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Knowledge and Awareness of Emergency Medical Physicians on the Management of Traumatic Dental Avulsion at Sultan Qaboos University Hospital

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Abstract

Objective: This study aimed to assess the level of knowledge regarding traumatic dental avulsion management among emergency physicians at Sultan Qaboos University Hospital (SQUH), Muscat, Oman. ***Methods:*** A cross-sectional survey-based observational study conducted among emergency physicians at SQUH from August 2021 to October 2021. Data were collected through a standardized and validated questionnaire. Fisher's exact and Mann-Whitney U tests were used to analyze the data. ***Results:*** Eighteen completed questionnaire forms were received, yielding a response rate of 72%. The data revealed that 66.7% of participants had prior knowledge of avulsion management, and 50% had received education on dental trauma. However, 83% of participants did not feel comfortable replanting an avulsed tooth themselves. With regard knowledge level, 45% of the participating physicians demonstrated low knowledge, 22% had moderate knowledge, and 33% showed high knowledge. Thus, 94% of participants were interested in acquiring information about avulsion management. ***Conclusion:*** The level of knowledge was significantly associated with receiving dental education and higher clinical grade. As a result, it is crucial to include information about avulsion and its management in both medical undergraduate and post-graduate curricula.

Keywords: Avulsion; Replantation Emergency; Knowledge; Dental Education; First Aid.

Advances in Knowledge:

- To the best of the authors' knowledge, this is the first study to assess avulsion management knowledge among Emergency Medicine physicians in Oman.
- This study demonstrated knowledge deficiency in managing traumatic dental avulsion among emergency physicians.

Application to Patient Care:

- More than 50% of the emergency physicians came across dental avulsion cases in the emergency room. These cases need immediate management by these physicians for favourable long-term survival of the tooth.
- Dental avulsion and its management need to be integrated into the medical undergraduate and emergency medicine post-graduate programs to graduate physicians with higher knowledge of managing avulsion.

Introduction

The most common injuries among maxillofacial injuries are the traumatic dental injuries.[1] Traumatic dental avulsion (TDA) is considered the most complex and severe injury among all traumatic dental injuries.[2] It is the total dislodge of the tooth from the socket.[3] The prevalence of avulsion among all traumatic dental injuries is 0.5% to 16%.[4] Furthermore, it is the most common type of traumatic dental injury seen in emergency departments (ED).[5] It is well documented that avulsion is more among the age group between seven to nine years.[6] That is attributed to the lesser degree of alveolar bone mineralization and low resilience of the periodontal ligament (PDL).[7] Moreover, avulsion occurs more frequently in children due to falls at home, sporting activities and fights.[7]

Management of traumatic dental avulsion

The prognosis of dental avulsion depends highly on immediate management provided at the injury site.[8] Therefore, immediate replantation of the permanent avulsed tooth is appropriate first-aid management.[4] If the replantation is delayed, using a suitable storage medium till

replantation can help maintain the PDL cells' vitality,[9] which is essential factor affecting the long-term survival of replanted avulsed teeth.[10] Additionally, to increase the possibility of sound healing, the reinserted tooth needs to be splinted to other teeth for 2 weeks. Finally, to reassure adequate healing and avoid complications, further reviews and assessments should be carried out regularly.[11]

At emergency room, full-time dentists are not available.[12] Hence, emergency physicians should determine the type of dental injury and the tooth involved and to provide immediate management for avulsion. Many studies have assessed avulsion management knowledge among physicians.[4–6,9,13] However, in Oman, no data were reported on the level of knowledge on avulsion management among emergency physicians. A study from Pakistan revealed that most (97.1%) of the included medical physicians had poor knowledge of avulsion management.[9] Furthermore, it showed that only 3% of medical doctors suggested immediate replantation of avulsed permanent teeth, and 8.6% correctly identified the suitable storage medium.[9] Another study reported that none of the medical physicians had high knowledge of tooth avulsion, although 73.3% (22/30) had low knowledge.[6] In addition, this study found that 96.6% of the physicians had not received dental education.

However, there are few studies have reported that most physicians (64%) knew the nature of avulsion, whereas 33% misdiagnosed the avulsion as displacement or fracture of the tooth.[13] Additionally, a study from the United States of America (USA) demonstrated that 89% of the physicians identified the appropriate avulsion management. Furthermore, most participants (80%) in this study received training on avulsion management during their dental courses.[5] The findings from previous studies revealed that physicians who received education on avulsion management during their medical training had better knowledge of the management of avulsion than those who did not.[4-6,9,13]

Methods

Study setting and design

The present study is a cross-sectional survey-based observational study that was conducted in the Emergency Department (ED) in Sultan Qaboos University Hospital (SQUH), a tertiary health care hospital in Muscat government, Sultanate of Oman, from 25th August to 25th October 2021.

Study subjects

The inclusion and excluding criteria

This study included all physicians working at the ED in SQUH and willing to participate in the study. Clinical attachment trainees and doctors from other medical and surgical specialities attending the ED at SQUH were excluded.

Sample size calculation

Our sample size was calculated to be 78 participants with a 99% confidence level using a mathematical formula based on the study that assessed the first-aid knowledge of avulsion.[9] $N= (z^2\ p(1-p))/d^2$, where n= Sample size, Z= Statistic corresponding to the level of confidence, P= Expected prevalence and D= Precision (corresponding to effect size). In this study Z= 2.58, P= 3, 0.03, d= 0.05 and the sample size= 78.

Ethical considerations

This study was conducted after receiving ethical approval (SQU-EC-487-2021) from the Medical Research and Ethics Committee (MREC) at the College of Medicine and Health Science (CoMHS) at Sultan Qaboos University on 26th July 2021 (#2542).

Data collection

The instrument used in our study for collecting the data was a standardized and validated questionnaire adopted from a study by Bahammam, 2018 after taking the author's consent.[12] There were 20 close-ended (multiple-choice) English questions divided into three parts. Part I (6 questions) contained demographic questions. Part II (8 questions) for assessing the knowledge of avulsion management. Finally, part III (6 questions) for evaluating the attitudes toward receiving more information. E-mail addresses were provided in the survey for any inquiries from the participants.

The questionnaire surveys were distributed among all emergency physicians at SQUH using two ways; link to the E-survey (Google forms ®) was e-mailed to emergency physicians and distributed through social media professional groups . In addition, paper forms were handed out personally with the help of the SQUH cooperative. This study used electronic forms initially due

to the COVID-19 precaution measures. Also, it will be easier to analyze and reduce paper waste. However, paper forms were used due to the low number of respondents electronically. Consent to participate in the study was taken from each subject by mentioning that in the survey form. This form contained a description of the study, its aim, and how it would be conducted. In addition, it informed the participants that anyone could exit the survey without a penalty, and the information provided would be used only for the study.

Data analysis

After collecting the data through a questionnaire survey, it was analyzed using the (SPSS®) (v.27). A standardized scoring method was used to measure each physician's actual levels of avulsion management knowledge This method was adopted from Abu-Dawoud et al., 2007.[6] A score of eight points was calculated for each participant by using eight questions from the questionnaire form. The interpretation of the score of each physician was as follow: score=8–6; high level of knowledge, score=5–3; moderate level of knowledge and score=2-0; low level of knowledge.

Finally, all participants' overall knowledge level was determined to find the association between categorized variables, and fisher's exact test was done. Additionally, the Mann-Whitney U test compared the means of continuous variables. Moreover, descriptive statistics were presented as mean, median, range and standard deviation for continuous variables. Additionally, categorized variables are presented as frequency and percentages. As well as suitable tables and graphs were used to present the findings.

Results

Questionnaire administration

Out of 25 emergency physicians in SQUH, 18 (72%) had completed the questionnaire form, and more than half (55.6%) had completed the forms electronically.

Demographic descriptions

The study cohort comprised 18 emergency physicians ranging from 25 to 52 years old. As shown in Table 1, the female-to-male ratio was 1.25 (1:0.8) among these physicians. Almost all the study population contained an equal number of different clinical grades, with fewer consultants

(16.7%). In addition, most of the participants (77.8%) graduated from Oman. Further details on the demographic data are described in Table 1.

Previous dental avulsion' management knowledge and experiences

The avulsion knowledge was variable among the emergency physicians. 59% of the participants came across avulsion cases. Table 2 demonstrates that 66.7% of the emergency physicians had prior avulsion knowledge, and sources of this knowledge were variable. Half of the emergency physicians had received dental trauma education. Furthermore, 55.6% of emergency physicians considered medical books the primary source of knowledge. On the other hand, undergraduate and post-graduate dental education were the primary sources of knowledge for 33.4% of the participants. The fisher's exact test found a significant association (*P*-value=0.029) between the reported level of information and previous dental courses.

Factors determining the knowledge of dental avulsion management

Many factors can determine the actual level of knowledge of avulsion management, as shown in Figure 1. More than 60% of all participants had determined the correct ways of managing the avulsion, including the correct suitable media, the correct way of holding the avulsed tooth and replanting the clean tooth. On the other hand, only 39% determined the suitable way of replanting the dirty avulsed teeth. Moreover, only 17% of the emergency physicians could replant the avulsed tooth themselves.

Measured level of avulsion management's knowledge

Among the emergency physicians, 45% had low-level knowledge of avulsion management (0-2 correct answers), 22% had a moderate level of knowledge (3-5 correct answers), and 33% had a high knowledge level (6-8 correct answers). Fisher's exact test showed a significant association between the measured level of knowledge and knowing that the replantation of the avulsed tooth is essential (*P*-value=0.007) (Table 3). To find the association between the level of avulsion management knowledge and different characteristics, fisher's exact test was applied. It showed that the level of knowledge is significantly associated with higher clinical grade (P-value <0.05).

While 87.5% of specialists to senior consultants had high knowledge, only 30% of the rest had high knowledge. However, other characteristics are not significantly associated with avulsion

management knowledge (Table 4). In comparing the physicians' age means in two groups of the level of avulsion management knowledge, a significant difference (P-value=0.032) in means between the two age groups was shown by the Mann-Whitney U test. Older physicians have a higher level of avulsion management knowledge than younger physicians.

The attitude of the physicians toward avulsion management

72% of the physicians indicated that their level of avulsion information is inadequate. Consequently, most of them (94%) were interested in improving their knowledge. Therefore, all participants were united in the opinion of the importance of learning about avulsion.

Discussion

In recent years, the number of avulsion cases in emergency departments (EDs) has been increasing,[5] and several studies have evaluated emergency physicians' knowledge of avulsion management.[5,6,9,11,13] However, to the best of our knowledge, such data has not been available for emergency physicians in the Sultanate of Oman. Therefore, the overall aim of this study was to assess avulsion management knowledge among ED physicians at Sultan Qaboos University Hospital (SQUH), a single center in Oman.

It should be noted that logistical barriers and the recent unstable circumstances caused by COVID-19 affected the flexibility in researching other medical centers in the country. Therefore, this study only included emergency physicians at SQUH, which limited the study's population and affected the results. Consequently, many findings in this study cannot be generalized .The response rate was higher (72%) than previous studies conducted at EDs, which varied between 40-60%.[7,9] This higher response rate can be attributed to the two methods of distributing the questionnaire forms, online and paper forms. A higher response rate (81.33%) was achieved by a study in the Kingdom of Saudi Arabia,[12] which included physicians from eight hospitals.

More than half (66.7%) of the participants in our study had prior knowledge of avulsion management, whereas a previous study[6] reported only 16.7% of physicians had information on managing avulsion. The difference between our findings and the previous study can be attributed to the age of the studied populations. Our study contained more senior clinicians who graduated

between 1994-2021, whereas the other study included a limited range of young physicians who graduated between 2000 and 2004.

Numerous sources are available to improve the knowledge of avulsion management. Half (50%) of the participants in our study received undergraduate and post-graduate dental courses, whereas previous studies reported that only 3%-6% of physicians had dental education.[6] These findings in our study could be attributed to the undergraduate oral health course in the MD curriculum at the College of Medicine and Health Science (CoMHS). Furthermore, the Fisher's exact test revealed that the level of knowledge is significantly associated with previous dental education, which agrees with the results reported by another study.[5]

The study was conducted to evaluate the level of physicians' knowledge in avulsion management and focused on the key factors that determine avulsion management, based on the International Association of Dental Traumatology (IADT) guidelines.[8] The findings of the study showed that holding an avulsed tooth by the crown is the appropriate way to save the PDL, and 78% of emergency physicians had adequate knowledge of this fact. This finding is consistent with the results of a study by Jyothi et al., where 72.8% of the participants correctly identified the appropriate method of holding an avulsed tooth.[14]

The need for immediate replantation was identified by 72% of physicians, but only 17% were confident enough to replant it themselves. When it comes to managing a dirty avulsed tooth, only 39% of physicians correctly identified the way to clean it with a stream of saline before replantation. In contrast to our study, a study conducted in KSA showed that a higher percentage of physicians, 79.5%, agreed to replant an avulsed tooth, and 48.4% were confident in doing so themselves.[12] The study population in Bahammam, 2018, which had a higher percentage of older physicians, also showed a greater ability to replant avulsed teeth themselves. Although there was no difference in the age range between our study and the KSA study,[12] the KSA study had 12 physicians over the age of 50, while our study had only one.

Saving an avulsed tooth in an appropriate storage medium is crucial for preserving the vitality of the periodontal ligament (PDL) and enhancing the tooth's long-term survival since replantation may be delayed. Therefore, knowledge of the appropriate storage medium is a fundamental

factor in determining the physician's avulsion management expertise. The study found that 61% of physicians chose saline as the appropriate storage medium, which is readily available in the ED compared to other recommended media. Physicians in our study demonstrated better knowledge of the suitable storage media than those in a study conducted in Pakistan, where only 8.6% of physicians were aware of the appropriate storage medium.[9] This better understanding could be attributed to our participants receiving more dental courses and information.

The study found that only 33.3% of the ED physicians demonstrated a high level of knowledge, and 22.2% showed moderate knowledge of avulsion management. These findings are generally higher than those of previous studies from neighbouring countries, which ranged between 10-12%. [1,6,9] The age factor may explain the difference, as our study included older participants compared to those in previous studies. However, our results significantly differed from a study conducted in the USA, which found that 89% of physicians were able to identify appropriate avulsion management. This difference can be attributed to the training on avulsion management during dental courses, which most participants (80%) in the US study had received.[5]

Furthermore, 44.4% of physicians in our study had insufficient knowledge, which is higher than the findings of a previous study by Abu-Dawoud et al. in 2007, where only 26.6% had insufficient knowledge of avulsion management.[6] Our study identified that the level of knowledge can be improved by enhancing education. However, the Junior clerkship phase of the medical degree to MD program at SQU does not include avulsion management in the oral health rotation.

Our study also found a significant association between the measured level of knowledge and the understanding that the avulsed tooth needed to be replanted (P-value=0.007). Improving knowledge on this topic is critical for emergency physicians to provide appropriate care for patients with avulsion.

Overall, only 33.3% of ED physicians showed a high level of knowledge, while 22.2% showed moderate knowledge, and 44.4% had insufficient knowledge. The study found that the level of knowledge of avulsion management was significantly associated with higher clinical grade and older age physicians. However, no significant association was found with the number of years of

experience. The study also found that all physicians agreed on the importance of avulsion management knowledge, and 94% were interested in increasing their knowledge.

Conclusion

Avulsion management needs to be integrated into medical programs to graduate physicians with higher knowledge to manage avulsion. Emergency physicians also need to improve their knowledge to have better outcomes of avulsion management.

Conflicts of Interest

The authors declare no conflict of interests.

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No funding was received for this study.

Authors' Contribution

SAB and AAM designed the study. SAB reviewed the literature, collected and analyzed the data. SAB and AAM drafted the manuscript. AAM supervised the work. Both authors approved the final version of the manuscript.

References

1. Raoof M, Vakilian A, Kakoei S, Manochehrifar H, Mohammadalizadeh S. Should Medical Students Be Educated About Dental Trauma Emergency Management? A Study of Physicians and Dentists in Kerman Province, Iran. J Dent Educ. 2013;77(4):494–501. Doi: 10.1002/j.0022-0337.2013.77.4.tb05495.x

2. Holan G, Shmueli Y. Knowledge of physicians in hospital emergency rooms in Israel on their role in cases of avulsion of permanent incisors. Int J Paediatr Dent. 2003;13(1):13–9. Doi: 10.1046/j.1365-263X.2003.00414.x

3. Westphalen VPD, Martins WD, Deonizio MDA, da Silva Neto UX, da Cunha CB, Fariniuk LF. Knowledge of general practitioners dentists about the emergency management of

dental avulsion in Curitiba, Brazil. Dental Traumatology. 2007;23(1):6–8. Doi: 10.1111/j.1600-9657.2005.00392.x

4. Çalışkan S, Delikan E, Kızılaslan S, Özbek Ö. Knowledge of Dental Avulsion Among Emergency Physicians: A Survey Study. The Journal of Pediatric Research. 2021;8(1):62–8. Doi: 10.4274/jpr.galenos.2020.98705

5. Needleman HL, Stucenski K, Forbes PW, Chen Q, Stack AM. Massachusetts emergency departments' resources and physicians' knowledge of management of traumatic dental injuries. Dental Traumatology. 2013;29(4):272–9. Doi: 10.1111/j.1600-9657.2012.01170.x

6. Abu-Dawoud M, Al-Enezi B, Andersson L. Knowledge of emergency management of avulsed teeth among young physicians and dentists. Dental Traumatology. 2007;23(6):348–55. Doi: 10.1111/j.1600-9657.2006.00477.x

7. Ulusoy AT, Önder H, Çetin B, Kaya Ş. Knowledge of medical hospital emergency physicians about the first-aid management of traumatic tooth avulsion. Int J Paediatr Dent. 2012;22(3):211–6. Doi: 10.1111/j.1365-263X.2011.01178.x

8. Fouad AF, Abbott P v., Tsilingaridis G, Cohenca N, Lauridsen E, Bourguignon C, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. Dental Traumatology. 2020;36(4):331–42. Doi: 10.1111/edt.12573

9. Qazi SR, Nasir KS. First-aid knowledge about tooth avulsion among dentists, doctors and lay people. Dental Traumatology. 2009;25(3):295–9. Doi: 10.1111/j.1600-9657.2009.00782.x

10. Subhashraj K. Awareness of management of dental trauma among medical professionals in Pondicherry, India. Dental Traumatology. 2009;25(1):92–4. Doi: 10.1111/j.1600-9657.2008.00714.x

11. Cagetti MG, Marcoli PA, Berengo M, Cascone P, Cordone L, Defabianis P, et al. Italian guidelines for the prevention and management of dental trauma in children. Ital J Pediatr. 2019;45(1):1–14. Doi: 10.1186/s13052-019-0734-7

12. Bahammam LA. Knowledge and attitude of emergency physician about the emergency management of tooth avulsion. BMC Oral Health. 2018;18(1):1–9. Doi: 10.1186/s12903-018-0515-5

13. Venkataramana M, Pratap K, Padma Tm, Kalyan Vs, Bhargava A, Varma LsC. Knowledge and attitude of medical professionals towards emergency management of avulsed tooth in a teaching medical hospital, Khammam Town, South India. Journal of Indian Association of Public Health Dentistry. 2015;13(2):183. Doi: 10.4103/2319-5932.159062

14. Jyothi KN, Venugopal P, Nanda S, Shah MK. Knowledge and attitude of medical doctors towards emergency management of avulsed tooth-a cross sectional survey. J Dent Sci Res. 2015;2:156–67. Doi: 10.1186/s12903-018-0515-5

Table 1: General and demographic characteristics of the participants

Characteristics	Study population (n=18)
Age (year) Mean ± SD (range)	36 ± 7 (25-52)
Gender (n,%)	
Male	8 (44.4%)
Female	10 (55.6%)
Experience (n,%)	
≤ 15 years	9 (50.0%)
> 15 years	9 (50.0%)
Country of graduation (n,%)	
Oman	14 (77.8%)
Others	4 (22.2%)
Clinical grade (n,%)	
House Officer - Senior House Officer	5 (27.8%)
Resident	5 (27.8%)
Specialist - Senior Specialist	5 (27.8%)
Consultant - Senior Consultant	3 (16.7%)

Table 2: Prevalence and associations of education, knowledge and its sources among participants with the reported level of information on AVULSION management

Questions and answers	Frequency (n,%)	The reported level of AVULSION management information		*P*-value*
		Adequate information	Inadequate information	
Have you received dental trauma education?				
Yes	9 (50%)	5 (55.6%)	4 (44.4%)	0.029
No	9 (50%)	0	9 (100%)	
Do you have prior AVULSION management knowledge?	12 (66.7%)	5 (41.7%)	7 (58.3%)	0.114
Yes	6 (33.3%)	0	6 (100%)	
No				
What is the better source of information?				
Medical books	10 (55.6%)	4 (40%)	6 (60%)	0.522
Education courses				
Undergraduate dental education courses	3 (16.7%)	0	3 (100%)	
Post-graduate dental education courses	3 (16.7%)	1 (33.3%)	2 (66.7%)	
Others	2 (11.1%)	0	2 (100%)	

** Fisher's exact test*

Table 3: The association of factors affecting level of knowledge of AVULSION management with the measured level of knowledge

Factors affecting the level of AVULSION management knowledge	Measured level of AVULSION managemnt knowledge		*P*-value*
	High-moderate knowledge	Low knowledge	
Correct suitable media	8 (72.7%)	3 (27.3%)	0.145
The correct way of replanting the dirty avulsed tooth	4 (57.1%)	3 (42.9%)	1.000
Replanting the permanent avulsed tooth	10 (76.9%)	3 (23.1%)	0.007
The correct way of holding the tooth	9 (64.3%)	5 (35.7%)	0.275

** Fisher's exact test*

Table 4: Comparison and association of the measured AVULSION management knowledge with different characteristics

Characteristic	Level of knowledge		*P*-value
	High-moderate	low	
Gender (n, %)			
Male	5(62.5%)	3(37.5%)	0.664*
Female	5(50%)	5(50%)	
Age (years) (n)			
Mean(SD)	41(6.8)	32(6.4)	0.032**
Median	39	29	
Clinical-grade (n, %)			
House officer - Residinet	3(30%)	7(70%)	0.025*
Specialist - Senior Consultant	7(87.5%)	1(12.5%)	
Country of graduation (n, %)			
Oman	8(57.1%)	6(42.9%)	1.000*
Others	2(50%)	2(50%)	
Years of experience (n, %)			
≤ 15 years	8(50%)	8(50%)	0.477*
>15 years	2(100%)	0	

** Fisher's exact test*

*** Mann-Whitney U test*

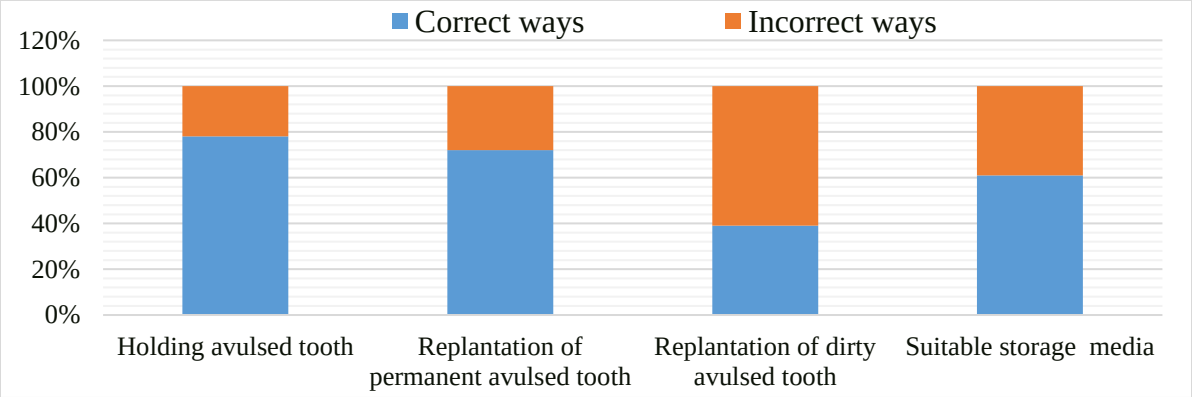

Figure 1: Awareness of factors determining correct ways of management of AVULSION as per participating physicians