

ORIGINAL RESEARCH

Awareness about emergency management of avulsed tooth among intern dentists—a cross-sectional observational study

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Abstract

Tooth avulsion is a frequently encountered dental emergency. Children are commonly reported group due to frequent sports activities, trauma, accidents and falls. Prompt emergency management is vital for long term success and to avoid morbidity. The study was aimed to assess the understanding of intern dentists about the emergency handling of avulsed teeth cases as mostly they are first responders among health care personnel. In this study a fourteen-item questionnaire with predefined responses was shared as online Google survey form with intern dentists of 5 different dental teaching hospitals of Islamabad, Pakistan. The duration of the study was 6 months (01 March 2022 to 31 August 2022). The questions were intended to collect personal information and to check level of knowledge and awareness about the management of avulsed tooth among the dental interns. The data was analyzed by statistical methods and is presented through tables and descriptive methods. In total, 152 participants completed the shared questionnaire. The vast majority (71%) of them were aware of the initial management of avulsed teeth, 49% were aware of the ideal transport medium for an avulsed tooth, (43%) were aware of the critical time for successful replantation, while (62%) had knowledge of the multiple factors responsible for the outcome of the tooth replantation. For majority of the statements, female participants had better knowledge as compared to their male counterparts. Statistically significant difference was noted for the statement “*If you found the knocked-out tooth and it is dirty what will be your initial approach?*” with female participants having better knowledge as compared to the male (p value = 0.005). Based on our study results, generally dental interns are well-informed but still lack expected level of awareness regarding the proper management protocol for avulsed tooth. Hence, improvement is needed regarding the effective handling of avulsed teeth cases.

Keywords

Dental trauma; Emergencies; Tooth avulsion; Tooth injuries

1. Introduction

Traumatic injuries frequently lead to dental injuries. Approximately 10% of the global population has experienced dental trauma ranging from minor luxation to dento-alveolar damage leading to tooth avulsion [1, 2]. Tooth avulsion is defined as a

complete displacement of a tooth from its socket in the alveolar bone, and it is one of the most traumatic dental injuries which originates due to the exposure of the cells of the periodontal ligament to the external environment as well as disruption of the blood supply to the pulp [3]. Avulsion of tooth is one of the major sports injuries that occur in children and adult.

The most predisposed teeth for avulsion are maxillary incisors [3, 4]. Avulsion of maxillary tooth not only affect the aesthetics but also the overall quality of life, effecting communication, phonetics, mastication, psychological and mental health of the patient [5]. Falls, sports, crashes, physical leisure activities, assault, being hit by an object, traffic accidents, and not wearing protective headgear during recreational activities are the major causes of tooth avulsion [6, 7].

The avulsed tooth must be replanted into its socket. The vitality of the cells over the root is critical for the success rate of the replanted tooth, and it must be placed in a tightly closed jar containing a wet medium, such as milk, the patient's own saliva, or Hank's balanced solution. The chances of success increase if the tooth is placed in a wet medium before replantation [8]. Placing the tooth into a dry storage medium like wrapping it in tissue paper or grabbing it in your hands before replantation can diminish the vitality of the cells. The prognosis depends on the measures taken at the incident site or in the time immediately after the avulsion. For good prognosis, an emergency management and treatment plan are important [7, 9]. The patient as well as health care providers, particularly dentists, should be aware of the appropriate management of avulsed teeth and try their best to save the tooth and replant it as soon as possible. Increase awareness will help them to manage such patients better in future.

In the past, various protocols for the management of avulsion have been introduced. For assessment of current knowledge and effective management of avulsion by young dentists, this study introduced additional thought provoking questions on avulsion and its management which were lacking in previous studies. Hence, the aim of this study is to evaluate the basic knowledge of dental interns working in private and public dental teaching hospitals of Islamabad, Pakistan regarding management of avulsed tooth.

2. Materials and methods

This was a cross-sectional study carried out by sharing a customized questionnaire amongst dental interns working in private and public dental teaching hospitals in Islamabad, Pakistan, *viz.* Rawal Institute of Health Sciences, Pakistan Institute of Medical Sciences, Islamabad Dental Hospital, Federal Medical and Dental College, and Margalla Institute of Health Sciences from 01 March 2022 to 31 August 2022.

A total of 186 participants were recruited for the study as calculated using World Health Organization formula at confidence interval of 95% and margin for error 5%.

The participants were selected using convenience sampling technique after consideration of inclusion and exclusion criteria. The inclusion criteria considered was: (1) dental interns currently working in different dental teaching hospitals of Islamabad, Pakistan; and (2) voluntary participation in the research study. Those who did not meet any of those criteria were excluded from the study.

2.1 Data collection tool

A customized self-administered questionnaire was designed. Ten subjects were selected randomly and a pilot study was un-

dertaken to assess the ability of participants to understand the questionnaire clearly. Subsequent modifications and revisions were carried out until a Cronbach's alpha value of 0.783 was achieved to ensure reliability and consistency.

A fourteen-item questionnaire was broadly categorized into 2 sections—Section I comprised of participant's personal, professional, and demographic details (including serial number, gender, age and year of graduation); and Section II consisted of close-ended questions related to awareness regarding tooth avulsion. The questions were regarding the immediate management, critical extra-alveolar time, ideal storage medium, manner of debriding a visibly sullied tooth, its legitimate care, splinting techniques and duration of splinting. Respondents were requested to choose the best answer from the multiple choices provided.

2.2 Procedure

The participation was made voluntary and the purpose of survey was briefed to the respondents before obtaining a verbal informed consent. It was assured in the beginning of the questionnaire itself that the results of the survey would be only presented or published as an aggregate data maintaining the confidentiality of personal information. The questionnaire was distributed among the participants with the help of Google forms *via* the participants' contact number or *via* Gmail. The correct responses were determined by expert knowledge and evidence in the accepted literature.

2.3 Statistical analysis

Initially descriptive statistics were calculated, followed by testing the statistical significance between various variables. Chi-square test was used to assess differences in mean values for knowledge among gender and age groups wherein the options were categorized as either "correct" or "incorrect". SPSS software version 20.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis, with a significance level of $p \leq 0.05$.

3. Results

A total of 186 dental interns responded to the questionnaire, and after excluding 34 individuals with deficient data, 152 individuals were available for final analysis. The response rate was 81.7%. Demographic characteristics of the participating interns are shown in Table 1. Majority of the participants were ≤ 25 years (122; 80.3%) and females were the predominant participants (94; 61.4%).

TABLE 1. Demographic characteristics of participating house officers (N = 152).

	Number (%)
Age (in years) (Mean age)	23.2
≤ 25	122 (80.3)
> 25	30 (19.8)
Gender	
Male	58 (38.2)
Female	94 (61.8)

Table 2 shows the frequencies and percentage of the responses to the questions. Most of the dental interns (71%) were aware of the initial approach of avulsed tooth, with 65% claiming to have knowledge of how to and from which side to hold the avulsed tooth. Half of the respondents understood the significance of replantation of avulsed tooth and only 43% of dental interns were aware that 30 minutes is the crucial window for replanting is significant. 35% of the dental interns were aware that splinting with semi rigid nickel titanium wire is preferred. However, 49% of the dental interns were conscious that a splinting time of 10–14 days is required. About 49% of the dental interns had the knowledge that the ideal storage solution for a displaced tooth is Hank's balanced salt solution. Only 34% of dental interns knew the material used for washing the tooth before reimplantation, while 62% had knowledge regarding the pharmacological aid after tooth reimplantation and 41% knew the duration of drugs prescribed.

Various factors influence the outcome of the tooth reimplantation. The fact that majority (62%) of the interns were aware of the many parameters influencing the success of tooth reimplantation, however, very few (10%) knew the correct follow up time of avulsed tooth. Only 64% of the house officers were aware of the overall treatment and management of tooth after avulsion.

Table 3 shows the frequencies and percentage of the responses based on the age groups. For majority of the statements, participants' >25 years had better knowledge as compared to the participants who were ≤25 years, other than for the statements, "if you were at the accident site, how would you hold the avulsed tooth?" and "best storage medium for preservation of avulsed tooth is?" for which the participants ≤25 years had better knowledge. For the statements, "what will be the tooth management before replantation?", "what is the normal duration for antibiotic prescription after tooth replantation?" and "what will be the duration of follow up period of avulsed tooth?", majority of the participants had poor knowledge, irrespective of the age groups. Statistically significant difference was noted for the statement, "what is the normal duration for antibiotic prescription after tooth replantation?" (p value = 0.012) with participants ≤25 years having poor knowledge as compared to participants >25 years.

Table 4 shows the gender based responses. For most of the statements, female participants' had better knowledge as compared to the male participants. For the statements, "what is the ideal extra-alveolar period?", "which type of splinting you do in case of avulsed tooth?", "what will be the tooth management before replantation?" and "what will be the duration of follow up period of avulsed tooth?" majority of the participants had poor knowledge, irrespective of the gender. Statistically significant difference was noted for the statement, "if you found the knocked-out tooth and it is dirty what will be your initial approach?" (p value = 0.005) with female participants having better knowledge as compared to the male.

4. Discussion

This survey provided baseline information about the existing level of awareness on the management of avulsed tooth among house officers working in Islamabad, Pakistan. The study

included 152 house officers working at private and public sector dental teaching hospitals who were assessed with the help of a questionnaire for their knowledge and awareness regarding tooth avulsion.

In the present study, 73% of the dental interns were aware of the initial management of avulsed tooth which is higher than that reported by Mustafa M in his study carried out in Saudi Arabia [2]. In this study, 50% of the house officers were aware of the procedure of replantation of the avulsed tooth. Similar results were reported by Al-Zubair NM *et al.* [9], in his study that reported willingness of 56% house officers regarding reimplantation of the avulsed tooth that is slightly higher than the current study.

The determining factors for a favorable prognosis of replantation of avulsed tooth are minimal time of the avulsed tooth outside the socket, the storage and transportation medium of the avulsed tooth, and also minimal handling of the root surface and the periodontal ligament [8–12]. In the current study, 62% of dental interns knew the various factors responsible for the outcome of the replanted tooth, which is in accordance with the study by Al-Zubair NM *et al.* [9].

Extra-oral time is a major factor in a favorable prognosis following tooth avulsion [10, 11]. According to treatment guidelines, all periodontal ligament fibers become non-viable if the extra-oral dry time of a tooth surpasses 60 minutes [12]. In our study, 43% of the respondents knew that less than 30 minutes was the ideal time for the replantation of the tooth, while in the study of Abdullah D *et al.* [13] only 16% of the practitioners had the correct knowledge.

The temporary storage solution employed during transportation before the avulsed tooth can be replanted is critical for the successful replantation as it preserves the vitality of the periodontal ligament (PDL) fiber that persists on the surface of the root [14, 15]. Although saline has a favorable pH and physiological osmolality but still it lacks the necessary ions and glucose, which are essential for the survival of PDL cells [15]. The majority of the dentists from Malaysia and India choose saline as their preferred storage medium [13, 14] while in our study, 49% of dental interns were aware that Hank's balanced salt solution is the best storage medium which has been specifically created for better tissue conservation for an extended time period.

Other than storage medium and extra-oral dry time, another factor that plays a vital role in replantation is amount of injury to PDL cells and the integrity of the remaining cells [15]. After reimplantation, an avulsed tooth with no evidence of bony fracture should be flexibly splined for 2 weeks, but no more than 2 weeks, as prolonged rigid splints may lead to ankyloses [15]. In contrast to Abdullah D *et al.* [13]'s study, where 52% of the house officers used rigid splints, only 35% of the dental interns in our study chose semi-rigid with nickel titanium wire. A splinting duration of 10–14 days is chosen by 49% of the dental interns in our study, which is more than that reported by Mustafa M, where 39% of the house officers recognized that a semi-rigid wire splint was indicated for 2 weeks [2].

Overall, the dental interns working in Islamabad, Pakistan had much better understanding and knowledge of the emergency management of avulsed tooth as compared to the dentists working in countries like Saudi Arabia and India [16, 17]. This

TABLE 2. Frequency/percentage of responses to the statements related to knowledge and awareness regarding tooth avulsion.

Statement	Frequency (percentage)
Q1. If you find an avulsed tooth and it is dirty, what will be your initial approach?	
Wipe with tissue paper	8 (5.2%)
Clean with tooth brush	20 (13.1%)
Rinse the tooth with tap water	110 (71.9%)
No need to clean	14 (9.2%)
Q2. If you were at the accident site, how would you hold an avulsed tooth?	
From the crown	100 (65.5%)
From the root	11 (7.2%)
Anywhere crown and root	18 (11.8%)
At the junction of CEJ	23 (15.0%)
Q3. If you were at the accident site where someone has knocked-out a tooth, what will be your action plan?	
Not take action because of lack of knowledge	27 (17.6%)
Not take action because of medico-legal consequences	31 (20.3%)
Be confident and replant	77 (50.3%)
Not confident but replant the tooth anyway	17 (11.1%)
Q4. What is the ideal extra-alveolar period?	
Less than 30 min	67 (43.8%)
Between 30–45 min	39 (25.5%)
Between 45–60 min	36 (23.5%)
More than 60 min	10 (6.5%)
Q5. Which type of splinting you do in case of an avulsed tooth?	
Semi rigid with nylon wire	33 (21.6%)
Stainless steel wire	46 (30.1%)
Semi rigid with nickel titanium wire	19 (12.4%)
No splints	54 (35.3%)
Q6. What is the splinting time for an avulsed tooth?	
7–10 days	49 (32.0%)
10–14 days	75 (49.0%)
14–22 days	25 (16.3%)
28–56 days	3 (2.0%)
Q7. Best storage medium for preservation of an avulsed tooth is?	
Patient's own saliva	27 (17.6%)
Milk	28 (18.3%)
Patient's own buccal mucosa	21 (13.7%)
Hank's balanced solution	76 (49.7%)
Q8. What will be the tooth management before replantation?	
Wash with any kind of solution	26 (17.0%)
Wash with tap water	52 (34.0%)
Other washing procedure	70 (45.8%)
Replant without any procedure	4 (2.6%)

TABLE 2. Continued.

Statement	Frequency (percentage)
Q9. Which type of systemic medication is prescribed after tooth replantation?	
Antibiotics	6 (3.9%)
Anti-inflammatory drugs	32 (20.9%)
Tetanus prevention	19 (12.4%)
Antibiotics and analgesics	95 (62.1%)
Q10. If a patient arrive in your clinic with an avulsed tooth, will you replant it?	
No	9 (5.9%)
See the condition of tooth then replant	109 (71.2%)
Refer to other hospital	17 (11.1%)
Depends on patient's cooperation	17 (11.1%)
Q11. The most important factor which influences the outcome of replantation is?	
Storage medium	20 (13.1%)
Extra-alveolar time period	95 (62.1%)
Amount of loss of periodontal ligaments	25 (16.3%)
Root maturity	12 (7.8%)
Q12. What is the normal duration for antibiotic prescription after tooth replantation?	
3–5 days	64 (41.8%)
5–10 days	63 (41.2%)
10–15 days	19 (12.4%)
15–20 days	6 (3.9%)
Q13. What will be the duration of follow-up period of an avulsed tooth?	
1–6 months	75 (49.0%)
6–9 months	40 (26.1%)
More than 1 year	21 (13.7%)
Lifelong	16 (10.5%)
Q14. If a patient calls you and gives history of avulsion, what will you advise the patient?	
Reassure and quick transfer to near hospital	17 (11.1%)
Ask for storage of tooth in milk and saliva and transport to near hospital	98 (64.1%)
Put tooth in patients mouth and bring clinic quickly	15 (9.8%)
Put the tooth back in the socket, bite the gauze and consult dentist	22 (14.4%)

CEJ: Cementoenamel junction.

TABLE 3. Age group wise responses to the statements related to knowledge regarding tooth avulsion.

Statements	Age (in years)	Correct (n; %)	Incorrect (n; %)	p value
Q1. If you find an avulsed tooth and it is dirty, what will be your initial approach?	≤25	87 (79.0)	35 (83.3)	0.179
	>25	23 (20.0)	7 (16.6)	
Q2. If you were at the accident site, how would you hold an avulsed tooth?	≤25	78 (78.0)	21 (84.6)	0.080
	>25	22 (21.9)	31 (15.3)	
Q3. If you were at the accident site where someone has knocked-out a tooth, what will be your action plan?	≤25	58 (75.3)	44 (58.7)	0.184
	>25	19 (24.6)	31 (41.3)	
Q4. What is the ideal extra-alveolar period?	≤25	52 (77.6)	70 (82.3)	0.613
	>25	15 (22.3)	15 (17.6)	
Q5. Which type of splinting you do in case of an avulsed tooth?	≤25	39 (72.2)	83 (84.7)	0.336
	>25	15 (27.8)	15 (15.3)	
Q6. What is the splinting time for an avulsed tooth?	≤25	60 (81.5)	62 (80.5)	0.663
	>25	15 (20.0)	15 (19.4)	
Q7. Best storage medium for preservation of an avulsed tooth is?	≤25	62 (81.5)	60 (78.9)	0.389
	>25	14 (18.4)	16 (21.0)	
Q8. What will be the tooth management before replantation?	≤25	42 (80.7)	80 (80.0)	0.638
	>25	10 (19.2)	20 (19.9)	
Q9. Which type of systemic medication is prescribed after tooth replantation?	≤25	74 (77.8)	48 (84.2)	0.497
	>25	21 (22.1)	9 (15.7)	
Q10. If a patient arrive in your clinic with an avulsed tooth, will you replant it?	≤25	87 (79.8)	35 (81.3)	0.979
	>25	22 (20.1)	8 (18.6)	
Q11. The most important factor which influences the outcome of the replantation is?	≤25	70 (73.6)	52 (91.2)	0.095
	>25	25 (26.3)	5 (8.7)	
Q12. What is the normal duration for antibiotic prescription after tooth replantation?	≤25	50 (78.1)	72 (81.8)	0.012*
	>25	14 (21.8)	16 (18.1)	
Q13. What will be the duration of follow-up period of an avulsed tooth?	≤25	14 (87.5)	108 (79.0)	0.223
	>25	2 (12.5)	28 (20.5)	
Q14. If a patient calls you and gives history of avulsion, what will you advise the patient?	≤25	75 (76.5)	47 (87.9)	0.738
	>25	23 (23.4)	7 (12.9)	

*Statistically significant.

TABLE 4. Gender based responses to the statements related to knowledge regarding tooth avulsion.

Statements	Gender	Correct (n; %)	Incorrect (n; %)	p value
Q1. If you found the avulsed tooth and it is dirty, what will be your initial approach?	Male	42 (38.1)	16 (38.0)	0.005*
	Female	68 (61.8)	26 (61.9)	
Q2. If you were at the accident site, how would you hold an avulsed tooth?	Male	37 (36.9)	21 (40.3)	0.338
	Female	63 (63.0)	31 (59.6)	
Q3. If you were at the accident site where someone has knocked-out a tooth, what will be your action plan?	Male	26 (33.7)	32 (42.6)	0.051
	Female	51 (66.2)	43 (57.3)	
Q4. What is the ideal extra-alveolar period?	Male	27 (40.2)	31 (36.4)	0.762
	Female	40 (59.7)	54 (63.5)	
Q5. Which type of splinting you do in case of an avulsed tooth?	Male	22 (40.7)	36 (36.7)	0.763
	Female	32 (59.2)	62 (63.2)	
Q6. What is the splinting time for an avulsed tooth?	Male	28 (37.3)	30 (38.9)	0.723
	Female	47 (62.6)	47 (61.0)	
Q7. Best storage medium for preservation of an avulsed tooth is?	Male	28 (36.8)	30 (39.4)	0.594
	Female	48 (63.1)	46 (60.5)	
Q8. What will be the tooth management before replantation?	Male	21 (40.3)	37 (37.0)	0.806
	Female	31 (59.6)	63 (62.9)	
Q9. Which type of systemic medication is prescribed after tooth replantation?	Male	38 (40.0)	20 (35.1)	0.764
	Female	57 (60.0)	37 (64.9)	
Q10. If patient arrive in your clinic with an avulsed tooth, will you replant it?	Male	37 (33.9)	21 (48.8)	0.107
	Female	72 (66.0)	22 (51.1)	
Q11. The most important factor which influences the outcome of the replantation is?	Male	35 (36.8)	23 (40.3)	0.987
	Female	60 (63.1)	34 (59.6)	
Q12. What is the normal duration for antibiotic prescription after tooth replantation?	Male	17 (26.5)	41 (46.5)	0.250
	Female	47 (73.4)	47 (53.4)	
Q13. What will be the duration of follow-up period of an avulsed tooth?	Male	6 (37.5)	52 (38.2)	0.824
	Female	10 (62.5)	84 (61.8)	
Q14. If a patient calls you and gives history of avulsion, what will you advise the patient?	Male	38 (38.7)	20 (37.0)	0.280
	Female	60 (61.2)	34 (62.9)	

*Statistically significant.

study provided a thought provoking opportunity for young dentists to realize the immense importance of simple timely measures for management of avulsion and will provide a strong base for teachers to identify the weaknesses in the future interns and to take remedial measures. The majority of the dental interns in our study responded correctly to most of the questions, but this can be due to multiple choices provided to them and the actual scores may be lower and in future studies the questionnaires may be designed to elicit subjective responses for thorough evaluation.

5. Conclusions

It is very important to save the avulsed tooth as it can affect the social, mental, and physical health of the patient. From the above study, it is concluded that the majority of the house officers in Islamabad are well informed, but improvement is still needed in certain aspects for effective management of tooth avulsion. Therefore, various seminars, continuous dental education programs, or workshops and more importantly a drill on simulated patients be incorporated into the undergraduate programme to increase their awareness of the proper prescribed management of avulsed tooth.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

RQ, US, FM, BA, MA and EAA—designed the research study. RQ—performed the research. AI, SS, OK and SS—analyzed the data. NANA, AMMA, RI and NP—wrote the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was received from the Institutional Review Board before conducting the study (RIHS/192/2022). A written informed consent was taken from all the participants.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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