usar medios de conservación apropiados (saliva/leche). Sin embargo, incluso los futuros dentistas presentaron lagunas importantes, y ambos grupos expresaron sentir preparación insuficiente; casi todos ($\approx 90\%$) reconocen la necesidad de más formación en traumatología dental. **Conclusión:** Existe una brecha educativa significativa no solo entre los estudiantes no odontológicos, sino también dentro de los propios programas de odontología; mejorar la formación en traumatología dental en los planes de estudio odontológicos e incorporar módulos básicos de primeros auxilios para profesionales no odontológicos (por ejemplo, estudiantes de medicina, enfermería, profesores) podría mejorar en gran medida la respuesta ante emergencias y los resultados en los pacientes. Además, la discrepancia entre el rendimiento objetivo y la confianza autodeclarada muestra que el aprendizaje en el aula por sí solo podría no ser suficiente para que los estudiantes se sientan preparados para actuar en situaciones reales.

PALABRAS CLAVE

Odontología; Traumatismos dentales; Conocimiento; Educación en emergencias

ABSTRACT (English)

Introduction: Traumatic dental injuries (TDIs) are a growing concern in dentistry, often resulting from accidents, sports, or falls; how they are managed in the first moments can significantly impact long-term outcomes. **Objectives:** To assess the knowledge and confidence levels of both dental and non-dental students in handling dental trauma, particularly avulsed teeth. **Material and Methods:** A cross-sectional survey of 109 students (60 dental, 49 non-dental) was conducted, including scenario-based questions on tooth avulsion, prior exposure, and self-reported preparedness for managing emergencies. **Results:** Dental students had a stronger grasp of key concepts—identifying permanent teeth, replanting avulsed teeth, and selecting appropriate storage media (saliva/milk)—yet noticeable knowledge gaps remained, and both groups reported feeling unprepared for real-life dental emergencies; nearly 90 % agreed that more training in dental trauma management is necessary. **Conclusions:** There is a significant educational gap not only among non-dental students but also within dental programs; enhancing dental trauma training in dental curricula and incorporating basic first-aid modules for non-dental professionals (e.g., medical students, nurses, teachers) could greatly improve emergency response and patient outcomes. Furthermore, the discrepancy between objective performance and self-reported confidence shows that classroom learning alone might not be enough to make students feel ready to act in real situations. Implementing regular, simulation-based exercises and interprofessional workshops could therefore be critical for reinforcing knowledge retention and enhancing students' competence in emergency management.

KEYWORDS

Dentistry; Dental trauma; Knowledge; Emergency education

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1. INTRODUCTION

1.1 Background and Importance

Traumatic dental injuries (TDIs) are a growing area of concern within the field of dentistry. These kinds of injuries can occur due to accidents, sports activities, or falls and they can lead to immediate pain, aesthetic problems, and lasting complications if not managed correctly (1). TDIs can range from simple enamel fractures to more complex injuries, such as tooth avulsion or luxation. When treated promptly and correctly, many of these injuries can have favourable outcomes, preserving the patient's oral health, appearance, and quality of life. However, delayed or inadequate management can lead to permanent damage, tooth loss, and costly restorative procedures (2,3).

Even though the effective management of dental trauma is important, we find it is often not sufficiently covered in general first-aid training or non-dental healthcare education. A number of studies show that laypeople and even medical professionals have a lack of basic understanding regarding dental trauma first aid (1). A recent survey conducted in Spain found that 88.5% of schoolteachers had poor knowledge of correct first-aid protocol for dental injuries (4). Teachers are often the first responders to a child who has had an accident in the playground or class, so a lack of training among teachers is certainly concerning. Also of note, doctors and medical students who might deal with dental crises in clinics or hospitals frequently lack the knowledge necessary to manage traumatic dental injuries (1,5).

One study highlighted that approximately 13.5% of medical students felt confident in their ability to diagnose a traumatic dental injury, and an even smaller fraction (~9%) were confident in their knowledge of how to provide emergency dental treatment. The majority of the study participants acknowledged that they would need further education and training on the topic of managing traumatic dental injuries (1).

These findings expose a significant gap: many people who are in positions of work wherein it is likely they will be first responders in the event of a traumatic dental emergency, do not feel equipped to handle dental emergencies, mostly due to limited awareness and training on this topic (6).

Globally, approximately 15.5% of permanent teeth and 22.7% of primary teeth are affected by TDIs, emphasizing the scale and significance of this problem (7). Correct and informed management of these injuries requires a comprehensive understanding of emergency protocols and long-term care strategies, which are necessary for preventing complications. Dental professionals, especially students training to become dental practitioners, are expected to develop these skills during their

studies. However, many educational institutions place an emphasis more so on theoretical instruction, often without a sufficient amount of practical clinical experience. This lack of hands-on experience can leave students feeling unprepared for when they encounter real-life dental emergencies (8).

We also see that non-dental students, such as those who study medicine, nursing, or other various health sciences, also tend to receive minimal training, if any, in the management of dental trauma. This can be problematic, in the sense these professionals are likely to encounter patients who have TDIs, particularly in emergency or community health settings (9,10).

A systematic approach for treating traumatic dental injuries (TDIs), such as fractures, luxation, and avulsions in both primary and permanent teeth, is provided by the 2020 IADT guidelines. These are evidence-based guidelines that promote the correct emergency care that improves long-term outcomes and have been developed by global specialists. Publicly available online in several languages, these protocols are accessible and encourage uniform adherence among dental professionals worldwide. Despite this effort, studies still show variability in knowledge and adherence to these standards among dental students, highlighting the need for a more cohesive integration of guidelines into the curriculum, to prepare practitioners for real-world cases (11).

1.2 Justification

Quick and effective responses to dental trauma are critical for minimizing complications, such as tooth loss, infection, and long-term aesthetic problems (7). Studies have demonstrated that timely intervention, such as replanting an avulsed tooth within a critical timeframe, can significantly improve the likelihood of successful outcomes (3), as research shows that the first few minutes after the injury can determine the prognosis of the tooth (9). However, achieving this level of care depends on proper training and a clear understanding of evidence-based protocols.

Surveys conducted with dental and medical students have revealed major differences in their knowledge and confidence when dealing with dental emergencies (1). Dental students often have a better theoretical foundation, but many still feel inadequately prepared for real-world scenarios due to limited clinical practice. Non-dental students, who might encounter dental trauma in various settings, often have minimal exposure to these topics in their curriculum. (8).

By exploring and comparing the knowledge levels of these two groups, this study seeks to identify key gaps and propose strategies for improving education and training. Enhancing the preparedness of both dental and non-dental students will ultimately lead to better emergency responses and improved patient care outcomes.

This study will use a pre-validated questionnaire to assess dental students' knowledge of TDIs. Utilizing previously validated tools ensures reliable data collection and simplifies the ethical approval process, as these instruments have been tested in prior research. This approach is common in dental trauma studies to maintain data consistency and ethical compliance.

The variability in training and exposure to TDIs among dental and non-dental students has created a critical gap in emergency dental care. Some students gain valuable experience and feel prepared to manage trauma cases, while others may have only a superficial understanding of theoretical concepts with little to no practical application. This inconsistency is concerning because it can lead to delayed or improper care for patients with dental injuries. Previous studies have shown that clinical exposure and hands-on experience are critical for reinforcing theoretical knowledge and building confidence in managing emergencies (2,12).

By comparing the knowledge and skills of dental students with those of non-dental students, this study aims to shed light on the effectiveness of current educational approaches and highlight areas for improvement.

1.3 Hypothesis

Alternative Hypothesis (H1): There is a significant difference in the knowledge and management capabilities of traumatic dental injuries between dentistry students and non-dental students at the Universidad Europea de Madrid.

Null Hypothesis (H0): There is no significant difference in the knowledge and management capabilities of traumatic dental injuries between dentistry students and non-dental students at the Universidad Europea de Madrid.

2. OBJECTIVES

2.1. General objective

To assess and compare the knowledge, attitudes, and practices regarding the emergency management of traumatic dental injuries (TDIs) among dental and non-dental students at the Universidad Europea de Madrid.

2.2 Specific objectives

1. To identify the level of knowledge among dental and non-dental students about the management of avulsed permanent teeth.
2. To evaluate attitudes and confidence levels in handling TDI emergencies between the two groups.
3. To determine the frequency and types of sources used by students to acquire knowledge on TDI management.
4. To propose educational strategies based on the observed gaps to improve TDI management training among students.

3. MATERIALS AND METHODS

3.1 Study Design

This study was conducted as a cross-sectional survey to assess the knowledge and attitudes regarding dental trauma management among two distinct student groups (dental and non-dental). A cross-sectional design was chosen because it allows collection of data at a single point in time from different populations for comparison. This approach is efficient for capturing a “snapshot” of participants’ current knowledge and opinions without requiring a long follow-up. It is particularly suitable for our objectives, as we aimed to compare the immediate awareness and practices between dental students (who receive formal training) and non-dental students (with no specific training) under the same conditions. By using a survey questionnaire, we could reach a relatively large sample and ensure standardized questions for all participants, making the results comparable across the groups.

3.2 Participants and Sampling

The target population for this survey included senior dental students as well as students from non-dental faculties at the university. A total of 109 students participated, comprising 60 dental students in their 4th or 5th year of the Dentistry program and 49 non-dental students from other disciplines from 1st to 5th year. We employed a convenience sampling strategy: participants were recruited on-campus based on their availability and willingness to volunteer.

Recruitment process: Dental students were approached during their clinical practice sessions at the university’s dental policlínica (university clinic). The researcher, being a fellow dental student, invited

peers in 4th and 5th year to take part. Non-dental students were recruited in person at various common areas on campus (e.g. libraries, cafeterias, study halls) by directly explaining the study and asking if they would be interested in participating. In both cases, interested students were provided with a QR code that, when scanned with their smartphone, opened the online survey. This allowed immediate access to the questionnaire via their personal devices. Participation was voluntary and no incentives were offered aside from highlighting the importance of the research in improving dental trauma education. All participants were required to be at least 18 years old and actively enrolled in the university. There were no other strict inclusion or exclusion criteria beyond being a dental student in 4th /5th year or a non-dental student, essentially any student willing to contribute was welcome. This broad inclusion helped ensure a diverse sample of non-dental fields (e.g. medicine, nursing, education, engineering, etc.), though the sample is not random and therefore may not be fully representative of every student in those programs. To better understand who was included in this study, the table below summarizes the main inclusion and exclusion criteria used when selecting participants.

Table 1. Inclusion and exclusion criteria for survey participation.

Inclusion Criteria	Exclusion Criteria
≥ 18 years of age	Under 18 years of age
Enrolled as a student at UEM	Not enrolled at UEM
Dental student in 4th or 5th year	Dental student in 1st–3rd year of study
Non-dental student (any year of study)	None (no year restriction for non-dental students)
Provided informed consent (volunteered)	Did not consent / declined to participate

This table presents the criteria in an easy format. Anyone who met all the inclusion criteria was eligible, and anyone who failed to meet any of them was excluded.

3.3 Survey Instrument

We developed a structured questionnaire (hosted on Microsoft Forms) consisting of 19 close-ended questions (plus one initial consent question) to evaluate dental trauma knowledge and attitudes. The survey was divided into four sections: demographics (questions 1–4), knowledge scenarios (questions 5–12), personal experience/training (questions 13–16), and self-assessed

competency/attitudes (questions 17–19). To ensure content validity, each survey question was adapted from previously published questionnaires used in peer-reviewed studies on dental trauma. Using established questions has the advantage of relying on validated items rather than creating new ones, and it aligned with our university’s guidance.

Table 2 below lists each question alongside the source article from which it was adapted. In selecting these questions, we drew from four key studies: a multi-faculty student survey by Ivkošić et al. (2020) and a Saudi dental student survey by Al-Shamiri et al. (2015) for demographics and prior exposure items, a Japanese dental student study by Fujita et al. (2014) for the avulsion scenario-based questions, and a recent nursing student survey by Carrión-Ruiz et al. (2024) for knowledge and attitude items. Adopting questions verbatim or with minor wording adjustments from these sources ensured the questionnaire was grounded in validated measures and covered all relevant aspects (recognition of primary vs permanent teeth, emergency management steps, prior training, confidence levels, etc.). Each adapted question was carefully reviewed to fit the context of our university student sample.

Table 2. Survey Questions and Their Source of Adaptation

Question	Adapted From (Source)
Q1. “What is your gender?”	Ivkošić et al. (2020), Al-Shamiri et al. (2015)
Q2. “How old are you?”	Ivkošić et al. (2020), Al-Shamiri et al. (2015)
Q3. “Study Program” (Dentistry or Non-Dental)	Ivkošić et al. (2020)
Q4. “Year of Dental School (if applicable)”	Al-Shamiri et al. (2015)
Q5. “Can you distinguish between a temporary (primary) and permanent tooth?”	Carrión-Ruiz et al. (2024)
Q6. “Would you keep the fragments of a broken tooth?”	Carrión-Ruiz et al. (2024)
Q7. “[In an avulsion scenario] Is the damaged front tooth likely to be a primary or permanent tooth?”	Fujita et al. (2014)
Q8. “Which of the following would you do first? (Arrange in order of priority)” – (listing actions for an avulsed tooth scenario)	Fujita et al. (2014)

Q9. "Would you replant (put back) the avulsed tooth into its socket?"	Fujita et al. (2014)
Q10. "If the avulsed tooth fell on the ground and got dirty, what would you do before replanting?"	Fujita et al. (2014)
Q11. "If you decide not to replant the tooth immediately, how would you transport it to the dentist?"	Fujita et al. (2014)
Q12. "If using a liquid to transport the tooth, which medium would you choose?" (rank options)	Fujita et al. (2014)
Q13. "Have you ever witnessed a traumatic dental injury?"	Ivkošić et al. (2020)
Q14. "Have you ever experienced a traumatic dental injury yourself?"	Ivkošić et al. (2020)
Q15. "Have you had any first-aid training in dental trauma management?"	Ivkošić et al. (2020); Al-Shamiri et al. (2015)
Q16. "Have you attended any additional courses about dental trauma?"	Al-Shamiri et al. (2015)
Q17. "Do you think you have the knowledge necessary to manage a traumatic dental injury?"	Carrión-Ruiz et al. (2024)
Q18. "Do you think you need more knowledge or training regarding dental traumatology?"	Carrión-Ruiz et al. (2024)
Q19. "Do you consider dental trauma education important?"	Al-Shamiri et al. (2015), Ivkošić et al. (2020)

Table 2: Questions 7–12 were presented as two clinical scenarios involving a knocked-out (avulsed) front tooth, for which participants had to answer several sub-questions about the correct management steps (identifying the tooth type, deciding whether to replant, how to clean it, and how to transport it).

3.4 Procedure

The survey was administered online using Microsoft Forms, which the participants accessed via the QR code link as described. Upon opening the form, participants first encountered an informed consent statement outlining the study's purpose, what was expected from participants, and ethical assurances (voluntary participation, anonymity of responses, confidentiality of data, and the ability to stop at any time). They had to actively agree to the informed consent by selecting "Yes, I agree to participate" in order to proceed to the actual questions. If a participant chose "No," the form would

end, and no data would be recorded. This ensured that all respondents had given informed consent prior to answering any survey questions.

After giving consent, participants filled out the questionnaire on their own device. The form was set to allow only one submission per participant (to prevent duplicates). On average, completion of the survey took about 5–10 minutes. The questionnaire was anonymous; we did not collect any names, student IDs, emails, or other personal identifiers – only the survey responses to the listed questions were recorded. Responses from Microsoft Forms were periodically monitored and, after the survey period ended, all responses were downloaded into a spreadsheet for analysis.

3.5 Data Analysis

Once the survey was closed, the data was exported from Microsoft Forms into Microsoft Excel and then analysed using basic statistical methods. We performed descriptive statistics to summarize the data: for each question and calculated the percentages of each response option. This gave an overall picture of common answers and differences between the two groups of students. We then carried out comparative analyses to examine differences in responses between the dental and non-dental student groups.

No composite or overall “knowledge score” was computed, because we did not design the survey with a scoring system (each knowledge question stands on its own, rather than contributing to a single test score). Instead, each survey item was analysed individually. This means we looked at each specific knowledge question (e.g. the correct management of an avulsed tooth) and evaluated the percentage of dental vs. non-dental students who answered correctly, rather than giving each participant an aggregate score. This approach kept the analysis straightforward and directly tied to each question’s objective. Data analysis was performed using Excel’s statistical functions. The results are presented in the next section of the report with appropriate tables and charts.

3.6 Ethical Considerations

The study was approved by the Ethics Committee of the Universidad Europea de Madrid (Code OD.037/2425) in March 2025 (Annex 1). Data handling was carried out in accordance with the regulations (EU) 2016/679 of the European Parliament, and of the European Council 27th April 2016 on the protection of personal data, its processing and free movement.

Participation in the survey was entirely voluntary – students were free to decline or withdraw at any point. All respondents provided informed consent electronically before accessing the questionnaire,

as described in the Procedure section. The consent form informed them about the purpose of the research, the types of questions and assured them that their answers would be used for academic research purposes only. It also emphasized that responses were anonymous and confidential. We did not collect personal identifying information, ensuring that individual participants could not be linked to their responses.

The online Microsoft Forms collection was set to anonymous response mode, meaning no email or login was recorded. After analysis, data will be retained only for the duration necessary to complete the TFG and any academic requirements, and it will be disposed of or archived according to the university guidelines.

We have included a copy of the informed consent form and the ethical committee approval letter in the Annexes section (Annex 1&2) for transparency. In summary, all ethical precautions were taken to respect participants' rights and privacy throughout this study.

4 RESULTS

4.1 Demographics and participant overview

A total of 109 students participated in the survey, comprising of 60 dental students (55%) and 49 non-dental students (45%). The sample included 61 men (56%) and 48 women (44%). Most participants were young adults: 72% were 18–25 years old, with 24% in the 26–35 range and only 4% above 35 years old. The dental student subgroup consisted mostly of senior students – the majority were in their 5th (final) year (approximately three-quarters of the dental group), with the remainder in 4th year. In comparison, the non-dental students were a mix of various other programs and included very few participants over age 35 (Table 1 presents a breakdown of participant demographics by group, including their gender and age distributions).

Table 3: Participant Demographics

Demographic	Category	n (Percent)
Gender	Female	48 (43.6%)
	Male	62 (56.4%)
Age Group	18–25	78 (70.9%)
	26–35	27 (24.5%)

	36–45	4 (3.6%)
	46–55	0 (0%)
	>55	0 (0%)
	<i>Not reported</i>	1 (0.9%)
Program	Dental students	60 (54.5%)
	Non-dental students	49 (44.5%)
	<i>Not reported</i>	1 (0.9%)

Breakdown of the 110 student respondents by gender, age group, and study program. One respondent did not report their age or study program and therefore was not included in the study.

4.2 Knowledge-based questions analysis

Basic dental trauma knowledge: When asked about fundamental concepts, dental students showed a substantially higher level of knowledge than non-dental students. All 60 dental students (100%) reported that they could distinguish between a primary (deciduous) tooth from a permanent tooth, in comparison to only 12% (6 out of 49) of non-dental students, who did not feel capable of making this differentiation. We also found that 87% of dental students knew to save fragments of a broken tooth, in the case of a possible reattachment, compared to just 35% of non-dental students. indicating that non-dental students are far more likely to discard broken tooth pieces, therefore presenting a clear knowledge gap.

Case Scenario – tooth avulsion: The survey presented a scenario involving an avulsed (knocked-out) front tooth in a child. Observable knowledge differences between the groups were apparent when identifying the tooth’s status and the appropriate emergency responses. 92% of dental students correctly identified the injured tooth as a permanent tooth (not a baby tooth), whereas the majority (59%) of non-dental students presumed it was a primary tooth. We also found that only about half of the dental students (50%) said they would attempt to replant (reinsert) the avulsed tooth into its socket – and effectively none of the non-dental students would attempt to replant the tooth. The results show that only 4 non-dental students (8%) specified that they would replant the tooth, while the remaining 92% in that group answered “No” to replanting. Some of the dental students were apprehensive or unsure about replantation, but overall, the dental group was much more likely to attempt it than the non-dental group. According to these findings, many

participants—especially those who are outside the dentistry field—did not know that an avulsed permanent tooth should be transplanted straight away for the best outcome.

Table 4: Knowledge-Based Questions and Correct Response Rates

Knowledge Question	% Correct – Dental Students	% Correct – Non-Dental Students
Distinguish between primary vs. permanent teeth	100.0%	12.2%
Keep fragments of a broken tooth (Yes)	86.7%	34.7%
Identify injured front tooth as permanent (scenario)	91.7%	40.8%
Replant an avulsed permanent tooth (Yes)	50.0%	8.2%
Properly clean a dirt-covered avulsed tooth	83.1%	49.0%
Transport tooth in mouth if not immediately replanted	73.2%	2.0%

Comparison of dental vs. non-dental students' knowledge of key dental trauma questions. Values indicate the percentage of students in each group who answered the question correctly (with total n=60 dental and n=49 non-dental students). Dental students showed higher correct response rates in all the categories.

Emergency management, cleaning and transport: Participants were asked to choose from a variety of options regarding the correct handling of a dirty avulsed tooth and how best to transport it to the dentist. Here, we again see, that it was the dental students who showed better knowledge of recommended guidelines and practices. When the avulsed tooth was described as having fallen on the ground and become dirty, 82% of dental students chose the correct cleaning method, gently rinsing the tooth with running water. On the other hand, only 49% of non-dental students selected rinsing with water (the rest chose improper cleaning methods). Many of the non-dental students instead opted for suboptimal techniques: over a quarter (27%) of the non-dental students said they would spray the tooth with alcohol to disinfect it, and about 12% would scrub it with a toothbrush or wipe it with a tissue – actions of which can damage the tooth's root cells. Very few dental students chose these harmful cleaning methods.

Correct storage of the avulsed tooth, prior to emergency dental care, was another critical knowledge item on the survey. If immediate replantation was not done, the ideal management protocol is to keep the tooth moist. Figure 1 illustrates the strong contrast between the groups on this item. Approximately 68% of dental students selected an appropriate transport medium by holding the tooth in the child's mouth (keeping it in saliva) to prevent it from drying out. In distinction only 1 non-dental student (2%) chose this correct approach. Most non-dental students suggested inappropriate transport methods: such as, nearly half (47%) said they would seal the tooth in plastic wrap, and other students suggested placing it on ice (26%) or wrapping it in dry tissue. Such methods would likely jeopardize the tooth's viability, demonstrating a significant knowledge gap among those not in the dental field.

When considering the transport of an avulsed tooth in a liquid medium, many participants did not identify the best option. When asked to rank potential liquids for storing the tooth, less than one-third of all respondents (29%) correctly ranked milk as the top choice – milk is well-known as one of the best storage mediums for avulsed teeth. Indeed, we found that a larger number of participants (47%) ranked physiological saline (saltwater solution) as their first choice over milk. While saline is a reasonable option, this suggests that milk was not widely recognised as the superior storage medium. Concerningly, 15% of students (mostly from the non-dental group) mistakenly chose alcohol as the optimal liquid for transporting purposes, which would be damaging to the tooth. These findings strongly suggest significant gaps in knowledge regarding the emergency management of dental trauma, especially amongst non-dental students. Table 4 provides a summary of key knowledge question outcomes, comparing the percentage of correct responses between dental and non-dental students for each question.

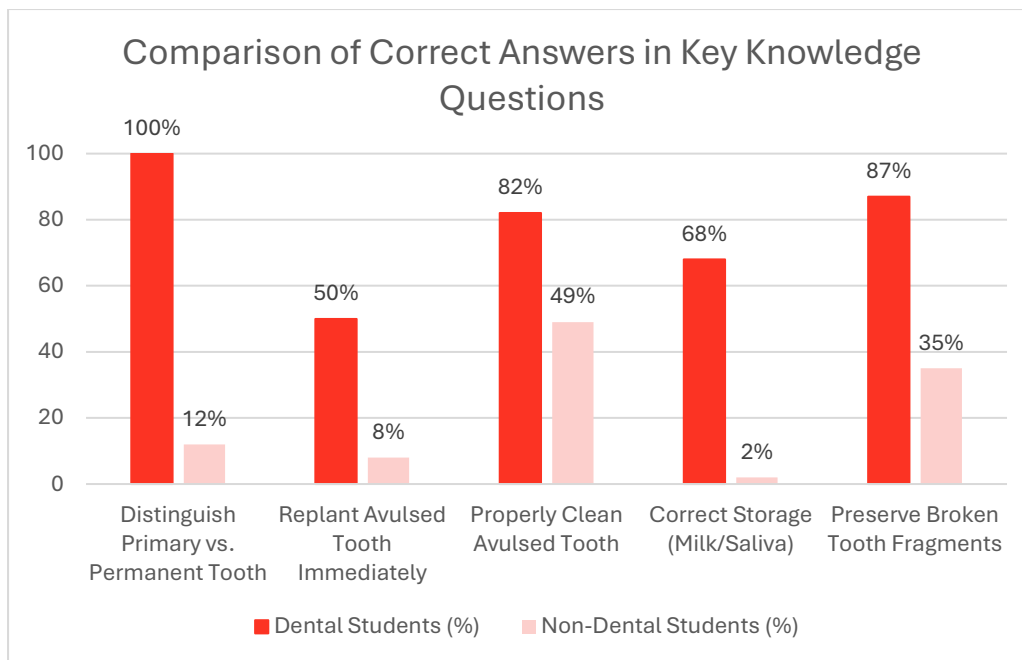


Figure 1: Comparison of Correct Answers in Key Knowledge Questions.

A bar chart compares the percentage of correct responses for each major knowledge question, contrasting dental vs. non-dental students. The chart highlights that dental students scored substantially higher on all knowledge questions. For example, 100% of dental students vs. 12% of non-dental students knew how to distinguish a primary (baby) tooth from a permanent tooth. Similarly, 87% of dental students vs. 35% of non-dental students knew to preserve broken tooth fragments, and 50% vs. 8% would replant an avulsed tooth. Across all questions, dental students demonstrated greater knowledge of proper dental trauma management steps, as summarized in Table 4.

4.3 Experience and Training

Participants were asked about their prior exposure to dental trauma and any relevant training they may have received with regards to dental trauma management. Overall, about 38% of respondents reported having witnessed a traumatic dental injury at some point in their lives (for example, seeing another person suffer a tooth injury), and 16.5% had personally experienced a dental trauma themselves. Dental students tended to have slightly more exposure: 43% of dental students had witnessed an incident of dental trauma, compared to 31% of non-dental students. Results showed that 22% of dental students versus 10% of non-dental students had themselves suffered a traumatic dental injury in their past. These differences propose a trend of greater exposure among dental students (possibly through clinical rotations or peers), although the differences were not statistically significant in our sample.

In terms of training, there were notable disparities between the groups. Around one-third of the dental students (32%) reported having had first-aid training in dental trauma management (e.g.

through coursework, workshops, or certifications). Additionally, 15% of dental students said they had attended an extra course or seminar specifically on dental trauma outside of their regular curriculum. Our findings identified that not one of the non-dental students (0%) had received any training or courses on managing dental injuries. The lack of any formal dental trauma training among the non-dental group is expected, given that their programs of study do not typically cover this topic; however, it emphasizes that virtually all their knowledge (or misconceptions) come from general first aid knowledge or personal experience rather than structured education. Statistical analysis confirms that dental students were significantly more likely to have prior training in dental trauma management than non-dental. These results emphasize that outside the dental field, students have little to virtually no training on this subject, which likely explains the knowledge gaps we observed.

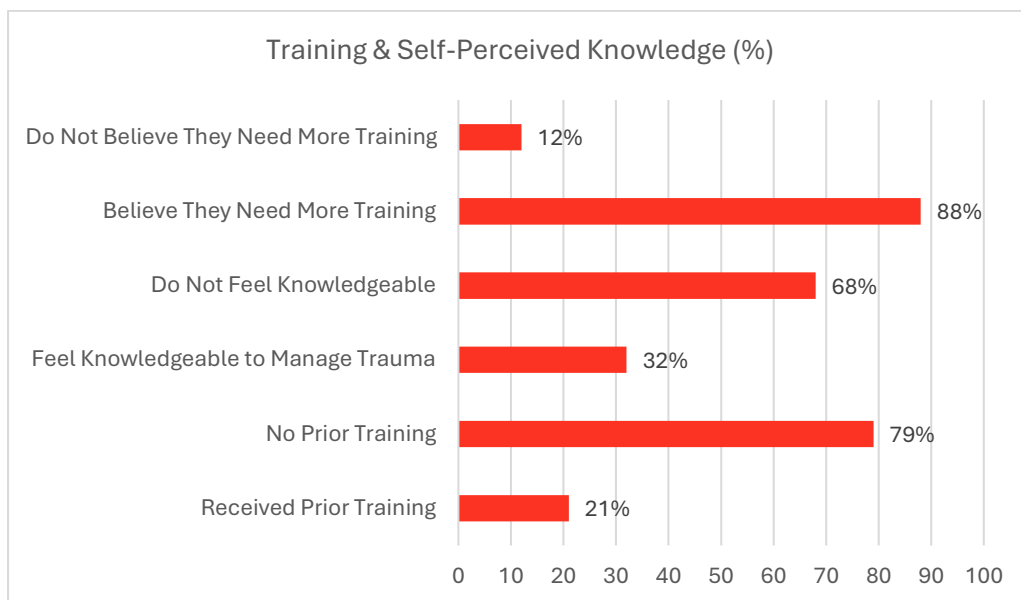


Figure 2: Training & Self-Perceived Knowledge.

This chart summarizes participants' (dental and non-dental students) previous training in dental trauma management, their self-assessed knowledge, and perceived need for further training. Only about 21% of students have had some form of prior training specific to dental trauma (including first-aid training or additional courses). Approximately 32% of students felt they currently have the necessary knowledge to manage a dental injury, reflecting a low self-confidence level especially among non-dental students. Notably, an overwhelming majority - about 88% of respondents - believe they need more training in dental traumatology. This graph underscores the gap between current training/knowledge and the recognized need for additional education in managing dental trauma.

4.4 Attitudes & self-perceived knowledge

Despite the differences in factual knowledge, students in both groups generally felt underprepared to manage dental trauma and expressed a strong desire for more education. When asked if they believed they have sufficient knowledge to handle a traumatic dental injury, only about one-third (31%) of all participants answered “Yes.” Even among dental students, who demonstrated better objective knowledge, their confidence was limited: only 38% of dental students felt they have the necessary knowledge, while the remaining 62% admitted they do not. Non-dental students were even less confident, with only 22% feeling prepared and 78% acknowledging a lack of necessary knowledge. This difference in self-confidence (38% vs 22%) trended in favour of dental students, but it was not statistically significant, indicating that the majority of students, regardless of their study program, do not feel adequately trained in the area of managing dental trauma.

Nearly all respondents recognized the need for additional training in dental traumatology. Over 90% of students (55 out of 60 dentals, and 42 out of 49 non-dental) agreed that they need more knowledge or training on managing dental trauma. This point of view was nearly unanimous and did not differ significantly between dental and non-dental groups, even those with some prior training wanted more training. In keeping with this, almost every participant (95%) considered dental trauma education important. Both dental and non-dental students overwhelmingly agreed on the importance of being educated in how to handle dental emergencies. Only 5 students in the entire sample (less than 5%) answered “No” to the importance of trauma education, with no meaningful difference between the two fields of study on this question.

Our results show that while dental students predictably outperformed non-dental students in dental trauma knowledge, both groups exhibit critical gaps in knowledge and a strong appetite for further training. These findings will be further examined in the discussion section, where potential curriculum implications and training strategies are considered.

5. DISCUSSION

Our survey results mirror many findings from existing literature, showing dental students consistently outperform non-dental peers in dental trauma knowledge, yet significant gaps persist in both groups. This aligns with Ivkošić et al. (2020), who reported that dental students scored highest in trauma knowledge compared to medical, education, and other students (mean score ~6.75/10 for dental vs. ~3–4/10 for others) (5). In keeping with these findings, our dental cohort also answered more questions correctly than non-dental students for most comparisons. However, like other studies, we found that overall knowledge was limited, even among the dental group, suggesting

room for improvement (5,13). Below we compare specific knowledge areas between our study and published findings:

- Identification of permanent vs. primary teeth: In our survey, 92% of dental students correctly recognized a knocked-out front tooth as permanent (vs. only 41% of non-dental students). This gap is comparable to Ivkošić et al.'s findings, where non-health students struggled with this basic identification between a primary and a permanent tooth (e.g. only 36.7% of education students identified a permanent tooth correctly) (5). Nursing students in Spain also had low initial confidence distinguishing tooth types (45.4% pre-training), indicating a widespread issue. After targeted dental training, that figure rose dramatically (to ~99%) (10), clearly showing that targeted training can close the knowledge gap. In similar case, a study in Hungary found that primary school teachers' knowledge of dental trauma management significantly improved after an educational intervention, highlighting the effectiveness of targeted training programs (18).
- Willingness to replant an avulsed tooth: Only 50% of our dental students and ~8% of non-dental students said they would replant a knocked-out (avulsed) permanent tooth immediately – a striking difference between the groups. This trend matches prior studies: Al-Shamiri et al. (2015) found about 67.5% of Saudi dental students knew an avulsed permanent tooth should be replanted on the spot (14). Fujita et al. (2014) noted a sharp rise in correct responses with dental training: only 45% of first-year Japanese dental students would replant immediately versus 72% by sixth year (13). Our findings echo this improvement with education, as dental students (who received some training) were far more likely to attempt replantation than non-dental students (who lack such training). However, the fact that only half of future dentists in our sample would take action to replant is concerning, reinforcing Fujita et al.'s conclusion that current undergraduate training on avulsion is insufficient (13).
- Cleaning a dirty avulsed tooth: When asked how to clean a dirty avulsed tooth prior to replanting, 67% of our participants (82% of dental, 49% of non-dental) said they would gently rinse it with water – the correct approach. This aligns with Fujita et al.'s sixth-year dental students, 64.7% of whom chose correct cleaning (vs. 43% of first-years). A minority of our respondents, mostly non-dental students, chose improper methods such as scrubbing or using alcohol, paralleling the mistakes reported in other studies (13). The improvement seen by final-year dental students in Japan and the high post-training success rate in nursing students (nearly all answered cleaning questions correctly after an intervention) suggest that with education, most students can learn how

to apply the correct cleaning technique (10). Additionally, a pre-post survey analysis in India demonstrated significant knowledge enhancement among dental assistants following a dental trauma seminar, reinforcing the value of continuous education (19).

- **Appropriate transport medium:** Our survey highlighted confusion about how to preserve an avulsed tooth if it cannot be replanted immediately. Nearly 68% of dental students in our study knew the tooth should be kept in a moist medium (most choosing to hold it in the mouth/saliva), whereas over 95% of non-dental students chose incorrect storage (commonly sealing in tissue, ice, or hand). This disparity was statistically significant and echoes findings in the literature. Ivkošić et al. noted non-dental groups often had inadequate knowledge of the best transport mediums, with many thinking a dry medium was acceptable (5). Our non-dental participants' most popular wrong answer – wrapping the tooth in dry tissue – is a well-documented mistake (13). By comparison, Al-Shamiri et al. reported 77% of dental students recognized the proper transport media (like milk or saline) (14), and Fujita et al. found 95.6% of senior Japanese dental students knew a tooth can be kept in the mouth (saliva) for transport (13). Interestingly, some of our dental students favoured sterile saline over milk as the most appropriate liquid, whereas dental guidelines consider milk the “gold standard” due to cell compatibility. Indeed, only one-third of our dental group ranked milk as the top choice, and just 25% of nursing students in Spain initially chose milk (rising to 93.5% post-education) (10). These results demonstrate a need to stress the best storage medium (milk or saliva) in the curriculum. Educational interventions have also proven effective among primary school teachers, significantly increasing their knowledge regarding the correct management of avulsed teeth, including appropriate storage media (18). On a positive note, 70% of our dental students did choose an appropriate moist option (saliva), which is comparable to the 71.6% of Saudi medical students who at least knew they should save the tooth and refer to a dentist (14). The majority of the non-dentals incorrect answers in our study highlight a considerable knowledge gap among the general student population.

- **Keeping broken tooth fragments:** We found 63.6% of all students (87% dental vs. 35% non-dental) answered that they would keep fragments of a broken tooth to give to a dentist. Non-dental students often didn't realize the importance of saving fragments. In contrast to this, Carrión-Ruiz et al. (2024) noted *over 90% of nursing students* knew to preserve tooth fragments, in at least in one of the surveyed institutions, indicating that some health-related students have either better intuition (due to health-related education) or prior knowledge on this point (10). Our non-dental group likely included many without any health education background, explaining their decreased awareness. This difference tells us that even seemingly common-sense measures (like keeping a broken piece of

a tooth) are not always comprehended and should be included and emphasized in general population first-aid training.

5.1 Prior training and self-confidence in management

Previous training in dental trauma emerged as a key factor influencing knowledge and confidence in the management of dental trauma. In our study, none of the non-dental students had ever received any kind of formal training on dental emergencies, whilst about one-third of dental students had some first-aid or trauma management training (30% had first-aid training, and 15% took an extra dental trauma course). Other studies also show this discrepancy: for example, only 5–6% of Saudi medical students reported any curriculum coverage of dental trauma, while dental programs naturally include some trauma education by the more senior years (in Japan, virtually all sixth-year dental students had received lectures on dental injuries by that point (13,14). Not surprisingly, students with formal training scored higher. Ivkošić et al. found those who had received dental trauma education had significantly better knowledge (training was associated with a +2.37 increase in knowledge score) (5). Our data agrees: the dental group (with training) outperformed the untrained group on every question. This trend was also seen within the dental group itself – our fifth-year students (who had more clinical exposure) generally answered more items correctly than our fourth-year students, similar to Al-Shamiri et al.'s observation that final-year dental students in Saudi Arabia scored higher than juniors. Prior experience with trauma helps: 43% of our dental students had witnessed a dental injury first-hand (versus 31% of non-dental), and those with real-life exposure were likely to feel more capable. Carrión-Ruiz et al. note that prior experience facilitates better internalization of new information, students who had seen an avulsion incident were quicker to grasp the management steps during training (10).

Despite their training advantage, dental students did not universally feel confident in the management of dental trauma. Only 38% of our dental students agreed they have the necessary knowledge and confidence to handle a dental trauma, while just 22% of non-dental students said they felt confident. This low self-assessed competency is consistent with other surveys. In Al-Haj Ali et al. (2022), only ~13% of medical students felt confident diagnosing traumatic dental injuries and ~18% felt confident managing them (1). Likewise, in our sample, a majority of even the dental group admitted they would need additional help in an emergency. It is encouraging, however, that nearly all students were able to accurately self-assess and recognize their limitations and the need for improvement – 88% of non-dental and 92% of dental students in our survey said they would require more training in dental traumatology. This reflects the overwhelming demand for education reported elsewhere: Ivkošić et al. noted 90.1% of students (across fields) desired further instruction

on dental trauma, and Al-Shamiri et al. found 95.7% of dental students emphasized the importance of trauma education (5,14). Clearly, students are aware that their knowledge is lacking and are eager to learn more, which is a positive catalyst for the implementation of curriculum changes or updates. One interesting difference between groups was in perceived importance: virtually all of our respondents (~95%) agreed that dental trauma education is important, regardless of their study program. Some studies have found disparities in attitude – for example, a survey in Croatia cited that while almost all dental students rated trauma knowledge as “extremely important,” only about 28% of medical students shared that view (5). In the context of our research, even non-dental students largely acknowledged the importance, likely because those who took our survey had an interest or awareness of the topic. This consensus on importance provides a good foundation for introducing cross-disciplinary training, as students would likely be receptive to it.

5.2 Implications and gaps in training - toward curriculum improvements

Our findings, alongside existing published studies, highlight several critical gaps in the current training provided for both dental and non-dental students. First, the virtually non-existent dental trauma education in non-dental programs (confirmed by our 0% training rate in that group and similar figures internationally means future professionals like doctors, nurses, teachers, police etc), may be unprepared to act when faced with a dental emergency. This is disconcerting, given that these individuals are often first responders. The literature consistently demonstrates that without education, knowledge is low across the board, whether it be school teachers, nursing students, or medical students (1,10).

Incorporating basic dental first-aid protocols into general first-aid courses or health curricula could address this gap. For example, a brief module on managing tooth avulsion (identifying the tooth, gentle handling, immediate replantation or proper storage) could be introduced in medical and nursing schools. Carrión-Ruiz et al.’s interventional study showed that even a single focused session with simulation can dramatically improve nursing students’ knowledge (mean scores nearly doubled post-training, from 5.85 to 10.35 on a 12-point scale) (10). Such evidence argues for adding hands-on dental trauma workshops in non-dental fields. Given that school nurses and teachers often encounter child injuries, targeted training for them (even via short courses or educational posters/apps) could markedly improve emergency management outcomes (10).

For dental students, while they did perform better, the gaps in their knowledge are still significant. Half of our senior dental students would not attempt replanting an avulsed tooth immediately, a worrying statistic considering they will soon be responsible for making such decisions. This aligns with Nagendrababu et al. (2024) and others who found that even graduating

dental students worldwide often fall short of mastering trauma guidelines. It is possible that the current curriculum may not be sufficiently reinforcing practical trauma management skills. As Fujita et al. suggested that dental schools must improve how guidelines for trauma are taught and ensure students can apply them by graduation (13). Possible improvements could include integrating dental trauma scenarios into clinical simulations, using problem-based learning cases on tooth injuries (as suggested by Puranik et al. 2023) and offering refresher sessions or emergency drills in the later years of dental training. Also, beneficial could be encouraging interprofessional learning, such as joint workshops between dental and medical students. These sessions would not only teach non-dentists what to do until a dentist is available to provide treatment but also give dental students experience in leading and communicating during emergencies.

Another gap is in knowledge retention. It is one thing to teach dental trauma management, but it is another thing for students to retain that information under stress or pressure. Some authors advocate for innovative teaching tools to reinforce learning over time, such as mobile apps or visual aids. We see an example of this via a poster campaign (“Save Your Teeth”) in schools, which significantly improved teachers’ knowledge retention about avulsion management (10). Dental curricula could likewise employ memory aids or periodic drills to ensure that what is learned in a lecture (say, in third or fourth year) is not forgotten by graduation. We found that only a small fraction of our students had attended additional courses on dental trauma (around 9% overall). Universities could encourage participation in professional development, perhaps by offering credit or integrating these seminars into the official program.

Both the comparative literature and our own findings demonstrate that while dental students have stronger dental trauma knowledge, than their non-dental peers, neither group is optimally prepared as could be. The differences in correct response rates – from identifying an avulsed permanent tooth to knowing the correct storage medium – were statistically significant in favour of those with dental training (5,13). The implication is clear: formal education makes a big difference, and lack of it leaves critical knowledge gaps. Bridging these gaps will require updates or advancements to existing curricula. Dental programs should reinforce trauma management protocols and practical skills before graduation, and non-dental programs (medicine, nursing, education, etc.) should incorporate basic dental first-aid principles. The nearly unanimous agreement on the importance of dental trauma education (95%+ of students in our survey) is an encouraging indication. By heeding these findings, our own and those from around the world in studies that shows that even many even among pediatricians, emergency doctors, teachers, and emergency staff lack knowledge about dental trauma, educators can implement targeted training and improvements, so that future professionals across disciplines, feel confident and competent in

handling dental emergencies, which will improve patient outcomes after traumatic dental injuries (5,15–17). Additional innovations include haptics-enhanced VR simulation in dental curricula, interdisciplinary problem-based learning models for trauma training, and VR-based anxiety-reduction methods during avulsion care (21–23).

5.3 Limitations of the Study

There are a few limitations to keep in mind. Since the survey was done at just one university and used a convenience sample, the results might not reflect students everywhere. Also, with only 109 participants, some group differences might not show up clearly. The study is cross-sectional and based on self-reported answers, so there is a chance some students overestimated or misunderstood parts of it. Even with these points, the results still give a good picture of how prepared students feel when it comes to handling dental trauma.

6. CONCLUSIONS

These results lead us to reject the null hypothesis (H0) and accept the alternative hypothesis (H1): there is a significant difference in the knowledge and management capabilities of traumatic dental injuries between dentistry and non-dental students at UEM. In line with our objectives, we found:

- **Knowledge gap:** Dental students correctly answered 77–92 % of avulsion related questions (identifying, cleaning, and storing an avulsed tooth), while non dental students scored only 8–49 % on those same items.
- **Confidence in managing trauma:** Just 38 % of dental and 22 % of non-dental students felt confident managing a dental trauma, showing low self-perceived preparedness across both groups.
- **Training exposure:** About 32 % of dental students had formal first aid or trauma training versus 0 % of non-dental students, confirming a curricular gap outside the dentistry field.
- **Need for education:** Over 90 % of all participants expressed a clear need for more training in dental trauma management.

While dental students outperform their peers in non-dental fields of study, neither group is fully prepared for real dental emergencies. These findings present to us a clear need to implement practical hands-on avulsion modules into dental courses and include brief and practical dental first aid units in general first aid training, which would target the non-dental students, so every future

professional can act quickly and correctly when a tooth is knocked out and assist towards best outcomes.

7. SUSTAINABILITY

- **Educational Sustainability**

Implementing short, hands-on trauma simulated hospital into each academic year's practical classes, using low-cost models and typodonts. Pair in-person sessions with brief online quizzes (Kahoot) or mobile-app refreshers so students revisit key steps over time. Recent multicentre studies have even demonstrated valid remote assessment of traumatic dental injuries using smartphone-acquired photographs, with diagnostic accuracy up to 95% for urgent cases (24,25).

- **Social Sustainability**

Organize interprofessional workshops that bring together dental, nursing, and medicine students to train on teamwork and shared learning. Encouraging peer-mentoring senior students coach juniors, so knowledge circulates naturally within the student community.

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9. ANNEXES

Annex 1. Ethical Committee Approval Letter



Comisión de Investigación

Villaviciosa de Odón, 26 de marzo de 2025

Estimado/a investigador/a,

La Comisión de Investigación de la Escuela de Doctorado e Investigación, una vez revisada la documentación e información, remitida por el investigador responsable con fecha 24/03/2025 11:28:01, relativa al proyecto abajo indicado, autoriza su desarrollo en la Universidad Europea.

Título del proyecto: Knowledge of Dentistry Students in Managing Dental Trauma.
Tipo de proyecto: TFG
Investigador/a responsable: VIVERO COUTO- LARA

Código CI: 2025-422
Código OTRI: Sin especificar
Código Departamento: OD.077/2425
Dictamen: APROBADO

Atentamente,



Dra. Ruth Muñoz Risueño

Directora de Investigación

ci@universidadeuropea.es

Annex 2. Informed Consent and Dental Trauma Knowledge Survey

INFORMED CONSENT: This questionnaire is part of the Final Degree Project in Dentistry at the European University of Madrid, titled "Knowledge of Dentistry Students in Managing Dental Trauma," supervised by Professor Lara Vivero Couto. The purpose of this study is to assess the knowledge and confidence levels of dental and non-dental students in managing dental trauma, with data collected through a brief survey. Your participation in this study is completely free and voluntary, and you may request to be excluded at any time without justification or consequences. The information collected will be confidential and will not be used for any purpose other than this research and related scientific dissemination. All collected data will remain anonymous, and no personal identifying information will be requested. The data obtained from this survey will be handled in accordance with Organic Law 3/2018 of December 5, concerning the Protection of Personal Data and Guarantee of Digital Rights. In compliance with this regulation, you are informed and expressly consent to the use of the data provided in this survey for the aforementioned purposes. This consent is granted without prejudice to your rights under the aforementioned law, including the ability to access the provided information, request corrections, request deletion, and object to the use of your data at any time. If you wish to exercise these rights, you must submit a written request to the project supervisor, Professor Lara Vivero Couto, at lara.vivero@universidadeuropea.es. Do you voluntarily consent to participate in this survey and allow the results to be used in the Final Degree Project titled "Knowledge of Dentistry Students in Managing Dental Trauma"?

☐ Yes

☐ No

Demographics

1. What is your gender? ***

☐ Woman

☐ Man

2. How old are you?

☐ 18 - 25

☐ 26 - 35

☐ 36 - 45

☐ 46 - 55

☐ > 55

3. Study Program

- ☐ Dental Student
- ☐ Non-dental Student

4. Year of Dental School (if applicable)

- ☐ 4th year
- ☐ 5th year

Knowledge of Dental Trauma

5. Can you distinguish between a temporary and permanent tooth?

- ☐ Yes
- ☐ No

6. Would you keep the fragments of a broken tooth?

- ☐ Yes
- ☐ No

Emergency Management Scenarios

Scenario 1:

"You are in a building at an elementary school. In front of you, a 9-year-old girl falls down the stairs and her lips receive a heavy blow. She is bleeding from her mouth, and one upper front tooth is found to be missing. Fortunately, she did not lose consciousness."

7. Is the damaged front tooth likely to be a primary or permanent tooth?

- ☐ Primary tooth
- ☐ Permanent tooth

8. Which of the following would you do? (Arrange in order of priority)

Wash the avulsed tooth with tap water.

Put the avulsed tooth back into the socket immediately.

Take her immediately to the nearest dentist with the avulsed tooth.

Sideline the injured girl and get her to bite on a tissue paper for several hours to control the bleeding.

Ask her whether she has incurred serious damage or injury.

Emergency Management Scenarios

Scenario 2:

"A boy who lives in your neighborhood has fallen down on the road, and one of his teeth has fallen out. He came to you with the knocked-out tooth in his hand after the accident."

9. Would you replant (put back) the tooth into the socket from which it avulsed?

☐ Yes

☐ No

10. If you decide to replant the tooth into its socket, but it has fallen onto the ground and is covered in dirt, what would you do?

☐ Rinse the tooth under running water

☐ Gently wipe off the mud that is stuck to the tooth by hand

☐ Scrub the tooth gently with a toothbrush

☐ Spray alcohol on the tooth

☐ Put the tooth straight back into the socket, with no pretreatment

11. If you did not replant the tooth, how would you transport it to the dentist?

☐ Hold the tooth in a hand

☐ Pack the tooth in ice

☐ Seal the tooth in plastic wrap

☐ Hold the tooth in the child's mouth

☐ Wrap the tooth in dry tissue paper

12. If a liquid is used to transport the tooth, how would you transport it to the dentist? (Arrange in order of priority)

Milk

Tap water

Alcohol

Physiological saline

Sports drink

Training and Experience

13. Have you ever witnessed a traumatic dental injury?

☐ Yes

☐ No

14. Have you ever experienced a traumatic dental injury yourself?

☐ Yes

☐ No

15. Have you had any first-aid training in dental trauma management?

☐ Yes

☐ No

16. Have you attended any additional courses about dental trauma?

☐ Yes

☐ No

17. Do you think you have the knowledge necessary to manage a traumatic dental injury?

☐ Yes

☐ No

18. Do you think you need more knowledge or training regarding dental traumatology?

☐ Yes

☐ No

19. Do you consider dental trauma education important?

☐ Yes

☐ No
