

Evaluation of Knowledge and Clinical Decision-Making of General Dental Practitioners for Pediatric Dental Trauma and Tooth Discoloration

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DOI: <https://doi.org/10.52403/gijhsr.20260307>

ABSTRACT

Background: Traumatic dental injuries (TDIs) and tooth discoloration are frequently encountered in pediatric dental practice and require prompt diagnosis and appropriate management to ensure favorable clinical outcomes. General dental practitioners (GDPs) often serve as the first point of contact for these patients; therefore, their knowledge of evidence-based management protocols is essential.

Aim: To evaluate the knowledge and clinical approach of general dental practitioners regarding the management of traumatic dental injuries and tooth discoloration in children.

Materials and Methods: A cross-sectional questionnaire-based survey was conducted among general dental practitioners from July to October 2025. The questionnaire, adapted from a previously validated survey and modified according to the 2020 International Association of Dental Traumatology (IADT) guidelines, comprised 13 close-ended questions assessing knowledge of dental trauma, avulsed tooth management, and tooth discoloration. Following pilot testing, the

questionnaire was distributed electronically, and 105 complete responses were included in the analysis. Data were analyzed using descriptive statistics and expressed as frequencies and percentages.

Results: Among the 105 respondents, 74% were female and 26% were male. Most participants demonstrated satisfactory knowledge regarding traumatic dental injuries and tooth discoloration. While 76% correctly identified the appropriate storage medium for an avulsed tooth, only 49.9% were aware of the recommended replantation timing. Knowledge regarding fluorosis as a cause of tooth discoloration was reported by 94% of participants, 90% were aware of available treatment options, and 81% correctly identified developmental causes of tooth discoloration. However, only 60% recognized drug-induced causes of tooth discoloration.

Conclusion: General dental practitioners demonstrated moderate overall knowledge regarding pediatric dental trauma and tooth discoloration. Although awareness of the etiology and management of tooth discoloration was satisfactory, deficiencies in the emergency management of avulsed teeth highlight the need for continuing

professional education to improve adherence to contemporary trauma management guidelines.

Keywords: *Avulsed tooth; Children; General dental practitioners; Knowledge; Pediatric dental trauma; Tooth discoloration; Traumatic dental injuries.*

INTRODUCTION

Traumatic dental injuries (TDIs) represent a significant public health concern and are among the most common oral health emergencies affecting children and adolescents. The International Association of Dental Traumatology (IADT) recognizes dental trauma as a condition requiring prompt diagnosis and evidence-based management to maximize the prognosis of injured teeth.^[1] Epidemiological studies indicate that approximately one-quarter of school-aged children and nearly one-third of adults experience traumatic injury to their permanent dentition, with the majority of incidents occurring before the age of 19 years. Falls, sports-related injuries, road traffic accidents, and recreational activities remain the leading causes of dental trauma in children.^[2]

The consequences of traumatic dental injuries extend beyond the immediate damage to dental tissues. Delayed or inappropriate management may result in pulpal necrosis, root resorption, tooth loss, compromised esthetics, functional impairment, and psychological distress. These injuries can negatively influence a child's quality of life while simultaneously imposing emotional and financial burdens on families.^[3] Therefore, timely recognition and appropriate emergency management by dental practitioners are essential for preserving tooth vitality and improving long-term clinical outcomes.

Among traumatic dental injuries, tooth avulsion is considered one of the most severe emergencies because the prognosis largely depends on extra-oral dry time, storage medium, and prompt replantation. The latest IADT guidelines emphasize

immediate replantation whenever feasible and recommend suitable storage media such as milk, Hank's Balanced Salt Solution (HBSS), saline, or the patient's saliva when immediate replantation is not possible.^[4] Consequently, general dental practitioners (GDPs), who often serve as the first point of professional contact, must possess adequate knowledge of current evidence-based recommendations for emergency management.

Tooth discoloration is another common clinical finding encountered in pediatric dental practice. Discoloration may arise from traumatic injuries, developmental defects, systemic illnesses, medications, fluorosis, hereditary conditions, or pulpal pathology.^[5] Accurate diagnosis of the underlying etiology is fundamental for selecting appropriate treatment options, which may range from observation and remineralization to bleaching, restorative procedures, endodontic treatment, or multidisciplinary management. Misdiagnosis can result in unnecessary treatment and compromised esthetic outcomes.

Although international guidelines for the management of traumatic dental injuries are periodically updated, previous studies have reported inconsistencies in the knowledge and clinical practices of dental professionals regarding emergency management of avulsed teeth and the diagnosis of tooth discoloration. Continuous assessment of practitioners' knowledge is therefore necessary to identify educational gaps and facilitate the development of targeted continuing dental education programs.

Therefore, the present study aimed to evaluate the knowledge and clinical approach of general dental practitioners regarding the management of traumatic dental injuries, particularly tooth avulsion, and the diagnosis and management of tooth discoloration in children using a structured questionnaire survey.

MATERIALS & METHODS

A cross-sectional questionnaire-based survey was conducted among general dental practitioners (GDPs) from July to October 2025 to evaluate their knowledge and clinical approach toward the management of traumatic dental injuries and tooth discoloration in children. The minimum sample size was calculated using the single population proportion formula, $n = \frac{Z^2 P(1-P)}{d^2}$, where $Z = 1.96$ at a 95% confidence level, $P = 0.50$ (assuming maximum variability), and $d = 0.10$ (10% margin of error). The calculated minimum sample size was 96 participants. A total of 105 complete responses were ultimately obtained and included in the final analysis.

The survey questionnaire was adapted from the study by Sen Yavuz et al. [6] and modified according to the recommendations of the 2020 International Association of Dental Traumatology (IADT) guidelines. The questionnaire comprised 13 close-ended questions covering demographic characteristics, knowledge regarding traumatic dental injuries, including tooth fractures, avulsion, appropriate storage media, and replantation of avulsed teeth, as well as the etiology, diagnosis, and management of tooth discoloration in children. Content validity was assessed by experts in Pediatric and Preventive Dentistry, and a pilot study involving 20 general dental practitioners was conducted to evaluate the clarity and feasibility of the questionnaire. Minor modifications were made based on the feedback received, and the pilot study responses were excluded from the final analysis.

The finalized questionnaire was distributed electronically through online platforms to registered general dental practitioners. Participation was voluntary, and completion of the questionnaire was considered as implied informed consent. Only fully completed questionnaires from registered general dental practitioners were included in the study, whereas responses from undergraduate dental students, interns, dental specialists, and incomplete or

duplicate questionnaires were excluded. Participant anonymity and confidentiality were maintained throughout the study.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data, and the results were expressed as frequencies and percentages. The findings were presented using tables and graphical representations.

RESULT

A total of 105 general dental practitioners completed the questionnaire and were included in the analysis. Among the respondents, 74% were female and 26% were male.

The majority of the participants demonstrated awareness regarding traumatic dental injuries, including tooth fractures, avulsion, and tooth discoloration. Approximately 76% of the respondents correctly identified the appropriate storage medium for an avulsed tooth, whereas only 49.9% were aware of the recommended time for replantation of an avulsed tooth.

Regarding tooth discoloration, 94% of the participants correctly identified fluorosis as a cause of intrinsic tooth discoloration. Overall, 74% of the respondents demonstrated adequate knowledge regarding tooth discoloration, while 67.6% correctly identified the characteristic color changes associated with different types of discoloration. Furthermore, 90% of the participants were aware of the available treatment options for tooth discoloration. Knowledge regarding systemic conditions associated with tooth discoloration was satisfactory among the majority of the respondents; however, only 60% correctly identified drug-induced causes of tooth discoloration. In addition, 81% of the participants were aware of the developmental conditions associated with tooth discoloration.

With respect to clinical exposure, 45% of the respondents reported encountering cases of traumatic dental injuries or tooth discoloration approximately once per month. Overall, the findings indicate that the participating general dental practitioners possessed moderate knowledge regarding the management of traumatic dental injuries and tooth discoloration in children, with noticeable deficiencies in the emergency management of avulsed teeth, particularly regarding the timing of replantation.

DISCUSSION

Traumatic dental injuries constitute one of the most common dental emergencies encountered in children, requiring prompt diagnosis and appropriate management to preserve tooth vitality and improve long-term prognosis.^[7] General dental practitioners are frequently the first healthcare professionals to evaluate these patients; therefore, adequate knowledge of current evidence-based guidelines is essential. The present study evaluated the knowledge and clinical approach of general dental practitioners regarding the management of traumatic dental injuries and tooth discoloration in children.

The findings of the present study demonstrated that the participating practitioners possessed an overall moderate level of knowledge regarding traumatic dental injuries and tooth discoloration. Although most respondents were familiar with the basic concepts of dental trauma, important deficiencies were observed in the emergency management of avulsed teeth, particularly regarding the appropriate storage medium and the optimal timing of replantation. Since the prognosis of an avulsed tooth is largely dependent on extra-oral dry time and immediate management, these deficiencies may adversely affect treatment outcomes and emphasize the need for regular continuing dental education programs based on the latest International Association of Dental Traumatology (IADT) guidelines.^[1]

In the present study, 76% of the respondents correctly identified the appropriate storage medium for an avulsed tooth, indicating satisfactory awareness of this aspect of emergency management. However, only 49.9% correctly identified the recommended time for replantation, suggesting inadequate knowledge of one of the most critical determinants of prognosis. Similar findings were reported by Al Shamiri et al., who observed insufficient knowledge regarding the emergency management of avulsed teeth among dental students in Saudi Arabia, with many participants demonstrating uncertainty about appropriate emergency procedures.^[8] Likewise, V et al. reported variable levels of knowledge, awareness, and practice regarding the management of dental trauma among dental practitioners, emphasizing the need for continuous professional education to improve adherence to evidence-based trauma management guidelines.^[7] These findings collectively indicate that despite increased awareness of dental trauma, significant knowledge gaps continue to exist in the management of tooth avulsion.

In contrast, some studies have reported comparatively better knowledge among practicing dentists. Imtiaz T et al. found that dental practitioners demonstrated satisfactory knowledge regarding the management of Ellis Class III fractures and other traumatic dental injuries, attributing this to increased clinical exposure and continuing professional education.^[9] The differences between their findings and the present study may be explained by variations in participant characteristics, years of clinical experience, educational background, and the assessment tools employed. Furthermore, periodic revisions of the IADT guidelines necessitate continuous updating of practitioners' knowledge, which may not always occur in routine clinical practice.

Another important finding of the present study was the high level of awareness regarding tooth discoloration. Nearly three-fourths of the respondents correctly

identified the causes of tooth discoloration, while 94% recognized fluorosis as an important etiological factor and 90% were aware of the available treatment options. These findings suggest that general dental practitioners possess adequate theoretical knowledge regarding the diagnosis and management of tooth discoloration, probably because esthetic concerns constitute a frequent reason for dental consultation in routine clinical practice.

Nevertheless, deficiencies were observed in identifying drug-induced tooth discoloration, with only 60% of the participants answering correctly.

Drug-induced intrinsic discoloration, particularly that associated with tetracycline administration during tooth development, remains an important clinical consideration in pediatric dentistry.^[10] Similar deficiencies have been reported in previous questionnaire-based surveys evaluating dentists' knowledge of intrinsic tooth discoloration, indicating that uncommon etiological factors often receive less emphasis during undergraduate training and continuing education programs. Improving practitioners' understanding of the various causes of intrinsic discoloration would facilitate accurate diagnosis and appropriate treatment planning.^[11]

The present study also found that 81% of the respondents were aware of developmental causes of tooth discoloration, and 67.6% correctly recognized the characteristic color changes associated with different etiological factors. This level of awareness is encouraging, as accurate identification of the nature of discoloration is fundamental for differentiating developmental defects from trauma-induced pulpal changes and selecting appropriate management strategies. However, the persistence of knowledge gaps in specific clinical scenarios highlights the importance of incorporating evidence-based updates into continuing dental education programs.

The findings of this study should be interpreted in light of certain limitations. The study employed a cross-sectional questionnaire design, which reflects

participants' knowledge at a single point in time and does not establish changes in knowledge or clinical practice over time. As the responses were self-reported, they may be subject to response and recall bias. Furthermore, the study included only 105 participants, which may limit the external validity and generalizability of the findings. In addition, the questionnaire assessed theoretical knowledge without evaluating participants' practical skills or clinical decision-making in real-life emergency situations.

Future research should focus on developing and validating standardized educational interventions aimed at improving dentists' competency in the management of pediatric dental trauma. Comparative studies evaluating knowledge before and after continuing dental education programs, simulation-based training, or online learning modules would provide valuable evidence regarding the effectiveness of these educational strategies. Additionally, nationwide multicenter studies involving both general dental practitioners and dental specialists could provide a broader understanding of existing knowledge gaps and help formulate evidence-based educational policies.

CONCLUSION

Within the limitations of this study, general dental practitioners demonstrated satisfactory knowledge regarding the identification and management of tooth discoloration in children. However, deficiencies were observed in critical aspects of traumatic dental injury management, particularly the emergency management of avulsed teeth, including appropriate storage media and replantation timing. Since these factors play a decisive role in the prognosis of traumatized teeth, strengthening undergraduate training and promoting regular updates on contemporary trauma management guidelines are essential to enhance the quality of pediatric dental care.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Sridhar. M, Burma Aishwarya, Naseemoun Shaik, Bhagyasri Krishna, Hiba Tazeen. Evaluation of knowledge and clinical decision-making of general dental practitioners for pediatric dental trauma and tooth discoloration. *Gal Int J Health Sci Res*. 2026; 11(3): 56-61. DOI: <https://doi.org/10.52403/gijhsr.20260307>
