



# Awareness of medical emergencies among dental practitioners in three Egyptian dental schools: A cross-sectional study

Conscientização sobre emergências médicas entre dentistas em três Faculdades de Odontologia Egípcias: um estudo transversal

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## ABSTRACT

**Objective:** To evaluate the awareness of medical emergencies among dental practitioners in three dental schools. **Material and methods:** The study group included 384 dental practitioners, including dental staff members, post-graduate students, and dental interns. These professionals were attending three dental educational institutions in Egypt. Two of them were governmental and one was a private school. The educational model is almost the same in most Egyptian dental schools. **Results:** The response rate was 100%. Most of the participants worked in private academia (44.16%) or practice (42.34%) and 65.20% of them were females. The participants who recorded the medical history and filled a form (91.17%, 80.52 % respectively) while only 41.82% obtained the vital signs. Among the participants, 48.57 % were confident about handling medical emergency and 74.29 % reported their capability of intramuscular injection while only 25.71 % for intravenous injection and 49.35% knew about emergency kits. Management knowledge of airway obstruction and prosthetic heart valve patients was reported by 80.27 % and 71.94 % respectively, while less percentage for activation of EMS, chest compression, CPR ratio, and infant rescue breathing. The mean preparedness percent score was 54.57% and it was inversely correlated to the years of experiences and directly correlated to the degree of confidence in their ability to manage the dental emergency. **Conclusion:** The current study results reflected a deficiency in the dental practitioner awareness about the medical emergency especially the practical part.

## KEYWORDS

Dentists; Cross-sectional studies; Emergencies; Educational models; Dental schools.

## RESUMO

**Objetivo:** Avaliar a consciência das emergências médicas entre os dentistas de três faculdades de odontologia. **Material e Métodos:** O grupo de estudo incluiu 384 dentistas, abrangendo membros da equipe odontológica, alunos de pós-graduação e estagiários de odontologia. Esses profissionais frequentavam três instituições de ensino de odontologia no Egito. Duas eram governamentais e uma era uma instituição particular. O modelo educacional é similar na maioria das escolas de odontologia egípcias. **Resultados:** A taxa de resposta foi de 100%. A maioria dos participantes trabalhava na área acadêmica (44,16%) ou clínica privadas (42,34%) e 65,20% deles eram do sexo feminino. Os participantes registraram o histórico médico e preencheram um formulário (91,17%, 80,52% respectivamente) enquanto apenas 41,82% obtiveram os sinais vitais. Entre os participantes, 48,57% estavam confiantes para lidar com emergências médicas e 74,29% relataram sua capacidade de injeção intramuscular, enquanto apenas 25,71% para injeção intravenosa e 49,35% sabiam sobre kits de emergência. O conhecimento do manejo de pacientes com obstrução das vias aéreas e válvula cardíaca protética foi relatado por 80,27% e 71,94%, respectivamente, enquanto menos porcentagem para a ativação do serviço de emergência médica (SEM), compressão torácica, índice de reanimação cardiorespiratória (RCP) e respiração de resgate infantil. A pontuação percentual média de preparação foi de 54,57% e foi inversamente correlacionada aos anos de experiência e diretamente correlacionada ao grau de confiança em sua capacidade de gerenciar a emergência odontológica. **Conclusão:** Os resultados do presente estudo refletiram uma deficiência na conscientização do dentista sobre a emergência médica principalmente a parte prática.

## PALAVRAS-CHAVE

Odontólogos; Estudos transversais; Emergências; Modelos educacionais; Faculdades de odontologia.

## INTRODUCTION

An emergency is a medical condition that requires prompt attention and successful management. Since the number of elderly and medically compromised patients is increasing, the frequency of medical emergencies in the dental practice is also increasing [1]. It is the utmost responsibility of dental practitioners to sustain life until medical help arrives in order to reduce chances of mortality and morbidity [2,3].

The increasing number of medical emergencies can be attributed to the increase in the average age of the patients undergoing dental treatment which is associated with the rising number of medications administered to them, and their possible side effects [4]. In addition to the invasive procedures in the dental office which might result in medical emergencies [5]. The most common medical emergencies in dental practice are syncope, adverse reactions to local anesthesia (LA), grand mal seizures, angina pectoris, and hypoglycemia [6,7]. The extent of treatment by dentists requires both the prevention and management of medical emergencies. Hypertension and coronary heart disease affect 25% and 8.5% of the Egyptian population respectively increasing the probability of sudden cardiac arrest during dental therapy [8].

Dental practitioners face the risk of coming in contact with medical emergency events. These emergencies are unpredictable, should be managed instantly, and cannot be referred as they expose the life and the health of patients to danger and lead to emotional stress to the dental practitioners facing these serious episodes which require continuous awareness and preparedness of the dental team about their nature and proper maneuver of their management [3,9-11]. Dental practitioners have the duty of identifying medical emergencies once they arise, along with being competent in managing them optimally [12,13].

Dental practitioners worldwide still have inadequate ability to cope with many types of medical emergencies [14,15]. Ghanem E. et al. in 2018 concluded that there was a poor level of knowledge about Basic Life Support (BLS) skills among Egyptian medical students [16]. In recent decades, there is a dramatic shift in the method of teaching medical emergency management to undergraduate students in many developed countries in an attempt to improve their management outcomes [17]. Establishing a proper well-known action plan prior to dealing with a medical emergency in the dental office along with training all dental staff about it to know their roles in an urgency, are crucial in emergency management [18,19].

Diminishing the incidence of medical emergencies in the dental office can be attempted by obtaining a full medical history including medication use. This medical history must be performed using both a written questionnaire and oral discussion. Furthermore, measuring vital signs and performing visual inspection of the patient may disclose a hidden condition the patient may not know and may expose him to a crucial event during dental treatment [18].

The important aspects of medical emergencies in dental practice are to prevent or to correct the inadequate oxygenation of brain and heart tissues [12]. For ensuring the delivery of oxygenated blood to critical organs, the dentist must be competent in basic cardiopulmonary resuscitation (CPR) [5]. After the ABCs (airway, breathing, circulation), emergency drugs should be the next consideration in medical emergency management [20]. Thus, the aim of this study was to evaluate the awareness of medical emergencies among dental practitioners in three dental schools and to assess participants' preparedness for medical emergencies in dental practice. Our research hypothesis was that there was a need for more and different types of training to both the undergraduate and postgraduate dental students.

## MATERIAL AND METHODS

### Ethical considerations

The research has been revised and approved by the Research Ethics Committee, Faculty of Dentistry, Cairo University on 30 October 2018 (#18-10-52.) All the participants were informed about the nature of the study and agreed to participate through a verbal consent after confirming the confidentiality of the obtained data.

### Study design and setting

This is a cross-sectional questionnaire-based study on convenience sampling of dental practitioners in Cairo, Egypt. Questionnaire distribution was performed between the period of November 2018 and May 2019. The study followed the Strengthening and Reporting of Observational Studies in Epidemiology (STROBE) statement guidelines during the preparation of this study.

### Participants

The study group included 384 dental practitioners, including dental staff members, post-graduate students, and dental interns. These professionals were attending three dental educational institutions in Egypt. Two of them were governmental and one was a private school. The educational model is almost the same in most Egyptian dental schools.

### Data acquisition

A standard questionnaire in the English language was adapted from a previous study [21]. The questionnaire included four parts. Part A was about the demographics of participants. Part B was about case history and vital signs registry (seven questions). Part C included questions regarding the availability of emergency drug kits (seven questions). Part D included questions about BLS training and important practice in common medical emergencies in the dental office (eleven questions). This

gave a total of twenty five medical emergency-related questions. The questionnaire included the following topics: Emergency training and management, most common medical emergencies in the dental office, CPR, systemically compromised conditions and their management, and availability of emergency drugs. The questionnaire consisted mainly of objective questions, requiring a simple yes or no reply.

The face validity of the questionnaire was assessed by a pilot study of twenty participants to ensure language interpretation. All questions were comprehended by the participants with no confusion. The questionnaire was developed based on a previous study which already had content validity and its reliability determined using Cronbach's alpha coefficient test with a value of 0.82 [21].

### Data analysis

With a precision of 5%, a 95% confidence interval, a design effect of 1 and unknown prevalence of level of awareness level of dental emergencies (50% is used to ensure the highest number), the minimum estimated sample size was 384 participants. Data analysis has been done by Statistical Package for Social Sciences (SPSS) (version 20 for windows). Results were analyzed using an answer key, numerical variables. Descriptive statistics were calculated and variables are reported as means (M) and standard deviations (SD), frequencies, and percentages. Pearson correlation was obtained to measure the relationship between different variables. The value  $p < 0.05$  was considered statistically significant.

## RESULTS

The response rate of the questionnaire was 100%. The study was conducted on 384 participants and two-third of them were females (65.20%). There were three places of data collection at three different dental schools:

Faculty of Dentistry at Ain Shams University and Faculty of Oral and Dental Medicine at Ahrm Candian University had an equal number of participants (137) which is slightly higher than the Faculty of Dentistry at Cairo University (111). The participants were grouped into four groups according to the workplaces with the highest percentage was showed in private work either private academia (44.16%) or private practice (42.34%). Many participants reported that they have more than one workplace. The majority of the participants (71.69%) reported that they learned about medical emergency during undergraduate studies as shown in table I.

Regarding the medical history taking, the participants inquired about medical history were 91.17% and 80.52 % filled a form while only 41.82% of the participants obtained the vital signs. 48.57 % of the participants were confident that they can handle a medical emergency while 74.29 % reported their capability of intramuscular injection while only 25.71 % reported their capability of intravenous injection. 49.35 % reported their knowledge about emergency kits while 70.39 % reported the availability of glucose (Table II).

A total of 84.7% of the participants reported that they can manage syncope during dental treatment by placing the patient in a Trendelenburg position and giving ammonia inhalant. Regarding the management of airway obstruction by aspiration of a foreign body and prosthetic heart valve patients before tooth extraction, the answers level were 80.27 % and 71.94 % respectively. The percentage of participants who know about the activation of EMS was 26.75 % (Table III).

Almost half of the participants (51.68 %) answered the question of the chest compression location correctly. Also, 42.6% answered the adult CPR ratio correctly. While only 24.94% knew how to give rescue breathing in infants.

The relation between both years of experience and the degree of confident on how to handle emergency condition at dental office and high score of preparedness and awareness level was statistically significant. ( $r = -0.109$ ,  $p = 0.035$  ;  $r = 0.124$ ,  $p = 0.016$ ) prospectively (Table IV).

**Table I** - Baseline information

Question	Answer	No.	%
Gender	Female	251	65.20
	Male	134	34.80
Place of data collection	Ain Shams University	137	35.59
	Ahrm Canadian University	137	35.59
	Cairo University	111	28.83
Type of workplace *	Academia (private)	170	44.16
	Academia (governmental)	106	27.53
	Practice (private)	163	42.34
	Practice (governmental)	93	24.16
No. of years of experience	1-less than 5 years	220	57.14
	5 less than 20	141	36.62
	More than 20 years	24	6.24
When did you learn about medical emergency?	Undergraduate study	276	71.69
	Post-graduate study	70	18.18
	Self-study	86	22.34
	Continuous education course	43	11.17

\* Applicant might have more than one answer (multiple response).

**Table II** - Case history registration

Question	Yes		Yes	
	No.	%	No.	%
Do you enquire about medical history including medication and allergy?	351	91.17	34	8.83
Do you obtain filled health history Performa from the patients?	310	80.52	75	19.48
Do you obtain the vital signs?	161	41.82	224	58.18
Have you attended any workshop on emergency training or management programs?	251	65.19	134	34.81
Do you think you can handle any emergency condition at your dental office?	187	48.57	198	51.43
Can you give an intramuscular injection?	286	74.29	99	25.71
Can you give an Intravenous injection?	99	25.71	286	74.29
Availability of emergency drugs				
Adrenaline	172	44.68	213	55.32
Oral glucose	271	70.39	114	29.61
Ammonia inhalant:	117	30.39	268	69.61
Hydrocortisone:	151	39.22	234	60.78
Epinephrine:	152	39.48	233	60.52
Atropine:	95	24.68	290	75.32

**Table III** - Immediate response to a medical emergency

Question	Answer	No.	%
A patient suffered from syncope when you commenced a dental procedure. What would be your immediate action?	Continue dental procedure	4	1.04
	Place patient in Trendelenburg position and give ammonia inhalant †	326	84.68
	Make patient to sit in upright position	45	11.68
	Make patient to stand	1	0.26
	Don't know	9	2.34
A patient is cited with airway obstruction during dental treatment due to aspiration of foreign body what would you do	Attempt Heimlich/Triple maneuver	29	7.53
	Examine mouth and local area	20	5.19
	Ask patient to cough	20	5.19
	All of the above †	309	80.27
	Don't know	7	1.82
If you confirm somebody is not responding to you even after shaking and shouting at him. What will be your immediate action?	Start CPR	168	43.64
	Activate EMS †	103	26.75
	Put him in recovery position	68	17.66
	Observe	31	8.05
	Don't know	15	3.90
How do you plan for extraction of a tooth in patients with prosthetic heart valve	Advise antibiotic prophylaxis	44	11.43
	Ask the patient to stop blood thinners	5	1.30
	Advise the patient to take consent from the general physician	47	12.21
	All of the above †	277	71.94
	Don't know	12	3.12
Which of the following dental procedures can be performed in patients with prosthetic heart valve without giving antibiotic prophylaxis?	Dental radiographs	19	4.94
	Placement of orthodontic brackets	11	2.86
	Placement of removable prosthesis and orthodontic appliances	7	1.81
	All of the above †	340	88.31
	Don't know	8	2.08
What is the abbreviation of BLS?	Best life support	13	3.38
	Basic life support †	349	90.65
	Basic lung support	6	1.56
	Basic life services	7	1.81
	Don't know	10	2.60
What is the location of chest compression?	Left side of the chest	65	16.88
	Right side of the chest	11	2.86
	Mid chest †	199	51.68
	Xiphisternum	96	24.94
	Don't know	14	3.64
Ratio of CPR, single rescuer in adult?	15:02	64	16.62
	05:01	46	11.95
	30:02 †	164	42.60
	15:01	66	17.14
	Don't know	45	11.69
If you do not want to give mouth to mouth CPR, the following can be done except	Mouth-mask ventilation and chest compression	78.00	20.26
	Chest compression only	49.00	12.72
	Bag mask ventilation with chest compression	95.00	24.68
	No CPR †	163.00	42.34
How do you give rescue breathing in infants?	Mouth to mouth with nose pinched	148	38.44
	Mouth to mouth and nose †	96	24.94
	Mouth to nose only	20	5.19
	Mouth to mouth without nose pinched	80	20.78
	Don't know	41	10.65

† Correct answer

**Table IV** - Correlation between preparedness score and selected factors

	Pearson Correlation Score%	
	Correlation Coefficient	p-value (Sig.)
Gender	-0.072	0.157
Years of experience	-0.109*	0.035
(Type of work) Where do you work?	-0.019	0.711
Undergraduate	0.059	0.249
Post graduate	-0.025	0.618
Self-study	0.004	0.941
Have you attended any workshop on emergency training or management programs?	0.056	0.273
Place of data collection	-0.019	0.711
Do you think you can handle any emergency condition at your dental office?	0.124*	0.016

## DISCUSSION

As health professionals, dentists must be aware that they are dealing with human life, and must consequently assume the risks and responsibilities inherent to their occupation [22]. Medical emergencies in the dental office are not a rare incident and dentists worldwide have to deal with them, from those that are benign to life-threatening conditions such as cardiac arrest [23]. Based on the results presented, the null hypothesis of the present study can be rejected. It can be stated that there is a need for more training for both undergraduate and postgraduate dental students in the selected dental schools.

Many publications on medical emergencies in dental offices have been published. For example, in Germany, Muller et al. stated that 57% of dentists encounter at least three emergencies per year, and 36% face more than ten and in France Collange et al., in 2010 concluded that one of each 20 general dental practitioners will have to cope with cardiopulmonary resuscitation at least once during his/her career [13, 24].

Training in emergency management for dental graduates is essential, the dental curricula in many countries include training

models for medical emergency management. Yet, the lack of continuous training and inability to cope with medical emergencies can lead to tragic consequences and sometimes legal action [25]. Therefore, the current study aimed to evaluate the degree of awareness of medical emergencies among dental practitioners and their preparedness for management. According to our knowledge, our study is the first to assess the knowledge about medical emergency among dental practitioners in Egypt. Being a multicenter study, its results can be generalized to a wide population of Egyptian dental practitioners.

In the current study, an adapted questionnaire by Varma et al. 2015 was used in which reliability and validity measurements have been already done [21]. The questionnaire included both skills and knowledge sections. A pilot study was conducted by distributing the questionnaire over 20 participants and the questions were completely understandable.

The study group included 384 dental practitioners attending three dental educational schools in Egypt, two of them are the biggest governmental dental schools in Egypt with large numbers of dental staff and graduate students. Both schools get graduate students from all the governorates of Egypt with different types of workplace. One private school was included to increase the generalizability of the tested sample.

In the current study, 71.6% of the participants had knowledge about medical emergencies during their undergraduate education compared to 74.09% in the Verma et al study [21]. Both of which is relatively higher when compared to the study done by Gupta et al. [11].

In our study, 91.17% of the participants inquired about the medical history and 80.52 % filled a form which is very similar to Verma et al. who found that 94.02% of the participants inquired about the medical history but 67.11% documented that. However, all the above findings were high when compared to a similar study conducted by Kumarswami et al. which

was mainly due to the increase in the awareness regarding medical emergencies among dentists [26].

On the other hand, it was found that only 41.82% obtained the vital signs. This was low compared to the study conducted by Verma et al. where they found 83.06% recorded vital signs [21]. However, those results were higher than those reported by a Saudi study where they found that only 12% of the participants take vital signs every visit [27]. Such finding raised the awareness toward the alarming inadequacy of clinic and staff preparation toward medical emergency.

In the current study, 48.57 % of the participants were confident that they can handle a medical emergency. This percent approaches the percent in the study done by Verma et al. which was 49.5% [21] while Goel and Kroria (2016) had observed that 43.8% of the participants were confident in dealing with medical emergency themselves whereas the remainders were dependent on others to sustain life in such situations [28].

The present study demonstrated that the attitude of the participants to the capability of intramuscular injections is relatively high (74.29 %) and nearly the same as that obtained by Verma et al. (73.1 %) [21]. In the contrary, the capability of intravenous injection was just 25.7 % compared to that obtained by Verma et al that was 71.8 % [21]. This reveals the lack of training of the Egyptian dental practitioners to perform intravenous injections before their graduation or during practice.

Only 49.35% reported the availability of emergency kits. In contrast to Verma et al. where 87.2% of the practitioners had emergency kits at the dental office to handle medical emergencies [21]. However, the current finding was a much higher percentage compared to the findings (8.9%) in a study done by Gbotolorun et al. [29].

Reporting the availability of oral glucose was high (70.39%) while reporting of inhalant ammonia, hydrocortisone, epinephrine, and

atropine was low (30.39%, 39.22%, 39.48%, 24.68% respectively) compared to the much higher findings in other studies by Verma et al. [21], Kumaraswam [26], and Gupta et al. [11]. This is mostly due to the accessibility of the more available prepared oral glucose solution used in the dental settings.

Concerning immediate response to a medical emergency, 84.68 % of the participants reported that they can manage syncope during dental treatment by placing the patient in Trendelenburg position and giving ammonia inhalant. This is very very similar to results obtained by the study conducted by Verma et al. which was 81.4 %. In contrary to both the management of airway obstruction by aspiration of a foreign body (80.27 %) and the management of prosthetic heart valve patients before tooth extraction (71.94 %) in which the participants gave a higher percentage than that obtained by Verma et al. which were 61.8 % and 64.4 % respectively [21]. This may be due to these conditions are the most commonly discussed and encountered in dental practice by most of the participants. However, the knowledge about the activation of EMS was low (26.75%). This could be explained as EMS is used in the United States as an emergency medical service or 911 but not in Egypt.

The CPR-related knowledge was low especially that related to infancy-CPR. Only 51.69% of the participants had knowledge of the chest compression location, 42.6% for the adult CPR ratio and 24.94% about rescue breathing in infants. That indicates the utmost importance of the reinforcement of a periodic CPR training with special attention to CPR done on infancy. Our results support those results of Breuer et al. [30] and those of Elanchezhiyan et al. 2013 [2] They concluded that Advanced Cardiovascular Life Support (ACLS) training is necessary on a regular basis and it should be a standardized part of the medical emergency curriculum for the dental students and ACLS in life-threatening situations is considered a basic skill for dental professionals [2, 30].

A guided preparedness score was developed based on the participants' answers. We reported the mean medical emergency score percent of 54.57% in accordance with Goel and Kroria (2016) who had 5.28 score in their study denoting almost half of the dentists participating in this study had insufficient knowledge on handling clinical situations [29].

The correlation analysis showed that the awareness of the medical emergency is inversely proportional with the years of experience denoting lack of mandatory continuing education programs. However, the score was significantly correlated to the degree of confidence in their ability to manage the dental emergency in the dental office.

Although some of the post graduate students from the private practice or governmental hospitals were included in our study, future studies should be conducted with the focus on the general practitioners in private practice or governmental hospitals. This way, the generalization of the results should be done with caution because the research was conducted at educational schools.

## CONCLUSION

The current study results reflected a deficiency in the dental practitioner's awareness about the medical emergency especially the practical part and knowledge about emergency kit or equipment availability.

### Recommendations

- Introduction of medical emergencies problem-based case scenarios and patient's simulation into the undergraduate dental program courses.

- Continuous dental education and training of medical emergencies is a shared responsibility between the ministry of health and the dental educational schools.

- More stringent rules and regulations for emergency preparedness must be reinforced by the involved authorities.

- Medical emergency training courses should be an essential requirement for dental periodic practice license renewal.

### DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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### Conflict of interest

The authors have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

### Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subject's oversight committee guidelines and policies of: Research Ethics Committee, Faculty of Dentistry, Cairo University. The approval code for this study is: 18-10-52.

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