Emergency medical care in dentistry: A cross sectional analysis of competencies for undergraduate students

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ABSTRACT

Background: The possibility of a medical crisis, albeit a relatively uncommon occurrence in a dental practice, is often overlooked and it is imperative that dental practitioners equip themselves with the knowledge and skills essential to manage potentially life-threatening situations. The aim of this study was to evaluate the knowledge and competency levels of dental undergraduate students training across universities in the UAE in basic life support (BLS) and medical emergencies in a dental setting.

Methods: A cross-sectional survey-based study was conducted and 411 students undergoing clinical training (4th and 5th year of dental school) voluntarily participated in this study. The questionnaire comprised questions related to commonly occurring medical emergencies that they may have encountered in a dental setting. Data collected were then tabulated and subjected to descriptive statistical analysis.

Results: More than half of the respondents (55.2%) reported that they had lower confidence in handling medical emergencies, with 54.7% claiming that they had not received training on the subject during their undergraduate course. Majority of the respondents (216) reported that they would only choose to record vital signs if the medical history of the patient was indicative of an underlying condition.

Discussion: Findings from the present study strongly mandate the inclusion of training for BLS and medical emergencies in the existing dental curriculum to equip graduate dental practitioners to handle a medical crisis in their dental practice.

Key Words: Anxiety, basic life support, knowledge, medical emergencies, training, undergraduate dentistry

INTRODUCTION

Health care in the modern era has made significant strides in improving life expectancy of patients. This has been made possible through a comprehensive understanding of the etiopathogenesis of diseases, enhanced diagnostic proficiencies, state-of-the-art surgical techniques and newer pharmacological agents. Today's dental patient - the young, the old and the medically compromised, presents with a rather complex medical history, raising the likelihood of a medical crisis on the dental chair. The combination of an aging profile, multiple morbidities, and the subsequent pharmaceutical
dependence results in a medically complex patient cohort. Eventually, the dentist is faced with the challenge of being both knowledgeably and clinically equipped to anticipate and tackle potential medical emergencies in the dental office.

Some diseases and their treatments may increase the likelihood of a medical emergency during clinical treatment and hence the dental practitioner should be clinically competent to manage a variety of medical emergencies. The administration of local anesthetic agents and other drugs, materials used in dentistry, and the fear of operative and surgical treatments, as is routine in dentistry, have been found to evoke medically emergent situations, namely, syncope, hyperventilation, and cardiac arrest.\(^{[2]}\) Situations such as these have a higher likelihood to occur within the confines of a dental practice resulting from heightened levels of stress, common to most patients visiting a dental office. The likelihood of a medical crisis owing to an oversight on the dentist’s part in identifying patient anxiety has also been reported in a previous survey.\(^{[3]}\)

Medical emergencies, although perceived to be relatively infrequent in a dental office, can prove to be fatal to the patient in the absence of timely intervention and result in medicolegal consequences.\(^{[4]}\) A state-wide survey conducted by Müller et al. in 2008 in Saxony, Germany,\(^{[5]}\) showed 57% dentists reporting up to at least three medical emergencies in a 12-month period. Vasovagal syncope was reported to be the most commonly occurring medical emergency, a finding that corroborated with other studies.\(^{[5-9]}\) The incidence of medical crises such as cardiac arrest, anaphylaxis, airway obstruction, stroke, hypoglycemia, asthmatic, and epileptic episodes has also been previously reported.\(^{[10]}\) Albeit medical emergencies cannot be classified as an everyday occurrence within dental clinical scenarios, they do arise with an alarming unpredictability, rendering highly skilled clinicians perplexed and anxious. Owing to the uncommon nature of these emergencies, clinicians over the passage of time tend to lose the skills necessary to tackle and treat a medical crisis on the dental chair, leading to a state of vulnerability, anxiety, and confusion.\(^{[11]}\) What follows is a less-than-perfect outcome subsequent to the compromised execution of sound knowledge and competent skills.

Research in the past has also explored the knowledge and competency levels among dental students and dental practitioners in medical emergencies, mandating the need to incorporate basic life support (BLS) training in the dental curricula. More recent surveys have shown a continued lack of awareness among students and practitioners alike surrounding medical emergencies and the choice of appropriate emergency drugs.\(^{[9,12-15]}\) Existing body of literature has attributed this to the paucity of exposure in clinical training in medical emergencies and BLS measures.\(^{[5,16]}\)

To implement an evidence-based training program surrounding medical emergencies, a comprehensive assessment of knowledge and proficiency skills in medical emergency management is necessary.\(^{[17]}\) Clinical and scenario-based simulations may prove beneficial as compared to self-rated assessments or theoretical exams, which are purely based on factual knowledge. There is a paucity of studies that have explored the knowledge and experience levels of clinical undergraduate students in handling medical emergencies in the UAE. To this effect, our study was conducted to examine and evaluate proficiencies in medical emergencies across select dental colleges in the UAE; to ascertain attitudes toward preliminary routine procedures such as recording medical history and vital signs; and to evaluate student competencies in identifying a medical crises and awareness surrounding first-line drugs administered in the event of a crisis.

**METHODS**

A survey-based cross-sectional study was conducted during the academic year 2017–2018 (January through to April 2018) to assess the knowledge, attitudes, and awareness surrounding medical emergencies of dental undergraduate students in a dental clinical scenario. Ethical approval was duly obtained from the university’s ethical review board (IRB reference number GD-2017-14) before study initiation and participant correspondence.

The study recruited 411 fourth- and fifth-year undergraduate students who were undergoing clinical training in four dental colleges in the UAE, namely, the Ajman University (AU-Ajman campus), Ajman University (AU-Fujairah campus), the Gulf Medical University, and Ras Al Khaimah College of Dental Sciences (RAK). Ethical approvals were duly obtained from the colleges that participated in this study. The student cohort was identified by contacting the student registry services, with additional information pertaining to their lecture timetables and clinical postings for years 4 and 5.

The authors of this study approached students at the end of a lecture with prior permission duly obtained from the respective deans and concerned academic faculty, among which 451 agreed to participate in this study. Students were briefed on the intents and purposes of the study and the allotted time (10 min) to submit their responses. The investigators reassured students that their participation was entirely voluntary, and refusal/withdrawal from the study would bear no implications on their grades.
A consent form enclosing details of the investigation was distributed before participation and willing participants were asked to provide signatures as their consent to participation. Before seeking consent, participants were assured that responses, when submitted, would be stored on the research department’s desktop, secured with a username and password to prevent unauthorized access to information. Access to data was strictly permitted to the investigators involved in the study. An online portal was created for the questionnaire comprising 24 close-ended questions. After choosing their best response to each item of the survey, the respondents would then arrive at a final review step with a summary of their responses, which would permit them to review and change their responses before submission. Survey takers were only permitted to submit their response once, after which the survey would never be displayed a second time to prevent duplicate entries from the same user. Toward this end, a login action setup was determined by the authors following the pilot testing, which would require the respondent to create a username and password to access the survey. All items on the questionnaire were made mandatory for a successful submission and participants were reminded of missed out items on the survey before the review page.

The questionnaire was designed to evaluate the knowledge, confidence levels, and clinical experiences of dental students in handling emergency scenarios and was adapted from the works of Albelaihi et al. and Majage et al. Additional questions pertaining to the availability of emergency kits and drugs were also included, subsequent to reviewing the existing body of literature. Four faculty members from the College of Dentistry examined the questionnaire for structure and relevance of content, following which minor alterations were made to validate the instrument. A group of 15 undergraduate students volunteered to pilot test the survey to evaluate the response format and phrasing. Cronbach’s alpha value was measured to account for internal validity, rendering a coefficient of 0.75. A priori targets were set following the pilot study, which helped identify potential problems such as missing information during fielding of the questionnaire. Items on the survey were grouped in terms of knowledge, training, and practice-based questions, starting with broader questions such as “How confident are you in managing a medical crisis on a dental chair?” “Do you record vital signs during history taking?” to more specific questions such as “What is the first line of management for an epileptic crisis on a dental chair?” “Do you record vital signs before an emergency?” The choices of options for each item were randomized to minimize option bias.

A total of 411 students submitted their responses out of the 451 who volunteered to participate in the study, with an overall completion rate measured at 91.1%. Data obtained were recorded on Microsoft Excel sheets using specific codes. Data were then tabulated and examined, following which descriptive statistical analyses were applied. The results were calculated based on the frequency and percentages using IBM SPSS Version 20.0 (IBM Corp., Armonk, USA).

### RESULTS

#### Demographic data

Among the 411 students who had submitted their responses, nearly half of the participants were of 22 years or lesser ($n = 200$), while the rest ($n = 211$) were above 22 years of age. The cohort comprised 61.6% of female participants. Moreover, a significant number of participants were fourth-year students (62.3%), while the rest (37.5%) were training for the fifth-year of their dental undergraduate program [Table 1].

#### Training and Experience in BLS

Drawing from the data collected in the study, 35.3% ($n = 145$) of students reported that they had not encountered medical emergencies in the dental settings, while 28.7% of students reported vasovagal syncope as the most commonly occurring emergency in the clinical scenario. It was also noted from the findings that more than half (54.7%) of the respondents had received no previous training or attended workshops on medical emergencies. A vast majority of the respondents stated that they only chose to record vital signs before an operative treatment if the patient’s medical history was suggestive of an underlying medical condition. However, a significant percentage of respondents ($n = 322$) reported that they inquired about allergies and medication profile of their patients when recording the patient’s medical history [Table 2].

#### Awareness and Skill based responses to medical emergencies

More than half of the respondents (55.2%) felt incompetent in tackling medical emergencies in their dental office, with less than half (37.7%) considering ringing the emergency medical service if the patient elicited no response despite shaking/shouting, which was the right approach in the scenario. It was also noted from the findings that more than half (54.7%) of the respondents had received no previous training or attended workshops on medical emergencies. A vast majority of the respondents stated that they only chose to record vital signs before an operative treatment if the patient’s medical history was suggestive of an underlying medical condition. However, a significant percentage of respondents ($n = 322$) reported that they inquired about allergies and medication profile of their patients when recording the patient’s medical history [Table 2].

### Table 1: Baseline characteristics of participants

| Age            | Frequency | Percentage (%) |
|----------------|-----------|----------------|
| $\leq 22$ years | 200       | 49             |
| $>22$ years    | 211       | 51.3           |
| Gender         |           |                |
| Male           | 158       | 38.4           |
| Female         | 253       | 61.6           |
| University     |           |                |
| AU- Ajman      | 179       | 43.6           |
| AU- Fujairah   | 81        | 20.0           |
| GMU            | 82        | 19.7           |
| RAK            | 69        | 16.8           |
| Academic Year  |           |                |
| Fourth         | 256       | 62.3           |
| Fifth          | 155       | 37.7           |
given scenario. A significant number of respondents (70.1%) chose the right response to the question pertaining to the management of a patient suffering from epileptic fits, in which they would consider placing the patient on their lateral position and wait on the seizure to subside. On questions pertaining to the management of vasovagal syncope and airway obstruction, 56.9% answered correctly to the former by stating they would place the patient in the Trendelenburg position and administer ammonia inhalation, whereas only 37.2% of participants chose the right response to the latter by affirming they would attempt a Heimlich maneuver. The findings also demonstrated that more than half of the participants wrongly identified the mid-chest as the location of chest compression, while 65% of the respondents chose 30 compressions and 2 rescue breaths in a single rescuer as the right response to the ratio of chest compressions and rescue breathing when performing cardiopulmonary resuscitation (CPR). 31.4% of the participants chose antihistamines as the drug of choice in the occurrence of an anaphylactic shock, while 68.9% knew that sublingual nitrates were the drug of choice in the management of angina. A vast majority (85.9%) of respondents stated that they were aware of the availability of the emergency kit in the dental clinic. Furthermore, more than half \( (n = 254) \) of the respondents acknowledged the availability of adrenaline in the emergency kit, whereas less than half \( (n = 167) \) reported their awareness of antihistamines, 33.1% reported the availability of hydrocortisone, and 29% stated the availability of atropine in the kit [Table 3].

### DISCUSSION

Although the occurrence of medical emergencies is perceived to be a rare event in the dental chair, the consequences that follow can prove to be fatal to the patient’s life. Researchers in the past who have explored knowledge and competencies in medical crises, practitioners, have highlighted a continued lack of awareness among students and practitioners alike in their studies, with findings from more recent surveys mandating the need to incorporate BLS training in the dental curriculum. The existing body of literature has attributed this as a result of little to no exposure to...
Moreover, the significance of a thorough anamnestic and treatment planning should not be overlooked. Recording vital signs before a treatment will not only aid in diagnosis, but also help provide baseline measurements for reference to help monitor changes in the patient’s clinical condition. It also maintains a record of previous eventful episodes during treatment to be wary of a possible recurrence. In the present study, a significant proportion of respondents (52.6%) only chose to record vital signs if the patient’s medical history was indicative of an underlying health condition. These results are synonymous with similar findings from the study conducted by Albelaihi et al.,[9] which reported about 77% of respondents claiming that they recorded vital signs only when they perceived it mandatory. An acceptable standard of achievement would involve physical examinations such as inspection, palpation, auscultation as well as the evaluation of cardiac rhythm, blood pressure, and respiratory rate.[9]

In the current study, 55.2% of respondents claimed to have lower confidence levels to manage medical emergencies on their own in a clinical setting, with 44% reporting adequate confidence in patient management. More than half of the respondents (54.7%) in this study had reported to have had no training in medical emergencies during their undergraduate course. Elanchezhiyan et al.[6] reported that 56% of their total number of respondents had received prior training in BLS during their undergraduate training in dental surgery, with only one-third of the participants reporting clinical experience with medical emergencies. A considerable number of dental practitioners who have previously received training were reported to have significantly lower confidence and competency levels in tackling medical emergencies,[16] implying that proficiencies in medical management measures may be owed to a more continued clinical exposure to medical crises in addition to refresher courses, apart from regular lectures and didactic learning alone at undergraduate and postgraduate levels. A similar premise was established in a study conducted by Dhuha and Dalia[20] that explored the knowledge and attitudes of dental undergraduates and interns toward medical emergencies and BLS. Albeit most participants in their study had attended workshops and lectures on BLS, only a third of the respondents had scenario-based and hands-on experience with BLS in a dental setting. This can indicate that attending lectures or workshops alone may not necessarily be a reliable indicator of proficiencies in medical crisis management.

Therefore, it is imperative that dentists acquaint themselves with competency skills essential in identifying the signs and symptoms of potential medical emergencies that may arise in the dental chair as well as standard treatment protocols to stabilize the situation. Maintaining airway patency, providing breathing support, assessing circulatory and neurological functions are some of the common emergency procedures employed to stabilize a patient in the event of an emergency. On the premises that dentists and auxiliary staff hold complete responsibility in assuring the safety of the patient who attends a dental appointment, it is imperative that dentists and other health professionals alike procure rigorous and continuous professional training in emergency procedures as well as the prompt and effective use of emergency drugs and equipment in a dental setting.[18,21] The findings from the present study have shed light on self-perceived confidence and competencies among dental undergraduate students in emergency management but not without limitations. First, the investigators chose a nonprobability sampling method (convenience sampling) for participant recruitment. This may have potentially rendered a lower external validity to the study due to errors in generalizing findings from the study to the undergraduate student cohort. Moreover, the authors were unable to conduct a follow-up of participants recruited for the study due to time constraints.

Continued professional development training in BLS and knowledge of emergency equipment for dental undergraduate students and practitioners alike will aid in knowledge retention rendering them confident and professional competent in handling emergency situations in a dental practice. More rigorous mandates from dental regulatory bodies may need to be rolled out to initiate a discourse and address deficits in medical emergency training in most dental schools. In addition, the Dental Board of Practice in the UAE may be well advised to issue directives that require continuous training in BLS over 2-year cycles or more to renew license to clinical practice within the country. This recommendation is congruent with the code of practice issued by the Dental Practice Board of Victoria, South East Australia,[22] that mandates a minimum of 2 hour training in BLS over a 2-year cycle to maintain their licensure to clinical practice. Moreover, results from a previous study (Cooper et al.[23]) found that skills in BLS, defibrillation, and airway patency showed a notable decline within 6 months of training. Other authors (Mutz and Cancado[24]) have recommended providing incentives to practitioners, who sought continued professional training in BLS, as a means to encourage active participation in BLS training courses. Notwithstanding the limitations of the present and previously published studies within the realm of medical emergencies, there is sufficient evidence to highlight the gaps in knowledge which should essentially initiate a discourse on the inclusion of a collaborative hands-on training in medical emergencies in the existing dental undergraduate curriculum on a more global scale.
Research Quality and Ethics Statement
The authors of this manuscript declare that this scientific work complies with reporting quality, formatting, and reproducibility guidelines set forth by the EQUATOR Network. The authors also attest that this clinical investigation was determined to require Institutional Review Board/Ethics Committee review.

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Conflicts of interest
There are no conflicts of interest.

Research quality and ethics statement
This study was approved by the Institutional Review Board / Ethics Committee at Ajman University (approval number GD-2017-14). The authors followed applicable EQUATOR Network (http://www.equator-network.org/) guidelines during the conduct of this research project.

REFERENCES
1. Little JW, Miller CS, Rhodus NL. Dental Management of the the Medically Compromised Patient. 9th ed. Missouri: Elsevier; 2018.
2. Mohan M, Sharma H, Parolia A, Barua A. Knowledge, attitude and perceived confidence in handling medical emergencies among dental practitioners in Dakshina Kannada, India. Oral H Dent Mgmt 2015;14:27-31.
3. Malamed SF. Knowing your patients. J Am Dent Assoc 2010;141 Suppl 1:35-75.
4. Rao V, Batchelor M, Hudson P, Johanssen H, Ziegler C. P22 anaphylaxis risk management program enhances emergency care for anaphylaxis. Int Med J 2017;47:11.
5. Müller MP, Hänsel M, Stehr SN, Weber S, Koch T. A state-wide survey of medical emergency management in dental practices: Incidence of emergencies and training experience. Emerg Med J 2008;25:296-300.
6. Elanchezhian S, Elavarasu S, Vennila K, Renukadevi R, Mahabob MN, Sentilkumar B, et al. Awareness of dental office medical emergencies among dental interns in southern India: An analytical study. J Dent Educ 2013;77:364-9.
7. Marks LA, Van Parys C, Coppens M, Herregods L. Awareness of dental practitioners to cope with a medical emergency: A survey in Belgium. Int Dent J 2013;63:312-6.
8. Durranj OK, Khan K, Ahmed SE, Khan S, Arshad H, Bashir U. An assessment of dentist's knowledge about medical emergencies. Pakistan Oral Dent J 2015;35:552-55.
9. Albelalhi HF, Alweneen AI, Ettish A, Alshahrani FA. Knowledge, attitude, and perceived confidence in the management of medical emergencies in the dental office: A Survey among the Dental Students and Interns. J Int Soc Prev Community Dent 2017;7:364-9.
10. Leelavathi L, Reddy VC, Elizabeth CP, Priyadarshini I. Experience awareness and perceptions about medical emergencies among dental interns of Chennai city, India. J Ind Soc Pub H Dent 2016;14:440-44.
11. Somaraj V, Shenoy RP, Panchmal GS, Jodalli PS, Sonde L, Karkal R. Knowledge, attitude and anxiety pertaining to basic life support and medical emergencies among dental interns in Mangalore City, India. World J Emerg Med 2017;8:131-5.
12. Majage B, Kumararama SS, Mishra SK, Chowdhary R. Awareness among Indian Dental Graduate Students on Medical Emergency Drugs used in Dental Office: A pilot study. J Orofacial Res 2015;5:109-12.
13. Narayan DP, Biradar SV, Reddy MT, Sujatha BK. Assessment of knowledge and attitude about basic life support among dental interns and postgraduate students in Bangalore city, India. World J Emerg Med 2015;6:118-22.
14. Fennais A, Alayyar L, Aldhwaiby A, Alsarawi A, Alshammary D. Awareness of dental office medical emergencies among interns and last year dental students in Riyadh Colleges. Int J Current Adv Res 2017;6:1621-25.
15. Devishree RA, Mahesh R, Jain AR. Knowledge about basic life support in paediatric patients among Dental Students. J Pharma Sci Res 2018;10:278-81.
16. Stafluzza TC, Carrara CF, Oliveira FV, Santos CF, Oliveira TM. Evaluation of the dentist's knowledge on medical urgency and emergency. Brazilian Oral Res 2014;28:1-5.
17. Breuer G, Knipfer C, Huber T, Huettl S, Shams N, Knipfer K, et al. Competency in managing cardiac arrest: A scenario-based evaluation of dental students. Acta Odontol Scand 2016;74:241-9.
18. Fasoyiro O, Oyapero A, Onigbinde OO, Sorunke ME, Akinleye AI. Assessment of knowledge and self rated emergency preparedness amongst undergraduate dental students in Lagos state: A pilot study. Adv Hum Biol 2019;9:54-60.
19. Somaraj V, Vikraman KS, Meenakshi M, Preethy M, Nazrin M, Farhath M. Assessment of knowledge and attitude pertaining to basic life support and medical emergencies among final year undergraduate students and house surgeons in a dental college: A descriptive cross-sectional study. EC Emerg Med Critical Care 2018;28:31-.
20. Dhuha AS, Dalia HZ. Knowledge and attitudes of undergraduate dental students and interns in college of dentistry, Taibah University towards BLS and medical emergencies. Saudi J Oral Dent Res 2018;3:60-7.
21. Sopka S, Biermann H, Druener S, Skorning M, Knops A, Fitzner C, et al. Practical skills training influences knowledge and attitude of dental students towards emergency medical care. Eur J Dent Educ 2012;16:179-86.
22. Dental Practice Board of Victoria: Continuing Professional Development. Code of Practice Number C005; 2008.
23. Cooper S, Johnston E, Prisscott D. Immediate life support (ILS) training impact in a primary care setting? Resuscitation 2007;72:92-9.
24. Mutza VS, Cancado RP. Training study of undergraduate dentistry students in a public institution of Espirito Santo face to medical urgencies/emergencies. Rev Odonto Cien 2017;32:35-40.