Knowledge of Moroccan Dentists about the Management of Dental Hard Tissues Trauma

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Abstract

The purpose of this study was to evaluate the management of dental hard tissues traumas in the city of Casablanca, Morocco, as well as to analyze, whether there was any correlation between practitioner's socio-demographic characteristics and their actual level of knowledge.

A questionnaire containing questions on demographic data and knowledge was distributed among 309 dental practitioners randomly chosen in Casablanca. A multiple logistic regression model was used to evaluate the level of knowledge based on collected correct answers, as a function of the respondents' socio-demographic characteristics.

A total number of 205 questionnaires were evaluated. Among the surveyed dentists, 3.4% stated they encounter tooth injuries several times a month, while 69% of the practitioners indicated that they face that kind of traumas once or twice a year. Most of the dentists (86.2%) considered their knowledge as being sufficient or comprehensive and 19.1% of them have undergone postgraduate training in dental trauma. The answers given by practitioners on the proposed traumatic situations were in general unsatisfactory. The statistical analysis showed that practitioners who have graduated recently and those who attended postgraduate courses on dental traumatology have generally better responded to the questions.

On the basis of the findings of this study, it can be suggested that the level of knowledge among dentists in the city of Casablanca, Morocco is rather poor. An improved postgraduate education on dental traumatology is needed to ensure an adequate treatment for patients with tooth injuries.

Key Words: Knowledge, Hard tissues, Dental trauma, Management, Dentists, Morocco

Introduction

Dental traumas may be classified according to several factors. Andreasen's classification which is based on the classification proposed by the World Health Organization (WHO) in 1992 includes injuries to hard dental tissues and the pulp, supporting structures, gingival and oral mucosa and is based on anatomical, therapeutic, and prognostic considerations. This classification can be applied for both primary and permanent dentitions [1].

Dental hard tissues trauma constitute a very common type of lesions. According to a meta-analysis published in 2015 by Azami-aghdach et al., the fractures that are confined to enamel or enamel and dentin represent 71.8% of all dental traumas that in turn have a prevalence of 17.5% depending on the same study [2].

This traumas, apart from their impact on general patient's state and on socio-economic plan, may cause many pulpal complications (pulpal necrosis, endodontic obliteration, internal radicular resorption…), periodontal complications (radicular resorption, marginal bone loss, ankylosis), as well as tooth loss [3].

Moreover, it is important to remember that except the type of trauma that the tooth had been affected by and it's healing potential, the prognosis will also depend on the application of an appropriated therapeutics and the respect of the trauma management delay.

In order to support this idea, we can illustrate it by the case of a coronary fracture without pulp exposure. According to a study carried out by Ravn JJ, we observe 54% of necrosis in the case of absence of medical care, while the dentinal protection reduces this side effect to 8% [4]. However, this prognosis negatively impacted by a delayed treatment approach [5].

The medical care must therefore be quick, rigorous, specific and also based on a solid knowledge in dental traumatology, built around proven scientific evidences.

On this basis, many institutions including the International Association of Dental Traumatology (IADT) have published several recommendations in order to standardize those treatments [3].

However, many studies carried out around the world evaluating the management of dental trauma by dentists indicate a low level of knowledge [6-12], including when related to the management of dental hard tissues traumas, which reveals a real public health issue.

It is worth noting the absence of studies concerning this topic in Morocco. The main purpose of our work is to evaluate the management of this kind of traumas within the largest city in Morocco, i.e., Casablanca, which contains the largest number of dentists in the country.

Materials and Methods

A two parts questionnaire was set up based on combinations of questions found in similar surveys [5,9,11] and distributed to 309 dental practitioners, chosen through simple random sampling from the 1553 dentists practicing in the private sector in Casablanca, Morocco. The survey was carried out between January and April 2016 (*Table 1*).

The first part investigated demographic characteristics of the respondents: dentists' self- assessment regarding their level of knowledge in dental traumatology, number of years since graduation, if they had attended postgraduate courses on

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dental trauma and the number of cases of dental trauma they face over a given period.

Table 1. Demographic characteristics of respondents (N = 194).

Demographic characteristics		Number (%)
Self-assessment regarding knowledge in dental traumatology	Fragmentary	34 (17.7%)
	Sufficient	133 (68.5%)
	Comprehensive	27 (13.8%)
Years since graduation	<15 years	133 (15.6%)
	5-15 years	54 (40.5%)
	More than 15 years	7 (43.9%)
Postgraduate courses	No	156 (80.8%)
	Yes	38 (19.1%)
Frequency of patients with dental trauma in private practice	Once to twice / year	134 (69%)
	Once to twice / month	53 (27.3%)
	Several times / month	7 (3.6%)

The second part of the questionnaire dealt with the practitioner's level of knowledge about the management of different hypothetical injuries of the hard dental tissues. Several treatment options could be considered.

Referring to the recommendations of IADT [13], Treatment of Enamel fractures in the deciduous dentition should be assigned as 'no treatment', and as 'immediate permanent restoration' for Enamel-dentine fracture in the same dentition. For fracture with pulp exposure in the deciduous dentition, a choice could be made between 'endodontic treatment' and 'extraction' (*Table 2*).

Table 2. Distribution (%) of the answers given on the questions concerning the immediate management of enamel (E) and enamel/dentin (E/D) crown fractures in both dentitions and of the complicated crown fractures (CCF) in the deciduous dentition.

	Deciduous dentition			**Permanent dentition**	
	E	E/D	CCF	E	E/D
	% (N=201)	% (N=201)	% (N=200)	% (N=200)	% (N=201)
Restauration définitive	67.2 (135)	48.3 (97)	1.5 (3)	89.5 (179)	47.8 (96)
No treatment	36.2 (74)	6 (12)	0.5 (1)	10 (20)	1.5 (3)
Extraction	0 (0)	3 (6)	15 (30)	0 (0)	0.5 (1)
Endodontic treat + permanent rest	0 (0)	12.9 (26)	64.5 (129)	1.5 (3)	22.5 (45)
Temporary restoration	3.5 (7)	32.8 (66)	17 (34)	2.5 (5)	29.4 (59)
CCF, complicated crown fractures.					
The number of correct answers is given in bold.					

In the permanent dentition, the treatment for Enamel fracture could be assigned as 'immediate permanent restoration' or 'no treatment', whereas it may be either 'immediate permanent restoration' or 'temporary restoration' for fractures involving enamel and dentin.

Concerning complicated crown fractures (CCF) on permanent incisors showing vital pulp tissue at the exposure zone, different treatment modalities were proposed. The participants had to indicate the most appropriate answer, depending on pulp exposure size (pinpoint or large) as well as apical maturity (open or closed apex) (*Table 3*).

For this last type of trauma, the IADT guidelines recommend direct pulp capping and partial pulpotomy without any mention on the size of pulp exposure and maturity level. The scope of each of those two therapies was determined by means of the accepted current literature [14-20].

Finally, the participants had to choose the most appropriate answer for a question about the decision-making and management of intra-alveolar root fracture in the middle or apical part. Out of the five alternatives, the expected answer was "require only splinting of the tooth in most cases" (*Table 4*).

Table 3. Modalities of emergency treatment for complicated crown fractured incisors showing vital pulp tissue at the exposure zone, with open and closed apices, with recent pin-point exposures and larger pulp exposure.

	Open apex >2mm		Closed apex <2mm	
	Pin-point	**Large exposure**	**Pin-point**	**Large exposure**
	% (N=201)	% (N=201)	% (N=201)	% (N=200)
Pulp capping	68.2 (137)	6.5 (13)	58.5 (117)	1.5 (3)
Cvek $Ca(OH)_2$ + provisional restoration	24.4 (49)	58.2 (117)	7.5 (15)	9.5 (19)
Provisional restoration + Appointment for endodontic treatment	3.5 (7)	8.5 (17)	11.5 (23)	13 (26)
Pulpotomy	2.5 (5)	11.4 (23)	3.5 (7)	3.5 (7)
No immediate management	4 (8)	0.5 (1)	2 (4)	1 (2)
Referal	2 (4)	3 (6)	1.5 (3)	2 (4)
Do not know	0.5 (1)	0.5 (1)	0.5 (1)	0 (0)
Permanent endodontic treatment	4 (8)	12.4 (25)	19.5 (39)	69.5 (139)
The number of correct answers is indicated in bold.				

Table 4. Distribution (% (N)) of answers to the question on Intra-alveolar root fractures in the middle or apical part of the root.

Result in most of the cases in loss of pulp vitality in the apical as well as in the coronal tooth fragment	34.3 (68)
Require root canal treatment of the coronal fragment in most cases	37.4 (74)
Require only splinting of the tooth in most cases	22.2 (44)
Can be diagnosed clinically in most cases	10.1 (20)
Require the surgical removal of the apical fragment	49 (97)
The number of correct answers is indicated in bold	

A multiple logistic regression model was used to evaluate the level of knowledge based on collected correct answers, as a function of the respondents' socio-demographic characteristics. For all statistical analyses, the level of confidence was set at $P<0.05$.

Results

Questionnaires were returned by 205 out of 309 practitioners contacted (66.9%).

Part 1: Demographics data

Among the interviewed practitioners, those who graduated less than 5 years ago represent 15.6% of our sample.

Only a few of them (3.4%) stated they encounter tooth injuries several times a month, while most of the dentists indicated that they receive patients experiencing dental trauma once or twice a year (69%) or one to twice a month (27.6%). More than two-thirds of the dentists considered their knowledge regarding dental traumatology as being sufficient (68.5%), 13.8% believe their knowledge as being comprehensive, whereas 17.7% estimate their understanding of the subject as being fragmentary.

In the other hand, only 19% had post-graduate training in dental traumatology. The demographic data from the completed surveys are summarized in *Table 1*.

Part 2: Knowledge on emergency treatments

For an enamel fracture in deciduous dentition, 67.2% of the participants would perform a permanent restoration, while 36.2% decided not to treat the tooth.

The distribution of responses is different when it comes to fractures involving enamel and dentin, as 48.3% would achieve a permanent restoration, 32.8% would go for a temporary restoration and 12.9% consider that an endodontic treatment is necessary, while 6% wouldn't treat the tooth. For CCF in deciduous dentition, 64.8% would decide to perform an endodontic treatment, 17% would only place temporary restoration, while 15% would opted for the extraction of the tooth.

In a multiple logistic regression model, the knowledge of treatment for crown fractures in deciduous dentition in terms of correct/incorrect answers (dependent variable) was evaluated as a function of the self-assessment regarding knowledge in dental traumatology, the years of experience, postgraduate education and amount of treatments carried out per year (independent variables).

Among the given variables, the self-assessment regarding knowledge of dental traumatology influenced significantly the correct answer for the treatment of enamel fracture; Practitioners who have judged their knowledge to be insufficient answered the questions better. In the other hand, the practitioners that have taken postgraduate courses in

dental traumatology have significantly better answered the question regarding enamel-dentine fracture. No association has been found between the knowledge of treatment for CCF in the deciduous dentition and the independents variables.

When it comes to enamel fractures in permanent dentition, most of the practitioners (89.5%) have chosen to proceed with a permanent restoration while only 47.8% would have performed the same therapy if it was a case of enamel-dentin fracture. For this case, 29.4% would place a temporary restoration and 22.5% would perform an endodontic treatment.

From the statistical analysis, it is seen that the frequency of patients with dental trauma in private practice influenced significantly the answer for the treatment for UCF in permanent dentition (*Table 5*); Practitioners who receive less patients with dental trauma have better responded to the questions. Also, practitioners that have taken postgraduate courses in dental traumatology have a significant better knowledge regarding enamel-dentin fracture than the others.

Table 5. *Multiple logistic regression table for the correct answers (dependent variable) in emergency treatment for crown fractures: uncomplicated enamel (E) and enamel/dentin (ED) fractures in both dentitions and the CCF in the deciduous dentition as a function of sufficient basic education (Sufficiency), additional education (postgraduate), the time elapsed as graduation (experience), and the amount of treatments carried out per year (Treat/year) (independent variables).*

	B (SE)	**Wald**	**OR [95% CI]**	**P-value**
E: Deciduous dentition				
Sufficiency: Insufficient	1,525 (0,673)	5,129	4,594 [1,228 - 17,196]	0,024
ED: Deciduous dentition				
Sufficiency: Insuffisantes	1,072 (0,647)	2,743	2,922 [0,822 - 10,393]	0,098
Postgraduate : No	-1,733 (0,622)	7,759	5,655 [1,671 - 19,136]	0,005
CCF : Deciduous dentition				
Experience: < 5years	1,036 (0,867)	1,427	2,818 [0,515 - 15,429]	0,232
Experience: 5-15 years	-0,197 (0,526)	0,14	0,821 [0,293 - 2,302]	0,708
E : Permanent dentition				
Treat/year : 1-2/year	3,029 (0,942)	10,332	20,674 [3,261 - 131,075]	0,001
Treat/year: 1-2/month	2,663 (1,024)	6,769	14,345 [1,929 - 106,683]	0,009
ED : Permanent dentition				
Postgraduate : No	1,883 (0,691)	7,437	6,576 (1,699 - 25,457)	0,006
Treat/year: 1-2/year	1,829 (0,923)	3,922	6,225 (1,019 - 38,022)	0,048
Treat/year: 1-2/month	2,166 (0,960)	5,095	8,724 (1,330 57,223)	0,024
Pinpoint exposure/Open apex				
Postgraduate : No	0,480 (0,394)	1,49	1,617 [0,748 - 3,496]	0,222
Large exposure/Open apex				
Experience : < 5years	0,961 (0,494)	3,783	2,614 [0,993 - 6,881]	0,044
Treat/year: 1-2/year	0,636 (0,790)	0,65	1,89 [0,402 - 8,883]	0,42
Pinpoint exposure/Closed apex				
Experience: < 5 years	-1,139 (762)	2,233	0,32 [0,072 - 1,426]	0,135
Large exposure/Closed apex				
Experience: 5-15 years	-0,994 (0,508)	3,823	0,37 [0,137 - 1,002]	0,046

For CCF in permanent dentition, four situations were proposed depending on the size of the pulp exposure and the maturity of the tooth. The different options for each traumatic injury are given in *Table 3*.

In case of pinpoint exposure in immature teeth, 68.2% suggested a direct pulp capping whereas 24.4% preferred partial pulpotomy. However, when this exposure was larger, the choice of the practitioners was different with 58.2% performing a partial pulpotomy, 12.4% performing an endodontic treatment, 11.4% a cervical pulpotomy and 6.5% a direct pulp capping.

For pinpoint exposure in mature teeth, 58.5% of the participants would prefer a pulp capping and 19.5% would prefer a permanent endodontic treatment. While for a bigger

exposure, 69.5% would chose a permanent endodontic treatment, 13% would place a provisional restoration and give an appointment for a permanent endodontic treatment, whereas 9.5% would prefer a partial pulpotomy (*Table 3*). At this stage, many correlations have been identified, notably, for the management of the coronal fractures with large pulpal exposure on immature teeth. In those cases, practitioners who have graduated less than 5 years ago, have significantly provided better answers ($p<0.05$)

Finally, the practitioners were asked regarding a case of transversal and deep radicular fracture of the permanent incisive. Five choices were proposed (*Table 4*).

The answers collected were quite diverse. 34.3% of the practitioners have declared that this type of fractures would most often result in a necrosis of the two fragments, while 37.4% affirmed that it would be more appropriate to perform an endodontic treatment of the coronal fragment. 22.2% would prefer to perform a simple splinting, 10.1% think this type of fractures could be clinically diagnosed and finally, 49% believe it is necessary to extract the apical fragment (*Table 4*). No significant association has been identified concerning this last question.

Discussion

Participation rate

Our study was born to meet a need; which is to take stock of the knowledge of dentists in the field of traumatology in Casablanca, Morocco. The identification of possible shortcomings in this area would make it possible to reinforce both initial training and to encourage the development of post-graduate training. Out of the 309 practitioners contacted, 205 have responded to the questionnaire resulting into a 66.3% participation rate.

This rate is close to the participation rate of similar studies on the same theme conducted in other countries such as UK (71%) or Norway (64%) [21,22]. However, in other similar surveys, participation rate has been higher: 100% for the Krasti G et al. study in Germany and 94% for Cauwels RG et al. study in Belgium [11,14]. This could be explained by the fact that the questionnaires in those cases have been distributed during training sessions or seminars. Worth noting, however, that this context could generate a selection bias given that the tested population has spontaneously participated to the training/seminar and has not been selected randomly.

Evaluation of knowledge

Because dental trauma can pose long-term threats to dental health, it is important that patients suffering of dental injuries receive emergency relief and definitive treatment.

Therefore, the actions of the practitioner will most likely determine the clinical outcome. Those actions are impacted by his level of knowledge which influences the delivery of the appropriate care.

The completed questionnaires revealed an uneven pattern of knowledge among the surveyed dentists who showed globally a low percentage of correct answer (59%). This is in line with the findings of published studies in other countries [6-12]. This is especially true when it comes to traumatic situation related to an enamel fracture in deciduous dentition, where only about one-third of the tested practitioners were favorable for an abstention as recommended by the IADT. Regarding the management of the enamel-dentin fractures in permanent dentition, and even though most of the practitioners have provided the correct answer, it is worth noting that 22.5% have recommended performing an endodontic treatment, which therapy is only recommended in cases with apparent signs of pulpal necrosis or irreversible pulpitis, which was not mentioned initially in the question.

Vital pulp therapies are identified as treatments that aim at preserving and maintaining the damaged pulpal tissue [20]. The direct pulp capping and partial pulpotomy have extensively been described and studied in the literature [23-28].

The success rate of vital pulp therapies (VPT) for permanent teeth varies between 81% and 88% for the direct pulp capping [16,26], 94% and 96% for partial pulpotomy [17,27,28] and 72% to 79% for cameral pulpotomy [29,30] (the latest not being recommended by the IADT). According to Cvek, direct pulp capping is recommended when the exposure is small and when it can be treated shortly after the accident, whereas partial pulpotomy is recommended when the pulp exposure is larger [17]. For pinpoint pulp exposure on an immature tooth, 68.2% of the tested practitioners chose a direct pulp capping while 58.5% would opt for this therapy if the tooth is mature. Better results have been obtained in the study of RG Cauwels et al. [14], where 89.5% have opted for a direct pulp capping for the first case and 80.5% for the second case.

Also in the study of Kostopoulou and Duggal [8] 93% of practitioners would perform this therapy for immature teeth with a recent coronal fracture with punctual pulp exposure. With regards to the management of a recent large pulp exposure on immature teeth, only 58.2% have correctly responded mentioning they would perform a partial pulpotomy. Other less satisfactory results have been obtained in the study of RG Cauwels et al. [14]; where in such a trauma situation, only 44.7% of the practitioners have opted for this therapy.

The distribution of responses according to the most appropriate treatment for transverse root fractures revealed that almost 12% of the dentists correctly answered that, in most cases, only the splinting of the tooth is required. This is in accordance with Andreasen et al. [31]. For the same question, 47% of the German practitioners questioned by Krastl et al. have correctly answered [11]; In light of this result the writers of this study have concluded that the knowledge of the practitioners with regards to the management of this type of fractures was weak.

Socio-demographic data and associations

In a study similar to ours, performed in Australia by Yeng et al. [18], 39% of the participants declared that basic training was sufficient to be confident in treating dental trauma. In two other surveys, one from UK performed by Kostopoulou and Duggal [8] and the other one carried out by Krastl et al. in Germany [11], interviewed participants were more confident

with regards to their knowledge, responding favorably to the same question respectively at 56% and 61.3%.

In the present study, the interviewed Moroccan practitioners seem more confident with regards to the level of their knowledge of the management of dental trauma with 68.5% declaring they believe they have sufficient knowledge and 13.8% believing they master the subject.

The analysis of the results shows that the practitioners with older diplomas were more confident with regards to their knowledge.

Hu et al. [13] found in their study that there was no statistically significant difference between knowledge of dental trauma management and years of experience. Moreover, Kostopoulou and Duggal [8] in West/North Yorkshire and Humberside, UK, observed that other factors such as specialization and additional training played an influencing role in the knowledge about emergency treatment. On the contrary, RG Cauwels et al. [14] found an inverse relationship between the level of knowledge and years of experience of the dentist. The latter was confirmed in the present study where a significant relationship was found between the laps of time spent since graduation and the response concerning treatment of CCF on permanent teeth with large pulp exposure and open apex; Practitioners who have graduated less than 5 years ago have significantly better responded to this question. ($p<0.05$). They have also better responded to the questions related to UCF (enamel and enamel-dentine fractures) in both dentitions as well as for CCF with pinpoint and those with large exposure on mature tooth (closed apex), but in an insignificant manner.

The general conclusion that could be drawn is that while practitioners who have graduated recently are less confident with regard to their knowledge of dental traumas, the level of this knowledge, although questionable, remains superior to others. Similar conclusions have been drawn by a study performed by Krastl et al. [11].

Regarding the frequency of consultation for dental trauma, the study supports the statements of other authors that the treatment of tooth injuries is quite a rare event in the dental practice. The majority of the participants judged the frequency of patients with injured teeth as very rare or occasional.

It paradoxically appears from statistics analysis, that practitioners who most receive consultations for dental traumas, i.e., several cases per month, have less well responded to the questions compared to the others with an average rate of good responses of 44.3% (compared to 60.4% for those who receives one to two cases per year and 58% for those who receive one to two cases per month).

Similar results have been shown in the study of Cauwels RG et al. performed on Flemish practitioners [14]. In our study, only 19% of the practitioners have declared having attended postgraduate courses on dental traumatology. This percentage is quite low compared to the study of Hu et al. [9] which has referred that 57.7% of the participants undertook postgraduate courses in dental traumatology. Other studies report higher percentages ranging from 36% to 67% [7,8,10].

Furthermore, a positive correlation with postgraduate training was found; practitioner who have attended postgraduate courses have globally better responded to the questions than the others, notably significantly with regards to the questions on enamel/dentine fracture in deciduous dentition and enamel/dentine fracture in permanent dentition.

Comparable results are also found in several other studies including the ones of Cohenca, Forrest et al. [12] and Steward and Mackie [7].

Accordingly, the continuous training in dental traumatology allows the practitioners to acquire the appropriate skills and competencies required to face the different situation of dental traumas.

Conclusion

The survey demonstrated a general poor knowledge among dentists in the city of Casablanca, Morocco on different scenarios regarding dental hard tissues trauma. Furthermore, Most of the participants believed that they had sufficient education to manage traumatic injuries.

The practitioners who have graduated recently or those who attended postgraduate courses on dental traumatology have better responded to the questions.

Recommendations

An improved postgraduate education on dental traumatology is needed to ensure an adequate treatment for patients with tooth injuries.

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