

## Has the education of professional caregivers and lay people in dental trauma care failed?

### REVIEW ARTICLE

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**Abstract** – *Background/Aim:* Several reports have been published during the past decades showing a lack of care of traumatic dental injuries (TDIs) as well as dentists and lay people having insufficient knowledge on how to manage TDIs. This situation could seriously affect the outcome of TDIs, especially a complicated TDI. The overall aim of this study was to present a review of dental trauma care with focus on treatment and dentists and lay persons' lack of knowledge on how to manage a TDI. A further aim is to introduce the actors involved and the outcome of their education. *Material and method:* The databases Medline, Cochrane, SSCI, SCI and CINAHL from the year 1995 to the present were used. Focus was on treatment need, inadequate care, lack of knowledge and poor organization of emergency care. *Result:* Studies from different countries demonstrated that treatment needs were not properly met despite the fact that not all untreated teeth needed treatment. Treatment in emergency dental care was often inadequate or inappropriate. With the exception of lay people, teachers, medical personnel and even dentists performed inadequate care. Furthermore, information to the public was insufficient. Despite a low level of knowledge, lay people expressed a strong interest in helping someone with a TDI. *Conclusion:* The conclusion from this review is that consideration must be given the problematic results from different studies on education or information about dental trauma care. Despite that the studies reviewed were from different countries and groups of people, the results seem to be consistent, i.e. that a large part of the educational process of professional caregivers and lay people has failed. Too much hope seems to be put on lay people to handle difficult cases such as tooth avulsion. Education of caregivers and lay people is a field where much remains to be explored.

When a traumatic dental injury (TDI) occurs, the patient expects competent treatment from the dentist and other emergency department personnel. Inadequate treatment of a TDI and lack of knowledge of lay people on how to manage a TDI event could have serious consequences on the outcome.

The incidence of TDI episodes in the age interval 0–19 years in Sweden is 13.2 per 1000 individuals per year (1). Among these, 14% were presented as complicated TDIs to permanent teeth, with injuries to the pulp or periodontal ligaments. These TDIs need to be treated quickly to avoid future complications. Of course, other types of TDI also require early treatment though not to the same extent as complicated TDIs (2).

During the past decades, several reports have been published with disappointing results such as lack of care of TDIs and dentists and lay persons' lack of knowledge on how to manage a TDI. At the same time, the rapid expansion of scientific and clinical knowledge on how to handle complicated TDIs has increased significantly. This background made it worthy to study this phenomenon more closely.

The aim of this work, therefore, was to present a review over the past decades with special focus on care need, inadequate care and lack of knowledge in dental

trauma care as well as inadequate organization of emergency care. An effort is also made to present actors and the outcome of their education and knowledge in dental trauma care.

#### Search methodology

The review started with an electronic search of Medline<sup>1</sup>, Cochrane, SSCI<sup>2</sup>, SCI<sup>3</sup> and CINAHL<sup>4</sup> databases from 1995 to the present using the following search words: prevention, health promotion, education, after-hours care, control, health care costs, costs, savings, emergency medical services and review. Only reports in English were considered for inclusion in the review.

#### Treatment need

Epidemiological studies have demonstrated that treatment needs of persons suffering from TDIs are not

<sup>1</sup>Pub Med

<sup>2</sup>Social Citation Index

<sup>3</sup>Science Citation Index

<sup>4</sup>Nursing and Allied Health

properly met. In Britain, for instance, only 10–15% of children who sustained a TDI had received treatment in the early 1980s (3) and a decade later still 80% of TDIs were untreated (4). In a study from Tanzania, 21% of the children had at least one type of untreated TDI, with the highest percentage (26%) observed among children with high socio-economic status (5). A study in Jordan showed that only 3.1% of injured teeth were treated though 63.6% of the teeth needed treatment (6). Using radiographs to assess the treatment provided, one study found that only 47% of damaged teeth had received treatment, of which 59% were inadequately treated (7).

One explanation to account for inadequate treatment of TDIs is that not all teeth with TDIs need treatment. Kahabuka et al. (5), for example, found that almost all of the teeth with untreated TDIs were enamel (68%) or enamel-dentin (26%) fractures. In a study in the United Kingdom, Marcenés & Murray (8) found that not all untreated TDIs needed treatment because some of the injuries were minor. On the other hand, the authors also noted that not all treated injuries were satisfactorily performed, with some requiring re-treatment. A more accurate estimation of treatment need used in their study confirmed that the treatment of TDIs was neglected, i.e. the unmet normative need of treatment represented 56% of all traumatized incisors. One year later, the same authors showed that treatment of TDIs was still largely neglected in the same area (9).

Recent studies in Greece (10), Turkey (11, 12), Brazil (13), Jordan (14) and the United Kingdom (15) reported that patients wait a long time before seeking treatment, especially among low socio-economic groups.

### **Inadequate care and lack of knowledge**

#### **Dental personnel**

Several studies have shown that treatment of TDIs in emergency dental care services is often inadequate (7, 16–20) (Table 1) and that patients are not always satisfied with the care they receive (7, 21). In 1997, Hamilton et al. (7) found that about half of composite fillings and crowns and the majority of root fillings were unacceptable performed. The same study also showed that, in general, every second answer in a questionnaire administered to dentists was incorrect regarding dental trauma management. Two studies from Tanzania reported that dentists tend to over treat TDIs and that two-thirds of the treatments were either unnecessary or incorrect (17, 18). In England, Maguire et al. (19) observed that emergency treatment of complicated crown fractures, particularly in primary care services, is often inappropriate or inadequate regarding the emergency management of the exposed pulp and provision of a hermetic coronal seal. Hu et al. (20) recently showed that general dental practitioners (GDPs) in Brazil with trauma experience and who had attended postgraduate courses had a significantly higher mean knowledge score as compared with those who received no additional training. Despite this result, the mean score was not high (6.82 of 10), with a slightly higher mean for endodontists. This survey demonstrated generally poor knowledge among

dentists, especially among GDPs. A recent study in Brazil by de França et al. (22) showed that a shorter time since graduation was associated with the correct answer in coronal fracture cases, but not in cases of avulsion. Kostopoulou & Duggal (23) recently compared the knowledge of treatment of TDIs among GDPs and CDOs (community dental officers). They concluded that overall the dentists' knowledge of the emergency treatment of dentoalveolar trauma in children was inadequate. Salaried CDOs were significantly more knowledgeable than the GDPs, as were younger and more recently graduated dentists compared with those earlier graduated. The GDPs regarded the difficulty of treating children and the inadequate fees of the UK National Health Service as important barriers to treatment. The authors also found that, irrespective of being a GDP or a CDO, dentists who attended continuing dental education courses on dental traumatology had a more thorough knowledge than dentists who did not attend such courses. Hamilton et al. (16) showed that knowledge about splinting time of avulsed teeth and correct treatment of acute abscesses on traumatized teeth were inaccurate. There was little difference in knowledge even between dentists who had attended postgraduate courses and those who had not.

In a Swedish study, Robertson & Norén (21) showed that 39% of the patients reported dissatisfaction with the colour or anatomic form of the reconstruction. About 25% of the patients remembered the pain they experienced or the behaviour of the dental team.

#### **Medicine and school people**

In studies from Hong Kong (24), Brazil (25) and Israel (26, 27) medical students and physical education teachers were found to lack adequate knowledge in dental trauma treatment. In addition, poor knowledge in dental trauma treatment was reported for emergency medical technicians in Israel (28).

Health teachers trained in dental first aid have been found to have a false sense of knowledge. In these teachers, a past dental trauma experience was found to have no effect on dental trauma management; however, it did have a positive effect on attitude (29). Even after a 1-year community effort for physical education teachers in Jerusalem to reduce dental trauma, their knowledge level remained low (27).

#### **Lay people**

Despite established first aid measures, lay knowledge in society has been shown to be insufficient in studies from Nigeria (30, 31), the United Kingdom (32, 33), Singapore (34, 35), Brazil (36, 37), Portugal (38), Kuwait (39) and Jordan (40). Conclusions from these studies recommend the supervising of young children and the education of parents and other people responsible for their safety. The studies also stressed the necessity of immediate management if a TDI occurs. Raphael & Gregory (41) pointed out the lack of information to the public on how to prevent and manage TDI events. Their survey showed that only a few health professionals provided

*Table 1.* Results on education or information of care givers and lay people in the treatment of traumatic dental injuries (TDIs)

	Actors	Outcome of education or information	References
Dental	Dentists	Perform adequate treatment	42
		Too few patients receive treatment	3–9, 54, 61–64
		Perform unacceptable treatment	7, 16–23, 43
		Results from education or information campaigns are not acceptable	27, 41
	Dental therapists	Indicate a need for knowledge on how to perform acute treatment. The outcome from this education is not acceptable	53
Medicine	Emergency department personnel	Knowledge is not acceptable	48
	Physicians		26, 28
	Medical students		
	Emergency medical technicians		
School	Physical education teachers		24, 27
	Health teachers	Indicate a need for knowledge in how to perform acute care. The outcome from this education is not acceptable	29
	Teachers	Are motivated to perform acute care but lack knowledge	33, 35–38, 41
	Physical education undergraduates		25
The public	Mothers	Are motivated to perform acute care but lack knowledge	40
	Lay people	Lack knowledge to perform acute care	30–32, 34, 39, 41
		Keen interest to learn more	34, 40–41
	Parents	Long time passes before seeking treatment	10–15

information to the public. Although most parents would seek emergency dental care if necessary, only 10% were informed about the correct emergency procedures if a permanent tooth was avulsed.

#### Dental avulsion

In a recent study, de França et al. (22) concluded that the majority of dental professionals would not intervene according to the literature in the cases of avulsion. They showed that 37% of dental personnel presented a correct treatment of an avulsed central incisor in a 12-year-old patient who had brought the tooth with him to the clinic, but only 16% of the dentists presented a correct treatment when the tooth was not brought to the clinic.

Yet, all studies do not show inadequate treatment in avulsion-type injuries. A recent study by Westphalen et al. (42) demonstrated that the level of knowledge on the management of dental avulsion among GDPs was acceptable. On six of the nine questions (option for replantation, factors that may influence outcome of replantation, ideal extra-alveolar period, type of splinting, endodontic treatment and systemic medication), at least 183 (73%) of the 250 respondents produced a correct answer. For the remaining three questions (best storage medium, tooth management before replantation and splinting time), however, only 90 (36%) of the 250 respondents gave a correct answer. According to the authors, this result could be linked to the continuing education courses in dental traumatology and the establishment of four Schools of Dentistry in the city. In contrast, Cohenca et al. (43) recently showed that there is a need to improve the knowledge of general dentists in the USA regarding current guidelines for emergency treatment of avulsed teeth. Unfortunately, there were several limitations to this study, including the fact that an initial mailing of the questionnaire produced a low return rate and that the general dentists attended

continuing education courses. From the evidence presented, it seems that a patient admitted to a dental clinic may not receive optimal treatment.

The prognosis, especially for avulsed permanent teeth, depends on correct measures taken immediately after the injury occurs. Hamilton et al. (32) showed that more than 80% of the respondents (physical education personnel and lay people) would not want to replant an avulsed permanent incisor themselves, the main reason being lack of knowledge and training. Apparently, the same problem exists today as suggested by the study of Panzarini et al. (25) who found that 86% of the physical education undergraduates would not replant an avulsed permanent tooth into the socket, even though 50% of these undergraduates knew what to do. Mori et al. (37) reported that 75% of the teachers knew the importance of emergency management, but only 19% would replant the avulsed tooth in its socket; instead the teachers took the decision to seek a dentist. Chan et al. (24) found that among physical education teachers only 5.4% felt that they were able to undertake a replantation of an avulsed permanent tooth. Holan et al. (27), however, found an increase (from 19 to 53%) in the willingness of physical education teachers to replant a permanent tooth as a result of information.

An alternative to replantation is to store the avulsed permanent tooth in a suitable media and transport the patient and the tooth to a dentist for replanting. Unfortunately, several studies have shown an insufficient knowledge among lay people in the choice of transport media. Hamilton et al. (32) found that only 24% of lay people knew that milk was the preferred transport media while 53% suggested a handkerchief or ice to store the avulsed tooth. In another study, Chan et al. (24) noted that only 9% of the physical education teachers in their study suggested milk as the best transport media, whereas a large number of the teachers preferred ice or ice water or an antiseptic solution as the transport media.

Sae-Lim et al. (35) showed that only 15% of preschool teachers were aware of an optimal transport media. Panzarini et al. (25) observed that 45% of physical education undergraduates suggested a physiological saline solution, milk or saliva as a suitable transport media. In a questionnaire study, Mori et al. (37) reported that for 77% of school professionals, tap water or cold water was the first choice while only 8% suggested milk. Holan et al. (27) noted a small increase in knowledge of physical education teachers regarding the best media to transfer an avulsed permanent tooth (from 11 to 23%). In a study of Kuwaiti children (39) none of the children demonstrated good knowledge about an optimal transport media for avulsed permanent teeth. All these results strongly suggest that there is much to do to inform lay people about a suitable transport media for avulsed permanent teeth.

### Inadequate organization of emergency care

Another risk for the individual is the lack of or poor organization of emergency care. For instance, Fleming et al. (44) found in an analysis of after-hours emergency dental care in the United Kingdom that 49% visited hospital because of all types of toothache, whereas 38% visited emergency dental service because of dental trauma alone. If we include the information from several studies that oral injuries tend to occur during leisure time (45, 46), at weekends and in late evenings (47), the conclusion would be that emergency dental service must be organized so that service could be provided on a 24-h basis with an emergency dental staff experienced in dental trauma treatment. In the case of an acute TDI, it is important that an emergency dental staff and hospital accident and emergency departments have sufficient experience in dental trauma treatment. Furthermore, they should preferably be regularly exposed to such situations (45, 48): if not, the prognosis of these traumas will probably be poor.

### Discussion

The low rates of dental trauma treatment observed and the wide gap between treatment need and treatment performed in different countries are striking (3, 6, 9, 49–53). This phenomenon exists because TDI is not perceived as a disease or considered life threatening. In addition, dental school curricula and health authorities tend to focus resources on other oral health problems than TDIs, which may result in a serious conflict. The poor knowledge among the general public could be related to the fact that TDIs are not considered as serious as other injuries. If this were the circumstance, we obviously have a delicate mission of informing the public about the seriousness of TDIs, especially complicated TDIs.

Another problem is that a TDI is often accompanied by other injuries. Consequently, there may be competition as to which injury is most severe and in need of immediate treatment. In these situations, there is considerable risk that the TDI becomes secondary to the other injuries or is quite simply forgotten entirely. The

reasons could be that TDIs are not discovered because they are too small to be observed, or people are simply too afraid to treat TDIs even if they know what to do. Another reason for their hesitation might be that lay people feel they could be held personally responsible for the outcome if something went wrong (32).

The lack of adequate knowledge among physicians, emergency medical technicians and lay people is probably related to the fact that acute dental trauma treatment is generally not included in the education or in first-aid textbooks. Zadik (54) recently evaluated the recommendations of oral trauma and dental emergencies management from first-aid textbooks and manuals. From this study, the author found insufficient information on oral trauma management, which helps to explain the poor knowledge among medics, teachers and the general public. However, the newer textbooks on this topic were better than the older ones, which may result in an improvement in the quality of health care delivery to persons with acute dental trauma.

Another noteworthy phenomenon is that many patients wait before seeking treatment. This is most probably due to a lack of lay knowledge, but it also shows how difficult it is to inform the public about the importance of early acute dental trauma treatment. Furthermore, people in some countries or regions have problems in locating a dentist in time for treatment. The effect of treatment delay upon pulp and periodontal healing of TDIs has been described by Andreasen et al. (2). Although the treatment guidelines in their study were based on limited evidence, the conclusions were that complicated injuries to the pulp in general could be regarded as subacute and treated within a couple of days. The treatment approach of complicated injuries to the periodontal ligament appears to be indicated as acute or subacute and should be treated immediately or within a couple of days.

Recent studies and guidelines have recommended lay people or others to replant avulsed permanent teeth at the scene of the accident (2, 55–57). However, other studies have reported that such an approach is unsuccessful for a number of reasons i.e. lack of knowledge in how to replant avulsed teeth (24–26, 29, 32–34, 36, 37, 39–41). One reason is that, though an avulsion of a permanent tooth is one of the most serious TDIs, the frequency of such a separation is quite low (1).

As a consequence of the low frequency of avulsions, GDPs in most countries will not likely confront a patient with an avulsion of a permanent tooth. Because of this infrequency, it is very difficult for caregivers to reach an acceptable level of experience through training alone. In general, it would also be impossible for a lay person to reach any kind of experience in treating a permanent tooth avulsion. This means that information and routines in how to take care of an avulsion need to be clearly conveyed in the educational process of lay people. Thus, there should be no hesitation about what to do in case of an avulsion. Within a time space of about 15–30 min, lay people must either replant the avulsed permanent tooth, or transport the patient and the tooth to the treatment room of an experienced dentist, or find a suitable transport media to put the avulsed permanent tooth in.



Several studies in this review have reported an interest from lay people in helping a person with an avulsed tooth (25, 29, 33–38, 40, 41). Raphael & Gregory (41) found that almost two-thirds of the parents in their study would attempt replantation of an avulsed tooth. However, further questioning revealed that they did not know the correct procedures. Sae-Lim et al. (34) and Al-Jundi (40) recently showed that there is strong interest among parents to learn more about dental trauma management. Moreover, a high proportion (95%) of dental therapists in Singapore providing dental care to students aged 6–16 years indicated a need for more knowledge in the immediate management of traumatized teeth (58).

What approach do we need to resolve the deficiencies presented in this review, which shows the problem concerning dental trauma treatment of especially complicated TDIs and avulsions? Hamilton et al. (16) suggested improving front-line care provided in the primary sectors because of the deficient knowledge among GDPs to treat trauma in adolescents. Traebert et al. (49) recently asked for a combination of an evidence-based approach and clinical judgement, where both are enhanced by continuing education. Such an approach would reduce the wide variation in the methodologies and protocols, as well as facilitate treatment decisions. In addition, it would probably result in greater interest in the problems of many professionals. For this purpose, manuals and guidelines for emergency treatment are valuable tools that would facilitate the treatment of dental trauma for dentists, as well as for other personnel working in emergency services. Access to these manuals, presented by Flores et al. (56, 57, 59–63) and Andersson et al. (55) with help from the International Association of Dental Traumatology (IADT) and the American Association of Endodontists (AAE) (43), either by a computer (<http://www.iadt-dentaltrauma.org>) or in paper form would probably be highly useful.

It is probably not enough to only increase education or provide more information on TDIs and their treatment. Rather, other types of research methods and a more thorough analysis of the results are needed. Because of the modest interest in performing replantation among some groups, I suggest studying, for example, the willingness, hesitation and success of acute dental trauma treatment among professional caregivers and lay people. A common finding is that other people's presence affects a potential helper from not intervening (64). This effect seems to be affected by numerous factors, including knowledge about the 'bystander effect' and first aid knowledge.

To draw any firm conclusions, the reliability of this review needs to be examined. A large number of the studies reviewed present results from the same region on repeated occasions. The same method (questionnaire) has been used in several studies and results have been compared when performed at different periods of time. This confirms the good reliability of this review. However, each study reviewed here is probably trustworthy regarding the particular group of people studied. Yet, it is impossible to reach any general conclusions that the same group of people would have reacted or presented the same knowledge in other countries or regions. It is

nevertheless noteworthy that the results are highly consistent across different studies and over a long period. A large number of studies with varying groups of people in many countries have all reached the same conclusion, namely that the education or information to professional caregivers and lay people in dental trauma treatment has largely failed.

Because of the apparent failure to educate professional caregivers and lay people in dental trauma treatment, the only reasonable conclusion from this review is that treatment needs of TDIs must be properly met. Dentists need to be regularly educated in order to reduce or prevent inadequate care and enhance their knowledge of dental trauma treatment. Complicated TDIs that occur infrequently should be of particular interest. Treatment of traumatic dental injuries should be included in the education of the emergency staff and first-aid textbooks and manuals should include sufficient information concerning treatment of TDIs. Keen interest to help and a non-willingness to act in the event of a permanent tooth avulsion are important areas of investigation. Emergency dental care should preferably be organized so that service could be provided on a 24-h basis and that includes an emergency dental staff experienced in acute dental trauma treatment. If this is not possible, an experienced dental staff should be reachable by phone or through some other channel of communication.

### Acknowledgement

I wish to conclude with a tribute to all the authors cited in this work for their outstanding work in studying the education of professional caregivers and lay people in the care of dental trauma.

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