



## EVALUATING KNOWLEDGE AND POST TOOTH AVULSION CONDUCT OF PROFESSIONALS AT HOSPITAL EMERGENCY SERVICE

AVALIAÇÃO DO CONHECIMENTO E CONDUTA PÓS AVULSÃO DENTÁRIA DE PROFISSIONAIS DE SERVIÇOS DE URGÊNCIA HOSPITALAR

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**ABSTRACT:** The objective was to evaluate the knowledge and practices of healthcare professionals working in hospital emergency departments regarding the management of patients after dental avulsion. A total of 101 professionals, including physicians, nurses, and nursing technicians from two hospitals in the city of Ivaiporã, Paraná, Brazil, were assessed. Participants completed an online questionnaire addressing emergency care and clinical conduct following dental avulsion. The responses were analyzed using the chi-square test with a significance level of 5%. Only 14.9% of the professionals reported having received prior information on how to manage dental avulsion, and no statistically significant differences were found between professional category, access to information, or length of service and the adopted conduct. Although only 2% of the participants considered themselves capable of performing dental reimplantation, 49.5% reported that they would request a specialized professional. These findings indicate that healthcare professionals working in hospital emergency settings do not have adequate knowledge about dental reimplantation and tend to refer patients to a dentist rather than performing immediate intervention.

**KEYWORDS:** Dental avulsion, Dental trauma, Emergency medical services, First aid.

**RESUMO:** O objetivo foi avaliar o conhecimento e conduta de profissionais de saúde de setores de urgência hospitalar no atendimento ao paciente após avulsão dentária. Foram avaliados 101 profissionais, entre médicos, enfermeiros e técnicos de enfermagem de dois hospitais na cidade de Ivaiporã-PR. Os participantes preencheram um questionário online sobre o atendimento e a conduta após avulsão dentária. As respostas foram analisadas por meio de teste qui-quadrado com significância de 5%. 14,9% relataram ter recebido informação sobre como conduzir uma avulsão dental. Não houve diferença estatística entre conduta e profissão, acesso à informação e tempo de serviço. Apenas 2% dos profissionais se julgaram aptos a realizar o reimplante dentário, mas 49,5% solicitariam profissional especializado. Os profissionais que realizam o atendimento de urgência em hospitais não possuem conhecimento adequado sobre o reimplante dentário, optando por encaminhar o paciente ao cirurgião-dentista.

**PALAVRAS-CHAVE:** Avulsão dentária. Primeiros socorros. Serviços médicos de emergência. Traumatismos dentários.

## INTRODUCTION

Dental avulsion refers to the complete displacement of a tooth from its socket<sup>1,2</sup>, and it is the type of dental injury that causes the most significant functional, aesthetic, and emotional damage. It is considered a serious dental emergency. Approximately 25% of school-aged children experience some form of dental trauma, and 33% of adults report having suffered trauma to their permanent dentition<sup>3</sup>.

About 15% of dental traumas result in avulsion, which is the most severe dental injury due to its unfavorable prognosis, heavily dependent on the initial management immediately following the trauma<sup>4</sup>. In cases involving avulsed primary teeth, reimplantation should not be performed due to the risk of damaging the developing permanent tooth germ<sup>3</sup>.

Proper and timely management of dental avulsion is crucial for the survival of the avulsed tooth<sup>3</sup>. However, due to the lack of dental surgeons in hospital emergency services, physicians and nurses are often the first professionals to provide care in these situations<sup>5</sup>.

Dental trauma is considered a public health issue given its high prevalence in both the Brazilian<sup>6</sup> and global populations<sup>7</sup>, primarily affecting children and adolescents<sup>3,8</sup>. These injuries account for approximately 5% of all traumatic bodily injuries treated in hospitals<sup>3</sup>, commonly resulting from sports or recreational activities<sup>6</sup>. Among these, dental luxation and avulsion are the main injuries that lead patients to seek hospital care<sup>8</sup>.

The maxillary central incisors are the most frequently affected teeth, followed by the maxillary lateral incisors, as a result of their vulnerable position in the dental arch, where they receive direct traumatic forces<sup>8</sup>.

Avulsion causes severe neurovascular damage by rupturing the vascular bundle that nourishes the dental pulp, leading to pulp necrosis<sup>1</sup>. Additionally, the viability of periodontal ligament (PDL) cells and cementoblasts outside the body is extremely short<sup>9</sup>. Preserving the viability and proliferative capacity of PDL cells is critical to the success of tooth reimplantation<sup>1,10</sup>.

Hence, in cases of avulsed permanent teeth, the duration that the tooth remains outside the socket directly affects the prognosis<sup>3,11</sup>. Ideally, reimplantation should occur immediately (immediate reimplantation) or within 60 minutes (delayed reimplantation).

The avulsed tooth must be stored in a medium that supports the viability of the periodontal cells, allowing them to proliferate and colonize the denuded areas of the root surface, thereby reducing the incidence of root resorption and ankylosis<sup>10</sup>. Hank's Balanced Salt Solution (HBSS) is considered the most effective storage medium, as it maintains 70% of fibroblasts viable for up to 96 hours. It is composed of a mixture of salts enriched with amino acids, vitamins, glucose, and other components essential to cell survival<sup>12</sup>. However, HBSS is not always available at the site of the accident. In such cases, milk is recommended due to its basic pH and appropriate osmolarity, which can maintain cell viability for up to six hours<sup>10,13</sup>.

Saliva, being a hypotonic and contaminated medium, is not recommended, nor is water, as both can cause cell lysis<sup>13</sup>. Although saline solution has compatible osmolarity, it lacks essential nutrients for cellular metabolism<sup>13</sup>. However, keeping the avulsed tooth dry leads to a worse prognosis<sup>11</sup>.

Dental treatments based on scientific evidence—combined with factors such as the time elapsed and the storage medium used after avulsion—are critical for a successful outcome<sup>1,3</sup>. Therefore, people present at the site of the accident should be instructed to perform immediate reimplantation and/or store the tooth properly until reimplantation can occur shortly thereafter<sup>3</sup>. Nonetheless, reimplantation is not always indicated—for example, when the avulsed tooth is affected by extensive caries or periodontal disease, or depending on the patient's overall health condition<sup>3</sup>.

Many victims of dental trauma seek initial care in hospital settings due to difficulty locating a dental surgeon, who would be the most qualified professional in such cases<sup>3</sup>. Dental professionals are not always part of hospital staff, and in most cases, the initial care is provided by non-dental healthcare workers. Thus, it is essential that emergency hospital personnel are prepared to offer proper care and follow the appropriate protocols for each case.

Research conducted at a University Hospital in Brazil found that, even without formal training during their academic education, physicians were aware that reimplantation time directly affects prognosis and helps reduce complications<sup>14</sup>.

In India, a study carried out in emergency departments showed that physicians and nurses lacked adequate knowledge regarding the storage medium and handling of avulsed teeth, although 66.7% of these professionals considered the possibility of performing the reimplantation themselves<sup>15</sup>.

Another study in Germany evaluating emergency physicians revealed that 71.12% reported lacking the necessary skills to manage dental trauma, and only 26.06% would select the correct storage medium for an avulsed tooth<sup>16</sup>. Similarly, in a multicenter survey conducted in Pakistan comparing parents and physicians, 72% stated they had no knowledge of dental avulsion, and only 15% were aware of the appropriate storage medium. The level of knowledge regarding first aid for avulsed teeth was found to be independent of academic background<sup>17</sup>.

A comparable multicenter initiative conducted in hospital emergency departments in Saudi Arabia found that nearly half of the physicians surveyed were unaware of the importance of extra-oral time, and milk was selected as the best storage medium by only 31.1% of participants<sup>18</sup>.

These findings highlight the lack of formal knowledge about dental avulsion among non-dental healthcare professionals. However, little attention has been given to the differences in management between primary and permanent teeth, or to the protocols for proper storage. Moreover, recent Brazilian contributions to this topic remain scarce. Therefore, the objective of this study is to assess the knowledge of healthcare professionals (physicians, nurses, and nursing technicians) working in hospital settings regarding dental avulsion.

## METHODOLOGY

This study was approved by the Permanent Ethics Committee for Research Involving Human Subjects of the State University of Maringá (CAAE no.: 60698922.9.0000.0104, Appendix 1). All participants signed the Informed Consent Form (ICF), in accordance with ethical guidelines.

An observational cross-sectional study was conducted through a questionnaire administered to physicians, nurses, and nursing technicians working in the emergency departments of hospitals in the city of Ivaiporã. The municipality of Ivaiporã is located in the central region of the state of Paraná and serves as a healthcare reference center for 16 surrounding municipalities, with an estimated population of 130,000. The target professionals included healthcare workers providing emergency and trauma care at two reference hospitals—one public and one private—which together employ 80 physicians, 22 nurses, and 144 nursing technicians responsible for the initial care of trauma patients. Inclusion criteria: (1) being a healthcare professional (non-dentist) working in hospital-based emergency care, and (2) signing the informed consent form. Exclusion criteria: (1) being a dentist, (2) being a healthcare professional not working in hospital emergency settings, (3) not signing the informed consent form, and (4) not willing to participate.

To determine the sample size, a proportion-based calculation was performed considering a 95% confidence level, a 10%  $\beta$  error, and an estimated proportion of 50%, with an additional 30% to account for potential losses. This resulted in a minimum required sample of 101 participants. Although all professionals were invited to participate in the study, only 101 responses were obtained. Data collection was carried out between March and May 2022.

The questionnaire (Appendix 1) consisted of two parts and was developed by the researchers. The first part included sociodemographic questions, and the second addressed the approach and conduct in cases of dental avulsion. The questionnaire was administered in Portuguese through the Google Forms® platform and distributed via the WhatsApp® messaging application. Participants were given two days to respond.

Subsequently, the responses were statistically analyzed using Jamovi software (version 2.3), applying frequency tables and the chi-square test with a 5% significance level.

## RESULTS

Of the 101 professionals evaluated, 13 were physicians (12.9%), 21 were nurses (20.8%), and 67 were nursing technicians (66.3%). Regarding educational background, 41.6% held a higher education degree, and 44.6% reported having worked for over ten years in hospital emergency departments.

Table 1 presents the response rates regarding the participants' knowledge of dental trauma and avulsion. A total of 71.3% reported that dental trauma is a common occurrence, and 80.2% had previously treated such cases. However, 53.0% of participants were unable to define what dental avulsion is. Interestingly, when asked whether they had ever attended to a patient whose tooth had been completely displaced from the mouth, 64.4% answered yes.

All professionals agreed on the importance of knowing how to properly manage cases of dental trauma. Nonetheless, 28.7% reported being unable to distinguish between a primary and a permanent tooth. Only 2.0% felt capable of performing a dental reimplantation. However, no statistically significant difference was found among professional categories regarding reimplantation capability ( $p = 0.260$ ) (see Table 2).

Access to information on dental trauma did not significantly differ among the professional categories ( $p = 0.474$ ). Only 15 participants (14.9%) reported having received training on dental trauma. Among them, 73% stated that, in the event of a trauma case, they would refer the patient to a dentist rather than perform the initial care, and 100% of them reported not feeling prepared to carry out the reimplantation procedure (Table 2).

**Table 1.** Response frequency of emergency care professionals from two hospitals regarding conduct in cases of dental trauma and avulsion. Ivaiporã-PR (n = 101)

	<b>Total</b>
<b>What is your first action when faced with a dental trauma case?</b>	
Provide initial care	41 (40,6%)
Call a specialist	50 (49,5%)
Request imaging exams	10 (9,9%)
<b>What is the best definition of dental avulsion?</b>	
I don't know how to explain	25 (24,8%)
I've never handled such a case	22 (21,8%)
The tooth is mobile	5 (5,0%)
The tooth is completely out of the socket	48 (47,5%)
The tooth is broken	1 (1,0%)

	<b>Total</b>
<b>A 10-year-old child arrives with the tooth in hand. What should be done?</b>	
Place the tooth in a liquid medium	50 (49,5%)
Place the tooth in a clean, dry container	8 (7,9%)
Advise seeking a dentist	26 (25,7%)
Request imaging exams	17 (16,8%)
<b>A 10-year-old child arrives with a tooth in a cup of milk. What should be done?</b>	
Reimplant the tooth	11 (10,9%)
Discard the tooth	2 (2,0%)
Place the tooth in a clean, dry container	12 (11,9%)
Place the tooth in saline solution	36 (35,6%)
Advise seeking a dentist	40 (39,6%)
<b>Is there a difference in the approach to trauma when the tooth is deciduous?</b>	
Yes	85 (84,2%)
No	16 (15,8%)
<b>What to do if a deciduous tooth is completely avulsed?</b>	
Reimplant the tooth	4 (4,0%)
Discard the tooth	24 (23,8%)
Place the tooth in a clean, dry container	10 (9,9%)
Place the tooth in saline solution	13 (12,9%)
Advise seeking a dentist	50 (49,5%)

**Table 2.** Comparison between professional categories and conduct in cases of dental avulsion.

	<b>Profession</b>				p value
	Nursing Technician n(%)	Nurse n(%)	Physician n(%)	Total n(100%)	
<b>During your training, did you receive information about dental trauma?</b>					
Yes	12 (80,0%)	2 (13,3%)	1 (6,7%)	15 (100,0%)	0.474
No	55 (64,0%)	19 (22,1%)	12 (14,0%)	86 (100,0%)	
<b>Do you know how to distinguish between a "baby tooth" and a permanent one?</b>					
Yes	50 (69,4%)	13 (18,1%)	9 (12,5%)	72 (100,0%)	0.523
No	17 (58,6%)	8 (27,6%)	4 (23,8%)	29 (100,0%)	
<b>Have you ever treated a patient whose tooth was completely out of the socket?</b>					
Yes	35 (53,8%)	18 (27,7%)	12 (18,5%)	65 (100,0%)	0.002
No	32 (88,9%)	3 (8,3%)	1 (2,8%)	36 (100,0%)	
<b>Do you feel capable of reimplanting the tooth into the socket?</b>					
Yes	1 (50,0%)	0 (0,0%)	1 (50,0%)	2 (100,0%)	0.260
No	66 (66,7%)	21 (21,2%)	12 (12,1%)	99 (100,0%)	

## DISCUSSION

This study revealed that most professionals working in hospital emergency care had already attended cases involving dental trauma and avulsion. However, a significant portion of them did not know the ideal storage medium for an avulsed tooth and did not feel capable of performing dental reimplantation when indicated. Similar findings were reported in studies conducted in hospitals in India<sup>15</sup>, Saudi Arabia<sup>18</sup>, and Germany<sup>16</sup>, which also demonstrated a lack of knowledge among emergency professionals regarding appropriate storage media and the correct management of dental trauma. Fonseca et al. (2020) found that only 5.3% of professionals providing emergency care felt capable of performing tooth reimplantation. Most of them reported limiting their care to pain control, requesting complementary exams, and performing sutures<sup>14</sup>.

Despite the relevance of the topic, the knowledge of emergency hospital professionals regarding the management of avulsed primary teeth remains underexplored in the literature. In this research, most participants stated they were aware that the approach to avulsed primary teeth differs from that of permanent ones. Nevertheless, similar to the management of permanent teeth, the majority would opt to refer the patient to a dentist. In such cases, prognosis is not compromised, as reimplantation of avulsed primary teeth is not indicated<sup>3</sup>.

The management of dental trauma is often inadequate, even when performed by dental professionals. Studies involving dentists have shown inconsistent responses regarding the ideal time and appropriate storage medium for transporting avulsed teeth<sup>19</sup>.

A survey conducted with non-dental undergraduate students in Brazil revealed that, although many had received training in first aid, 85.1% reported never having received information on how to respond to oral trauma<sup>20</sup>. Dental education should incorporate first aid guidance and emphasize the need for awareness campaigns and training programs<sup>12</sup>. Knowledge about tooth avulsion should extend beyond the dental profession and be made available to other healthcare providers. Although the protocols for managing dental trauma are well documented in the literature, they are primarily targeted at dentists. Unfortunately, there are no public health policies addressing this type of injury<sup>11</sup>.

A prospective longitudinal investigation in Dubai evaluated school teachers and nurses at three different moments (before, immediately after, and three months following an educational intervention) and showed a significant improvement in their knowledge and responsiveness to dental avulsion cases<sup>21</sup>. In light of the challenges faced in initial dental trauma care, the International Association of Dental Traumatology (IADT) launched the mobile app 'ToothSOS®'<sup>22</sup> in 2018, which has not yet been translated into Portuguese. In Portuguese, the apps 'Acidente®'<sup>23</sup> and 'Dental Trauma®'<sup>24</sup> are available as quick reference tools for both patients and healthcare professionals managing dental emergencies.

In our study, few professionals reported having received information about the proper management of dental trauma. In India, although 60% of professionals stated they had received such guidance, 87% still preferred to refer the patient to a dentist<sup>15</sup>. In that context, having access to information on how to handle dental trauma was not sufficient to motivate non-dental professionals to intervene directly. This may be due to their understanding that dental reimplantation falls strictly within the scope of dental surgeons<sup>14</sup>, which ultimately increases the extra-oral time 25and negatively affects the prognosis, even though professionals recognize that timely intervention is crucial for favorable outcomes<sup>14</sup>. The resulting delay contributes to cellular deterioration and, consequently, to tooth loss.

It is understandable that non-dental professionals tend to refer patients to a dentist as their initial response, since medical, nursing, and technical training programs generally do not include detailed study of oral and dental anatomy. Additionally, professionals may feel anxious or insecure when faced with a traumatized and distressed patient, fearing that they might cause harm through an incorrect intervention.

Teeth are still widely perceived as the exclusive domain of Dentistry, and dental surgeons as the only professionals qualified to manage dental trauma. A significant gap persists between hospital services and dentistry, as dental professionals continue to seek greater integration into hospital teams. Oral and maxillofacial surgeons are the most commonly found dental professionals in hospital environments; however, they rarely work full shifts or provide initial trauma care. Likewise, hospital dentistry specialists<sup>25</sup> typically work in intensive care units (ICUs) and with patients who have complex medical conditions, and are not usually available for emergency triage and treatment.

Despite this scenario, in some Brazilian cities such as Curitiba-PR<sup>26</sup> and São Paulo-SP<sup>27</sup>, a few urgent care units (UPAs) already include dental surgeons among their 24-hour on-call staff for dental

emergencies. Since 1982, the Federal University of Uberaba<sup>28</sup> has operated a Dental Hospital that offers round-the-clock emergency services, including care for dental pain, odontogenic infections, dental and facial trauma, post-surgical bleeding, and more. Although promising, these local efforts address only a portion of the population's dental emergency needs and still do not fully meet the demands of patients seeking emergency hospital care, especially those who are polytraumatized or hospitalized.

In light of these challenges, Dentistry plays an essential role and should be integrated into the hospital's multidisciplinary healthcare team so that care can be provided comprehensively—both in urgent situations and in the daily routines of hospitalized patients requiring oral health management. Research carried out in Brazilian<sup>29</sup> and U.S.<sup>30</sup> hospitals have shown that healthcare professionals acknowledge the importance of oral health to general health, and that the fragmentation of care leads to poorer outcomes and higher costs for patients. It is essential that victims of dental avulsion receive timely and effective care, as delayed reimplantation is associated with significantly worse prognosis.

To address these gaps, health promotion and education initiatives are important for disseminating information. In addition to academic studies and training programs, the inclusion of dental surgeons in hospital settings is essential to improving care outcomes.

Finally, this study has the limitation of being conducted in a single location, with a relatively homogeneous population. Therefore, we recommend that future studies be carried out in other regions and in different countries.

## CONCLUSION

Therefore, it can be concluded that healthcare professionals providing emergency care in hospitals do not have adequate knowledge regarding dental reimplantation and tend to refer patients to a dental surgeon.

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