

DOI: 10.5455/msm.2022.33.60-65

Received: Jan 02 2022; Accepted: Feb 27, 2022

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ORIGINAL PAPER

Mater Sociomed. 2022 Mar; 34(1): 60-65

Preparedness of Dentists and Dental Clinics for Medical Emergencies in Jordan

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ABSTRACT

Background: Dentistry, as most clinical specialties, has a wide range of invasive procedures in which patients are at risk of having a medical emergency (ME). The stress induced at clinic during treatment, the medically compromised elderly patients whom are increasing in number due to the new advancements in medicine and the invasive techniques such as injections, surgical flaps, devitalization or extractions are risk factors for medical emergencies' occurrence. **Objective:** The aim of this study was to assess the knowledge and the training of dentists and the availability of the emergency drugs and equipment in a sample of dental clinics in Jordan. **Methods:** A questionnaire was designed and distributed using an online service to dentists all over Jordan. It included different question categories; Demographic, Medical emergencies, emergency equipment and medications and dentists' self confidence and training to manage medical emergencies. **Results:** Number of 180 completed questionnaires were accepted for the study, 102 were females and 92 were specialists. 158 (87.8%) responders faced a medical emergency at their work place. Most common medical emergency faced in the clinic was the vasovagal attack 81(45%). Major emergencies were witnessed by 79(43.9%) of the dentists. 110 (61.1%) of the responding dentists had their training in medical emergency management after graduation from dental school while 49(27.7%) had their training during dental school. 156(86.7%) found themselves still in need for further training. Blood pressure meter was the most available device at clinics 33(18.3%) and was the most used. Defibrillators were only used by 13(11.3%) of the responders. Epinephrine, steroids and nitro-glycerine were the available drugs for medical emergencies management in the practices (27.8%, 26.7% and 18.9%)

respectively. Most dentists were not confident enough to handle medical emergencies. **Conclusion:** Preparedness of dentists and dental clinics to handle and manage medical emergencies needs further attention and focus to assure prevention and management of such incidents.

Keywords: dentists, medical emergencies, Jordan.

1. BACKGROUND

Dentistry, as most clinical specialties, has a wide range of invasive procedures in which patients are at risk of having a medical emergency (ME). The stress induced at clinic during treatment, the medically compromised patients whom are increasing in number due to the new advancements in medicine and the invasive techniques such as injections, surgical flaps, devitalization or extractions are risk factors for medical emergencies' occurrence.

Medical emergency is any acute medical condition that can have an immediate risk to patient's life if not dealt with immediately (1). All health professionals should be well prepared to deal with any emergency. Different dental and emergency societies had set guidelines for the preparedness of the dental office including the staff training as well as the availability of emergency equipment and medications in dental clinics (2-5).

Medical emergencies in the dental clinic do occur, fortunately most MEs experienced are not life-threatening if recognized and dealt with early (6). Most MEs occur after the administration of local anesthesia during root canal treatment or tooth extraction (7). Other invasive procedures that may violate the mucogingival barrier can increase the risk of medical emergency especially in the medically compromised patients

this shows the necessity of obtaining a thorough medical history which includes the medications patients are using, writing to the treating physician for consultation to modify the dental treatment plan accordingly and taking vitals with good visual inspection physical examination of the patient may help the dentist recognize and prevent any ME (8-10).

Most common MEs in dental clinics according to the literature are syncope, hypoglycemia, seizures, anaphylaxis, hypotension and hypertensive crisis (11-14).

Cardiopulmonary emergencies which need resuscitations are rare in dental practice but can occur, a French study revealed that 1 to 20 general dentists will have to deal with cardiopulmonary resuscitation (CPR) at least once in their career. In another Australian study approximately 15% of the dental surgeons resuscitated patients in their clinics (15, 16).

Anon said "Wishing won't make you safe, preparedness will". Preparing a good plan for the management of MEs which includes the continuous staff training and regular drills with the availability of needed medications and proper equipment- will familiarize the team with emergencies and how to respond to them (8, 10).

To manage the more common medical emergencies encountered in general practice, the following drugs should be available: Oxygen, Oral glucose (solution/tablets/gel/powder), Glucagon injection (1mg IM), Salbutamol aerosol inhaler (100 micrograms/actuation), Adrenaline IM injection (1:1,000, 1mg/ml), Glyceryl trinitrate (GTN) sublingual spray (400 micrograms/dose), Aspirin dispersible (300mg), Midazolam (5mg/ml or 10mg/ml - buccal or intranasal). All emergency drugs should be stored in a designated storage unit, which is appropriately labelled and readily accessible, should be in date, and should undergo regular checks (17).

2. OBJECTIVE

The aim of this study was to assess the knowledge and the training of dentists and the availability of the emergency drugs and equipment in a sample of dental clinics in Jordan.

3. MATERIAL AND METHODS

A questionnaire was designed and distributed using an online service. It included 35 questions most of them were closed ended multiple-choice questions divided into different sections. The questionnaire was tested on ten different dentists and they did not participate in the study. The study was approved by the Ethical committee of the Jordanian Royal Medical Services. The categories of the questionnaire included:

Demographic Data

We inquired about gender, age, years of practice, their practice area (self-employed or governmental), type of practice (solo or with a group) and if he/she is a general practitioner or a specialist.

Emergency conditions

We asked the dentists if they had faced any minor medical emergencies, serious medical emergencies or a cardiac arrest. Minor MEs were listed as vaso-vagal reactions, hypotension or hypoglycaemia while serious conditions were

acute asthma attack, seizures, allergic reactions, inhalation or ingestion of foreign bodies or cardiac arrest.

Emergency equipment availability

Dentists were asked about emergency equipment availability in their practices and if they have ever used them. We included five items; Oxygen, pulse oxy-meter, defibrillator, blood pressure meter, bag valve mask and medications for emergency management.

Training and self-confidence in MEs management

Participants answered questions about their training to manage MEs. They were asked if they had any training during and/or after their dental school training, the type of training and if they see themselves in need for further training. Dentist also answered if they are confident enough to deal with a minor or a serious emergency at their clinic.

Data analyses were performed with SPSS® Statistics 17.0 (SPSS Inc, Chicago, Illinois, USA). Values are expressed as raw data, percentage or mean ± standard deviation. A p value < 0.05 was considered statistically significant.

4. RESULTS

One hundred eighty completed questionnaires were received. 102 (56.7%) were females. Among the respondents 92 (51.1%) were specialists; 19 (20.9%) were surgeons, 14 (15.4%) pedodontist, 14 (15.4%) periodontist, 13 (14.3%) were orthodontists and 12 (13.2%) conservative dentists. Most of the respondents worked in hospitals or clinics in health centres 97 (53.9%), 31 (17.2%) shared their clinics with other dentists in group practice and 29 (16.1%) worked solo in their own clinics. 38.9% of the study sample had 10-20 years of experience in dentistry. Over half of the respondents 109 (60.6%) were practising in Amman.

Variable	Witnessing at least one vasovagal reaction	
	No (%)	Yes (%)
Years of experience		
0-10	10 (25.6)	29 (74.4)
10-20	10 (22.7)	34 (77.3)
20-30	6 (27.3)	16 (72.7)
30+	0 (0)	2 (100)

Table 1. Bivariate analysis of years of experience and witnessing at least one vasovagal reaction

Most of our respondents experienced a minor ME at their work place 158 (87.8%). The most common minor emergency reported in the last twelve months (year of 2019) was vaso-vagal attack 81 (45%) followed by hypoglycaemia 67 (37.2%), orthostatic hypotension 48 (26.7%) and minor allergic reaction 26 (14.4%) (Table I).

Out of 79 (43.9%) respondents encountered a serious medical emergency during their practise, 42 (23.3%) witnessed a cardiac arrest. 22 (52.4%) of them witnessed it at work and 20 (47.9%) witnessed it outside their work place. 4 (2.2%) dentists reported witnessing a cardiac arrest in the previous twelve months.

Other serious conditions were also faced during the previous year by our reporting dentists; 35 (19.4%) dealt with mild and severe allergic reactions, 15 (8.3%) had to manage asthma attacks and 17 (9.4%) were faced with convulsions.

Variable	Trained on medical emergencies		p-value
	No (%)	Yes (%)	
Gender			<0.001*
Male	18 (23.1)	60 (76.9)	
Female	52 (51.0)	50 (49.0)	
Age			0.170
20 – 40	38 (34.9)	71 (65.1)	
41+ years	32 (45.1)	39 (54.9)	
Academic level			0.001*
GP or resident	45 (51.1)	43 (48.9)	
Specialist	25 (27.2)	67 (72.8)	
Years of experience			0.020*
0 – 20	42 (33.3)	84 (66.7)	
20+ years	28 (51.9)	26 (48.1)	

Table 2. Bivariate analysis of study variables and being trained on medical emergencies after graduation. * Significant at p<0.05 level

Variable	Need a training on the management of medical emergencies		p-value
	No (%)	Yes (%)	
Gender			<0.001*
Male	20 (25.6)	58 (74.4)	
Female	4 (3.9)	98 (96.1)	
Age			0.256
20–40	12 (11.0)	97 (89.0)	
41+ years	12 (16.9)	59 (83.1)	
Academic level			0.012*
GP or resident	6 (6.8)	82 (93.2)	
Specialist	18 (19.6)	74 (80.4)	
Years of experience			0.389
0 – 20	15 (11.9)	111 (88.1)	
20+ years	9 (16.7)	45 (83.3)	

Table 3. Bivariate analysis of study variables and the perception of need for a training on the management of medical emergencies. * Significant at p<0.05 level

As for the availability of the emergency supplies at their offices, about one third 68 (37.8%) of the respondents answered that they were available. When asked to point out what supplies they have, most dentists had a blood pressure metre 33(18.3%), 17 (9.4%) had oxygen supply and only 8 (4.4%) had defibrillators. 144 (80%) of the dentists used blood pressure metre while only 13 (11.3%) have used a defibrillator (Figure 1).

We asked the dentists to choose the emergency drugs they have out of a list of suggested emergency drugs. 50 (27.8%) had epinephrine, 48 (26.7%) had steroids and 34 (18.9%) had nitro-glycerine available at their clinics (Figure 2).

Out of 110 (61.1%) dentists had their training in the management of medical emergency after graduation while 49 (27.7%) had their training during dentistry school. 45 (25%) had basic life support (BLS) training, 30 (16.7%) had cardio-

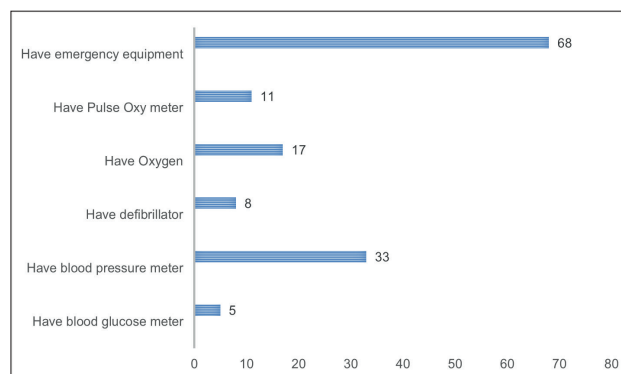


Figure 1. Emergency Equipment Availability

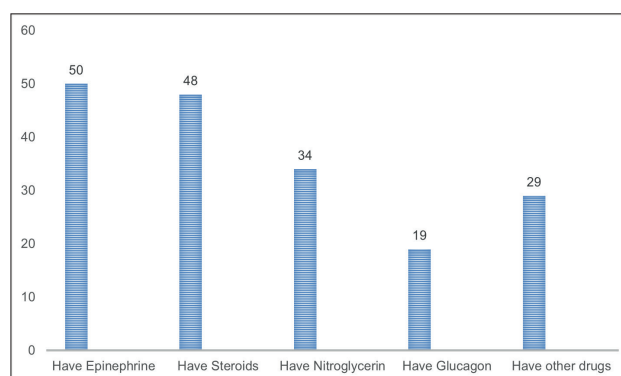


Figure 2. Emergency Medications Availability

pulmonary resuscitation (CPR) training and 21 (11.7%) had other emergency training courses. A significant association was identified between gender, academic level and years of experience and being trained on ME management after graduation (Table 2).

Most of the dentists 156 (86.7%) found themselves still in need for further training in managing MEs. Significant association was found between gender and academic levels in association with perception of the need of further training on the management of MEs (Table 3).

Being prepared for MEs requires having a protocol to follow in the case of an emergency event. 65 (36.1%) of the responders had a protocol at their clinic.

As for their self confidence in dealing or managing minor and serious emergencies most were capable enough to deal with minor MEs but not enough capable to handle serious conditions and cardiac arrest (Figure 3).

5. DISCUSSION

Recently different publications on medical emergencies and the preparedness of dentists and their clinics to manage them have appeared. The discussion was on the training and equipment availability to deal with such incidences.

In our study all the participates were practicing dentists in different regions of Jordan. 87.8 % (n=158) have witnessed a minor ME while 43.9% (n= 79) faced serious MEs, this shows that MEs do occur at the dental practice, fortunately minor conditions are more common.

The prevalence of ME in other countries vary, in the UK 70.2% of dentists faced at least one medical emergency during a ten-year time period (18) In a Belgium study; the most frequently reported emergency was vaso-vagal syn-

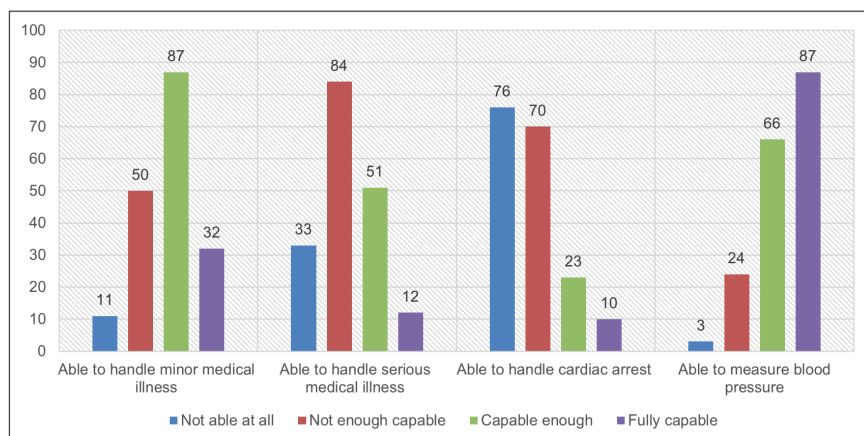


Figure 3. Ability and Self-Confidence to Handle Medical Emergencies.

cope (34.3%), followed by epilepsy and diabetic problems (8.4%) (19).

Malamad stated that the most frequent emergency in dental clinics in USA was syncope, in another study published 2010, 164 MEs per million dental appointment were reported in the USA (1, 20). In Brazil, the most prevalent emergency was presyncope followed by orthostatic hypotension (21).

The most common medical emergencies in Polish dental offices were vasovagal syncope, orthostatic hypotension and hyperventilation crisis (22). Vasovagal attack was also the most prevalent ME dealt with by Saudi dentists in the eastern part of Saudi Arabia (8).

The prevalence of MEs varies in different countries but syncope is the most common emergency reported. Other minor MEs are also more prevalent in comparison to serious emergencies.

Einstein said "A clever person solves the problem; A wise person avoids it". It is the responsibility of the practising dentist to identify the emergency, be able to prevent it and be capable enough to manage it.

Prevention of MEs is of utmost importance; Medical history taking at each visit before any dental treatment and assessing the vital signs may help identify high risk cases to MEs. Modifying treatment plans by avoiding invasive procedures, consulting treating physicians and sometimes hospitalization of high risk medically compromised patients may prevent emergencies in dental clinics. Nevertheless, emergencies do occur and the dentist should be ready to deal with them and this is only done by good continuous training.

In our study 27.2% (n=49) of the dentists had medical emergency management training during their dental education and only 61.1% (n=110) trained after graduation, 27.1% (n=39) had their training in the preceding year.

Different regulations and rules are found in different countries and societies concerning medical emergency training; The European Resuscitation Council (ERC) and the American Heart Association (AHA) suggest that dentists should participate regularly in Basic Life Support (BLS) and Advanced life Support (ALS) courses, at the optimal frequency of once a year (23). In Poland, there is a system of continuous postgraduate education to maintain the licence of a dentist, but annual BLS training is not mandatory. A

polish study published in 2019 showed that 24.82% of polish dentists participated in BLS training within the preceding 12 months, 40.10% during the preceding 2–5 years and only 8.35% had never participated in BLS training since graduation (22). An investigation performed in India found less than half of the Indian dentists had received practical training in management of medical emergencies during their undergraduate and postgraduate education (14). In Slovenia 94.3 % of dentists involved in a study conducted in 2018 acknowledged receiving BLS training during their undergraduate dental education and 85.1 % of dentists reported undergoing BLS training after graduation (24).

Regarding self-confidence in managing MEs, 49.7% (n=87) of the involved dentists in our study stated that they are capable enough to deal with minor MEs while 6.8% (n=12) were confident to be fully capable to manage serious MEs. Other studies that examined the self-confidence of the dental practitioners about MEs management revealed that dentists are more confident to manage minor emergencies, this could be because one gets used to dealing with conditions, he/she regularly face than conditions they probably never experience.

CPR is an emergency procedure that combines chest compressions often with artificial ventilation to manually preserve intact brain function until further measures are taken. It should only be performed when a person shows no signs of life or when they are: unconscious, unresponsive, not breathing or not breathing normally (in cardiac arrest, some people will take occasional gasping breaths). There is no doubt that every dental practitioner should be fully trained and competent to perform such emergency procedure.

When inquiring about the ability to perform CPR and dealing with cardiac arrest, 42.5% (n=76) of the participants stated they are not capable at all to manage such emergency or perform CPR while 39.1% (n=70) stated they are not capable enough. Similar results were observed in different studies, analysis of the self-assessed ability of Brazilian dentists reported the percentage of dentists who did not perceive themselves as capable of providing initial management in acute myocardial infarction was (79.7%) and in cardiac arrest (68.7%) (21).

In Kuwait, the majority of dentists have inadequate knowledge of CPR and only 57.2% feel competent in performing it (25). In Eastern Saudi Arabia regions 44.8% of dentists considered themselves skilled in performing CPR and in Slovenia, only 51% of the responding dentists estimated that they were competent to provide CPR (24, 26). These results show that continuous repeated training is mandatory to the dentist to stay self-confident and skilful in performing CPR and managing MEs.

Preparedness of the dental office to face MEs not only includes staff training it also involves the availability of equipment and drugs needed to handle MEs. 112 (62.2%)

of Jordanian dentists involved in this study answered that their clinics aren't fully equipped for MEs.

Amount of 18.3% of the dental clinics had a Blood Pressure Monitored the majority of dentists had used it (80%) this could be explained due to the high prevalence of hypertension among Jordanians. Meanwhile, since hypoglycaemia is one of the most predominant medical emergencies and Diabetes Miletus is highly prevalent among Jordanians providing glucose meters in dental offices could be beneficial to prevent such an incident, only (2.8%) of the dentists had it available at their practice (27, 28).

As for clinics that had oxygen available, (41.2%) of the dentists stated that they didn't know when was the last time they changed it and the vast majority of repliers (88.2%) stated they had never used oxygen. There is no debate that oxygen should be available in a dental surgery. Oxygen is indicated in all emergencies except anxiety-induced (primary) hyperventilation (16).

A study done in the western region of Saudi Arabia reported that only 22.9% have blood pressure monitor in their clinics (29, 30). Andrius Geguzis in his study Knowledge of Lithuanian Dentists about Medical Emergencies, also stated that the most found emergency equipment in dental clinics in Lithuania was the blood pressure monitor (31). Another similar study done in Nigeria also found that 91.1% of the total respondents stated they had no emergency kit in their dental clinics (32). As for defibrillators, the use of an Automated defibrillator (AED) does not require any special training but still 88.7% of the dentists responded that they had never used it.

The lack of emergency equipment as noticed in most dental clinics around the world may be due to the lack of experience to use them, underestimation of their need, their expensive prices and the absence of regulations and laws which state that lifesaving equipment must be provided in dental practices.

More than 75% of the dentists involved in the study had never used medications at their clinics to manage emergencies. Dentists who had emergency medications available stated that the available medications were epinephrine(adrenaline) (27.8%) and steroids (26.7%).

Different results were also seen in other studies. Gupta et al. (14) found that the most commonly available emergency drugs were oral glucose (82.8%), adrenaline (65.8%) and bronchodilator spray (24.7%). Results from a Lithuanian study showed that the most commonly available emergency drugs in emergency kits were adrenaline and prednisolone (31). The most available drug in participating clinics in a study done to assess the preparedness of the dental clinics to manage medical emergencies in Riyadh, Saudi Arabia was Aspirin (in half the study sample) (33). Adrenaline is the emergency drug of choice for the management of three types of severe allergic drug reactions: bronchospasm, laryngeal oedema, and anaphylaxis, which are potentially life-threatening emergencies. This is because of the antihistamic, bronchodilator and vasopressor actions of adrenaline (14, 34).

Countries that set regulations for ME drugs availability in dental clinics, had reported better percentages of general dental practitioner providing the required medica-

tions, keeping them up to date and being capable enough to know when to use them if needed. The percentage of General Dental Practitioners in Great Britain possessing a number of emergency drugs and equipment in one study were: 90% of possessed oxygen, more than 50% had the means of delivering air and more than 90% had the means of delivering oxygen (18).

6. CONCLUSION

The preparedness of dental clinics and dentists in Jordan for the management of medical emergencies is insufficient. There should be more focus towards the topic of medical emergencies starting with dental students in their dental school education to teach them the basics of medical emergency and consider the training courses such as Basic Life Support and Cardio-Pulmonary Resuscitation as a graduation requirement. Continuous post-graduation education should involve lectures and courses on managing medical emergencies and should be an integral recommendation for the dentists' license to practise dentistry in Jordan. Clinics should be properly equipped with the needed medications and equipment; this could be possible only if one of the health authorities puts a strict protocol and check list that is investigated and checked on regular bases.

The data gathered was via an online questionnaire due to COVID 19 pandemic lock down, this didn't give the authors the chance to evaluate the medications and devices available at clinics and set a standard to which all were compared to. The dentists' practical skills and ability to manage MEs was not assessed in this study. Most of the responders were from the central part of Jordan, another study can be conducted to investigate the preparedness of dentists in all three parts of Jordan: North, South and Central.

- **Acknowledgment:** The authors would like to thank all dentists that participated in this research.
- **Authors contribution:** Both authors equally contributed to the conception or design, the work in data acquisition, analysis and interpretation of data for the work, and critical revising and approval of the final version to be published. Final article drafting and proof-reading was made by the first author.
- **Conflict of interest:** There are no conflicts of interest
- **Financial support and sponsorship:** Nil.

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