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Medical emergency preparedness in Nepalese dentistry: an analysis of existing practices

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Abstract

Introduction: Medical emergencies in a dental clinic can be alarming to any clinician, but these situations become relatively less alarming with adequate precautions and necessary training. Effective management of emergencies reduce potential complications which requires a dental clinic set up with dentists and team member well prepared with training, essential medicine and equipment. The present study aimed to assess the status of preparedness of dental clinics of Nepal for medical emergencies.

Method: A descriptive cross-sectional study was conducted from 30 Apr 2023 to 29 Apr 2024 after ethical clearance. Dentists registered in Nepal Medical Council and Nepal Dental Association were selected using simple random sampling method. Dentists not actively practicing were excluded. An online google form of pre-tested structured close ended self-administered questionnaire was used for data collection. The descriptive statistics frequency and percentage was analysed using Statistical Package for Social Science version 29.

Result: In the study of 622 dentists, syncope 491(78.9%) and hypoglycaemia 357(57.5%) were the most common medical emergencies. Most of the medical emergencies occurred during extraction of tooth 402(64.7%) and local anaesthesia administration 363(58.4%). Only 235(37.8%) of the dental clinics have emergency medical kit in their clinics. Only half 329(52.9%) have Basic Life Support training and almost all 603(96.8%) agreed there should be training for dentist on medical emergency preparedness.

Conclusion: The preparedness of dental clinics for medical emergencies were sub-standard and inadequate. The clinics lacked the basic needed emergency kit whereas the dentists and team lacked in emergency management team and preparedness.

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Introduction

The preparedness for medical emergency includes; information regarding medical history, prior incidents; trained team; response plan and finally essential medications and equipment.[1-3] Syncope, anaphylaxis, hypoglycaemia, seizures, postural hypotension are the most common medical emergencies in dental clinics.[1,4-7] Patients with co-morbidities are at higher risk for medical emergencies during various dental procedures.[8-10] The prevalence of emergency events (excluding syncope) was 0.7 cases per dentist annually.[10] Most (90%) of complications were mild, but 8% were considered to be serious.[11] In USA (92%), Saudi Arabia (95%), UAE (74%), India (42.1%) of dentist have emergency training whereas in Nepal, 28% of dentist have training in the management of medical emergencies.[10,12-17] New Zealand (14.1%), UK(79.2%), India (53.33 %) and Nepal(>50%) felt inadequately prepared for an emergency in practice.[14,16,18,19] Emergency kits were available in India (24%) , Saudi Arabia (78%), UAE (74%) of clinics.[3,12,13] Despite Basic Life Support (BLS) training, dental graduates were found to feel incompetent to manage emergency events. Many studies reveal that dentists feel unprepared to manage emergencies effectively due to insufficient training and limited regular practice.[3,10-19]

In Nepal rules and regulation on compulsory medical emergency training and clinic equipped with emergency kit has been not implemented strictly as there are local, provincial and central government providing permission to run dental clinic and regular follow up are not properly done. This study aimed to evaluate the preparedness of dental clinics in Nepal for managing medical emergencies, focusing on the availability of emergency kits, medications, equipment, and the training of dentists.

Method

A descriptive cross-sectional study was designed and conducted from 30 Apr 2023 to 29 Apr 2024 among registered dentists both Specialist and general dental surgeons of Nepal. The Nepal Medical Council (NMC) and Nepal Dental Association (NDA) registered specialist or dentist working in a registered dental clinic were enrolled in the study. Dentists not actively practicing were excluded. The deregistered general dentist /Specialist were not included in the study. The election updated voter list for 15th executive committee election 2023-2025 was used with permission from the NDA executive was uses as a sampling frame. The simple random sampling technique was used for sample selection. $n= Z^2 \times p \times (1-p) / e^2$ where n is the sample size Z (2.576) is the z-score for the desired confidence level (99%) p is the estimated prevalence (37.1%) respondent experiencing one medical emergency[17] and margin of error 5%. This data is from an old study was used for sample size calculation due to paucity of study in our context. The sample size of the study was 622. The random number generator site https://www.randomizer.org/ was used to generate the random number to select the desired sample size of 622 with minimum number starting from 1 to maximum number 2171. The serial number in the final voter list corresponded to the sample selection and the random number generated was used to select the participant for the study.

The data collection tool used in the study was self -administered questionnaire. The tool was developed in English. The adequacy of content, relevance, clarity and sequence of the questionnaire was verified by a group of experts in the field Emergency Medicine, Anaesthesiology and Critical Care, Oral and Maxillofacial Surgery, Internal Medicine, General Practice and Emergency Medicine and trained expert in medical emergency care. The data collection tool was divided into two parts. Part I: 6 questions related to socio-demographic variables Gender, Age, Education level, Professional rank, and Specialist practitioner, Area of practice and Year of experience. The part II contained sub groups of questions in four sections A, B, C and D. The section A has 10 questions on self-assessed medical emergency preparedness. The section B has questions on immediate response to medical emergency. The section C has 7 questions on the assessment of self-reported knowledge about medical emergencies. The last section D has 7 questions on medical emergency.

The data collection tool was pre-tested in 10% of the sample and the content similarity index was found to be above 90%. The content similarity index was calculated using spider web chart from the response obtained from the 10% of the samples. The reliability of the tool was tested by Cronbach's Alpha which was found to be 93. Data were collected from 1 Jun 2023 to 30 Dec 2023 using an online Google form. First part of the form included consent and the second part contained pre-tested structured close ended self-administered questionnaire. The form was resent after one month to the non-responders. Contact number and email were obtained from the NDA data base with permission from the NDA central committee.

After data collection, data were re-checked for completeness and accuracy. The obtained data were arranged, entered and tabulated. Descriptive statistics such as frequency and proportion were calculated using SPSS version 29. Ethical clearance for this study was obtained from Nepal Health Research Council prior to start of study (Ref. No.3213).

Result

The total participants of the study were 622; Bagmati Province was with nearly half of the dental practitioner 294(47.3%) and Sudurpaschim Province with least 17(2.7%) of the total participants, Table 1.

Table 1. Sociodemographic characteristics of Nepalese dentist in online survey on preparedness for medical emergency, n=622

Variables	n(%)
Age	
<40 Years	574(92.3)
<40 Years	48(7.7)
Sex	
Male	252(40.6)
Female	370(59.8)
Qualification	
BDS	422(67.9)
MDS	200(32.1)
Position	
Specialist	121(19.5)
General Dentist	501(80.5)
Province	
Bagmati Province	294(47.3)
Gandaki Province	80(12.9)
Karnali Province	18(2.9)
Koshi Province	71(11.4)
Lumbini Province	74(12.0)
Madhesh Karnali Province	68(10.8)
Sudurpaschim Province	17(2.7)
Work Experience	
5-10Years	514(82.6)
15-20Years	108(17.4)

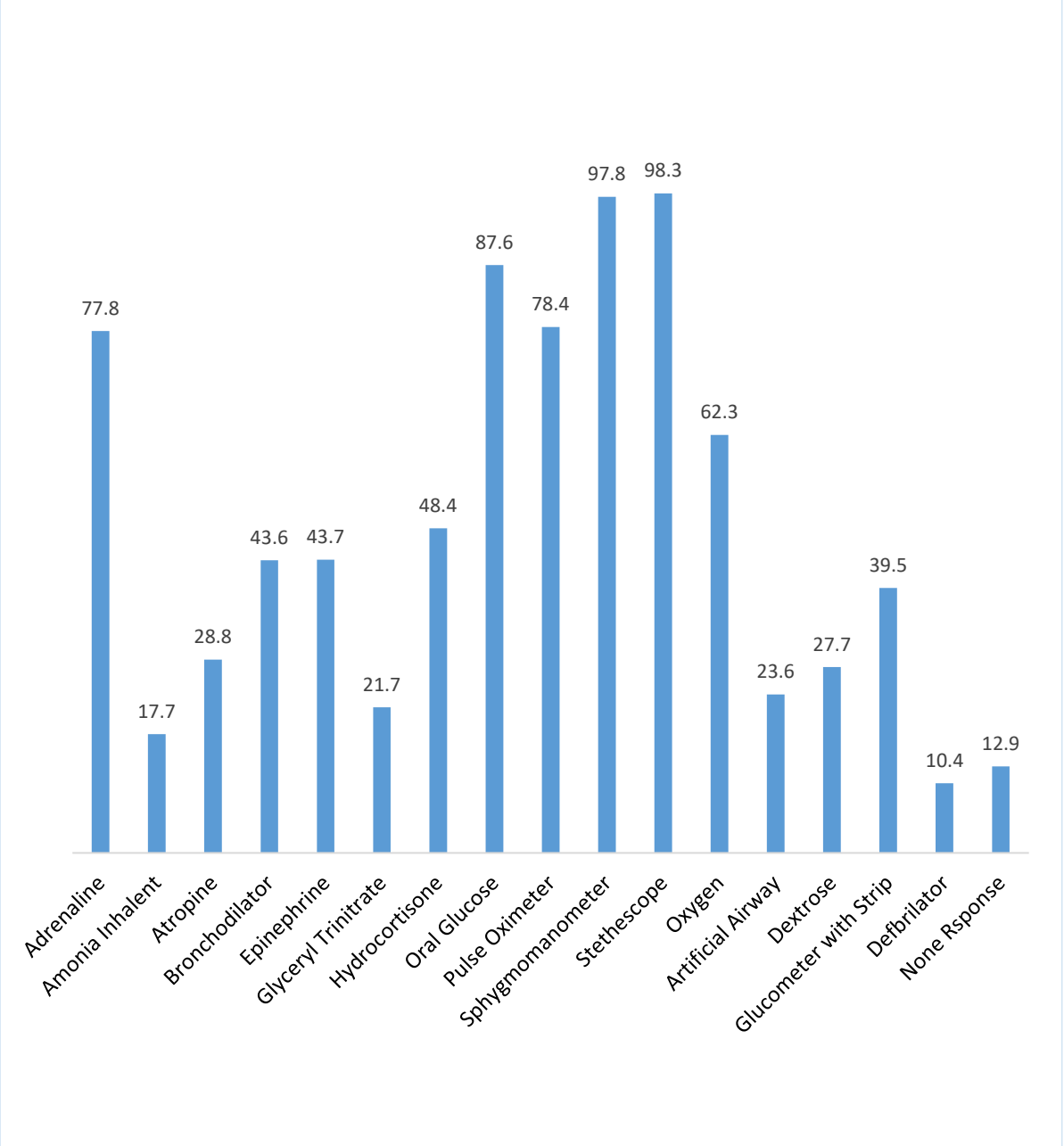

Figure 1. Emergency kit in dental clinics, findings of online survey on preparedness for medical emergency, n=622

Syncope 491(78.9%) and hypoglycaemia 357(57.5%) were most common medical emergency occurring during extraction of tooth 402(64.7%). Only half 329(52.9%) have Basic Life Support (BLS) training, Table 2. Oxygen was available in 387(62.3%) and adrenaline in 484(77.8%), Figure 1. Less than half 267(43%) can handle medical emergency. Half of the participants 373(46%) have not attended any workshop or training on emergency management. One third of the dental clinics 235(37.8%) has emergency kit at dental office. Almost one third 239(38.5%) can give intravenous injection, Table 3. Only 2.2% of respondents were right for dental procedure under antibiotic prophylaxis, Table 4 and 5.

Table 2. Dentist self-reported medical emergency in dental clinics, n=622

Variables	n(%)
1.Which of the ME situation you have encountered or observed during your dental treatment Procedure? (Multiple choice)	
a) Hypoglycaemia	357(57.4)
b) Hyperventilation	56(9.0)
c) Allergic reaction	115(18.5)
d) Anaphylaxis	55(8.8)
e) Syncope	491(78.9)
f) Seizures	142(22.8)
g) Myocardial infarction	15(2.4)
h) Angina	12(1.9)
i) Others	42(6.8)
2. When did the ME occurred in your dental clinic during your dental treatment procedure? (Multiple choice)	
a) During local anaesthesia administration	363(58.4)
b) During endodontic procedure	43(6.9)
c) During restorative procedure	14(2.3)
d) During minor surgical procedure	167(26.8)
e) During oral prophylaxis	24(3.8)
f) During extraction of tooth	402(64.6)
g) Others	46(7.4)
3. Do you think BLS is needed for dental practitioner?	
a) Yes	598(96.1)
b) No	4(0.6)
c) Don't know	1(0.2)
d) None response	19(3.1)
4. Do you have training on basic life support (BLS)?	
a) Yes	329(52.9)
b) No	269(43.3)
c) Don't know	7(1.1)
d) None response	17(2.7)
5. When do you have training on BLS?	
a) BLS during Bachelor education	226(36.3)
b) BLS during Master education	57(9.2)
c) BLS during practice	83(13.3)
d) No training on BLS	222(35.7)
e) None response	34(5.5)
6. Do you think there should be training on preparedness of medical emergency?	
a) Yes	603(96.9)
b) No	0
c) Don't know	1(0.2)
d) None response	18(2.9)
7. If yes, what type of training do you think will be on preparedness of medical emergency?	
a) Seminar	26(4.2)
b) Hands on	314(50.5)
c) Workshop	261(41.9)
d) Other	1(0.2)
e) None response	20(3.2)

Table 3. Self-assessed medical emergency preparedness of Nepalese dentist for medical emergencies during online survey, n=622

Self-assessed medical emergency preparedness, n(%)	Don't Know	No	Yes	None Response
1. Do you obtain filled health history proforma of the above from the patients?	20(3.2)	214(34.4)	388(62.4)	0
2. Do you think you can handle any emergency condition at your dental office?	178(28.6)	177(28.5)	267(42.9)	0
3. Do you obtain the vital signs (blood pressure, pulse, respiration, temperature) of patients before commencing any treatment?	8(1.3)	171(27.5)	443(71.2)	0
4. Do you enquire about medical history including medication and allergy?	5(0.8)	16(2.6)	601(96.6)	0
5. Have you attended any workshop on emergency training or management programs?	9(1.4)	286(46)	321(51.6)	6(1)
6. Can you give an intramuscular injection?	19(3.1)	80(12.9)	523(84.1)	0
7. Can you give an intravenous injection?	60(9.6)	323(51.9)	239(38.4)	0
8. Do you have availability of emergency kits at dental office?	37(5.9)	292(46.9)	293(47.1)	0
9. Availability of oxygen at your practice centre.	28(4.5)	384(61.7)	210(33.8)	0

Table 4. Self-reported knowledge about medical emergencies of Nepalese dentists preparedness for medical emergencies, n=622

Self-reported knowledge about preparedness for medical emergencies	n(%)
1. How do you plan for extraction of a tooth in patients with prosthetic heart valve?	
a) Advice antibiotic prophylaxis	100(16.1)
b) Ask the patient to stop blood thinners	8(1.3)
c) Advise the patient to take consent from the general physician	127(20.4)
d) All of the above	376(60.5)
e) None response	11(1.8)
2. Which of the following dental procedures can be performed in patients with prosthetic heart valve without giving antibiotic prophylaxis? (Multiple choice)	
a) Dental radiographs	5(0.8)
b) Placement of orthodontic brackets	5(0.8)
c) Placement of removable prosthesis and orthodontic appliances	14(2.3)
d) All of the above	532(85.5)
e) None response	199(32)
3. What is the abbreviation of BLS?	
a) Best life support	14(2.3)
b) Basic life support	587(94.4)
c) Basic lung support	4(0.6)
d) Basic life services	2(0.3)
e) None response	15(2.4)
4. What is the location of chest compression?	
a) Left side of the chest	75(12.1)
b) Right side of the chest	2(0.3)
c) Mid chest	270(43.4)
d) Xiphisternum	251(40.4)
e) None response	24(3.9)
5. Ratio of CPR, single rescuer in adult?	
a) 15:02	108(17.4)
b) 5:01	35(5.6)
c) 30:02	384(61.7)
d) 15:01	59(9.5)
e) None response	36(5.8)
6. If you do not want to give mouth to mouth CPR, the following can be done except	
a) Mouth mask ventilation and chest compression	106(17.0)
b) Chest compression only	73(11.7)
c) Bag mask ventilation with chest compression	259(41.6)
d) No CPR	152(24.4)
e) None response	32(5.1)
7. How do you give rescue breathing in infants?	
a) Mouth to mouth with nose pinched	349(56.1)
b) Mouth to mouth and nose	159(25.6)
c) Mouth to nose only	9(1.4)
d) Mouth to mouth without nose pinched	53(8.5)
e) None response	52(8.4)

Table 5. Dentist immediate action reported in online survey on preparedness for medical emergencies, n=622

Variables	n(%)
1. Patient suffered from syncope when you commenced a dental procedure. What would be your immediate action?	
a) Continue dental procedure	2(0.3)
b) Place patient in Trendelenburg position and give ammonia inhalant	594(95.5)
c) Make patient to sit in upright position	12(1.9)
d) Don't know	2(0.3)
e) None Response	12(1.9)
2. A patient is cited with airway obstruction during dental treatment due to aspiration of foreign Body what would you do? (Multiple choice)	
a) Attempt Heimlich/Triple manoeuvre	200(32.2)
b) Examine mouth and local area	86(13.8)
c) Ask patient to cough	68(10.9)
d) All of the above	373(60)
e) Don't know	7(1.1)
f) None Response	16(2.6)
3.If you confirm somebody is not responding to you even after shaking and shouting at him. What Will be your immediate action? (Multiple choice)	
a) Start CPR	313(50.3)
b) Activate EMS	239(38.4)
c) Put him in recovery position	132(21.2)
d) Observe	30(4.8)
e) Don't know	34(5.5)
f) None Response	30(4.8)
4. A patient suffered from anaphylactic reaction. What would be your immediate action? (Multiple choice)	
a) Start CPR	15(2.4)
b) Observe	33(5.3)
c) Put him in recovery position	40(6.4)
d) Administer Corticosteroid	77(12.4)
e) Administer adrenaline IM or IV	392(63)
f) Administer antihistaminic IV	167(26.8)
g) Administer Oxygen at high flow to maintain saturation	97(15.6)
h) Refer to higher centre	191(30.7)
i) None Response	16(2.6)

Discussion

The Nepal Medical Council (NMC) has added extra mandatory module of 10 credit points on "Medical emergencies in dental practice and practice management "in continuing professional development (CPD). It is because most of the dental practice setups are outside the hospital setting where medical emergency backup many not be available medical emergencies can occur in the dental clinic during dental treatment.

This study highlighted a significant gap in emergency preparedness among dental clinics in Nepal, with only 37.8% equipped with an emergency kit and just 43% of dentists confident in managing medical emergencies. The commonly occurring medical emergency in the present study were syncope and hypoglycaemia whereas allergic reactions,

Anaphylaxis and Myocardial infarction were least encountered but life threatening. Similar finding was noted in other studies.[16,17,21-27] These finding indicate that the pattern of occurrence is same as in other countries. The practicing dentist should be prepared to manage these conditions with well-equipped dental clinic for medical emergencies. However further knowledge needs to be enhanced by continued educational programs to ensure appropriate treatment. Reforms in dental curriculum and thorough training of dental Practitioners at an initial stage will help to increase their confidence and competence to deal with medical emergencies.

The study showed that majority of the dental clinics lacked emergency kit; more than half of the participants have attended workshop and training on emergency management and can handle emergency medical conditions. The findings are similar to studies conducted in other countries.[7-11,14,16,18,19] Studies have found emergency kits were available in less than 40% of the clinics and the nearly 61% of the dentists have training in emergency management.[6,21,25,] Emergency preparedness figures in this study fall below those observed in countries such as Saudi Arabia and the United Arab Emirates (UAE). The lower rates of emergency preparedness in Nepal compared to Saudi Arabia (78% of clinics with emergency kits and 95% of dentist with training) and UAE (74% with emergency kits and 74% with trainings) can be attributed to the absence of regulatory mandates requiring emergency preparedness training and equipment in Nepal.[12,13] The regulating bodies of the country should ensure the presence of emergency medical kit and adequate training and refresher training should be there for proper management.

Majority of the dentists felt they lack confidence in gaining intravenous access. The lack of intravenous injection skills (38.5%) among participants may stem from the limited exposure to such procedures during undergraduate education, where practical training often focuses on routine dental procedures rather than emergency management and iv access is not so routinely performed during undergraduate training. Similar results were found in the research conducted in other studies with regard to skill to apply injections.[6,26,27] This implies that dental students should be trained in iv assess technique during their undergraduate and post graduate training.

Large number of dentists lack confidence in emergency management or CPR performance which was found to be weak. This could be due to the fact that though medical emergency is included in the curriculum less emphasis and training are given to the dental graduates both by the teaching institute and regulatory bodies not mandating these trainings. The regulation on competency test in BLS is not mandatory in our country. The low rate of confidence even in those who have had training might be either due to the poor quality of training or the lack of frequent practice and refreshing courses.[6]

The present study showed that adrenaline and hydrocortisone were the most common available emergency at the dental clinics. The results are similar to other studies.[12,21,25,30] Less than half can handle medical emergency. Since attention to detail varies depending on the clinician attending to the patient and the volume of work each dentist encounters, a medical pro forma is desirable to ensure that vital aspects of patients' history, which could predispose them to medical emergencies, are not omitted. A detailed and precise medical record provides crucial information to help recognize patients at risk for medical emergencies, allowing modifications to be made to treatment planning or adequate arrangements for their referral to a specialist for review and management. A key limitation of this study is its reliance on self-reported data, which may have introduced reporting bias, as participants might overstate their preparedness. Future studies could employ observational methods to validate self-reported capabilities.

Conclusion

The preparedness of dental clinics for medical emergencies were sub-standard and inadequate. The study highlights critical gaps in emergency preparedness among dental clinics, with significant deficiencies in training,

equipment, and policy enforcement. Dental clinics lacked essential emergency kits, and dentists were inadequately trained in emergency management. Essential emergency medications, such as adrenaline, oxygen and hydrocortisone, were often unavailable in clinics, underscoring the need for better resource allocation. Stakeholders should mandate the availability of emergency kits and ensure periodic hands-on training for all dental practitioners.

Author contribution

Concept design: AKY, PKY, AT, VKM; Literature search: AKY, PKY, AT; Data collection: AKY, AT, VVM; Data analysis: AKY, PKY, AT, VVM; Draft manuscript: All; Final manuscript and accountability: All

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Conflict of interest

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Supplementary material

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

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Questionnaire/tools

Part I
Demographic data, please tick one option.

1. What is your Age group?
   a. <40 years
   b. >40

2. What is your Gender?
   a. Male

b. Female
c. Other

3. Which is the Highest Professional degree you hold?
   a. BDS or equivalent
   b. MDS or equivalent

4. What is your Professional rank at your working clinic?
   a. General Dental Practitioner
   b. Specialist Practitioner

5. Area of practice
   a. Koshi province
   b. Madhesh Province
   c. Bagmati Province
   d. Gandaki Province
   e. Lumbini Province
   f. Karnali Province
   g. Sudurpaschim Province

6. Years of expertise
   a. 5-10 years
   b. 15-20 years

Part II

A. Self-assessed medical emergency preparedness, please tick one option.

1. Do you enquire about medical history including medication and allergy?
   a. Yes
   b. No
   c. Don't know

2. Do you obtain filled health history proforma of the above from the patients?
   a. Yes
   b. No
   c. Don't know
3. Do you obtain the vital signs (blood pressure, pulse, respiration, temperature) of patients before commencing any treatment?
   a. Yes
   b. No
   c. Don't know

4. Have you attended any workshop on emergency training or management programs?
   a. Yes
   b. No
   c. Don't know

5. Do you think you can handle any emergency condition at your dental office?
   a. Yes
   b. No
   c. Don't know

6. Do you have availability of emergency kits at dental office?
   a. Yes
   b. No
   c. Don't know

7. Can you give an intramuscular injection?
   a. Yes
   b. No
   c. Don't know

8. Can you give an intravenous injection?
   a. Yes
   b. No
   c. Don't know

9. Availability of emergency drugs and equipment (Please tick all the drugs available at your practice center)
   a. Adrenaline
   b. Atropine
   c. Ammonia inhalant
   d. Bronchodilator spray (salbutamol)
   e. Epinephrine
   f. Glyceryl trinitrate
   g. Hydrocortisone
   h. Oral glucose
   i. Pulse oximeter
   j. Sphygmomanometer
   k. Stethoscope
   l. Oxygen
   m. Artificial airway
   n. Dextrose
   o. Glucometer with strip
   p. Defibrator
10. Availability of oxygen delivery system at your practice center.
    a. Yes
    b. No
    c. Don't know

A. **Immediate response to a medical emergency**

Please tick the options which you think is right.

1. Patient suffered from syncope when you commenced a dental procedure. What would be your immediate action?
   a. Continue dental procedure
   b. Place patient in Trendelenburg position and give ammonia inhalant
   c. Make patient to sit in upright position
   d. Make patient to stand
   e. Don't know

2. A patient is cited with airway obstruction during dental treatment due to aspiration of foreign body what would you do?
   a. Attempt Heimlich/Triple maneuver
   b. Examine mouth and local area
   c. Ask patient to cough
   d. All of the above
   e. Don't know

3. If you confirm somebody is not responding to you even after shaking and shouting at him. What will be your immediate action?
   a. Start CPR
   b. Activate EMS
   c. Put him in recovery position

d. Observe
e. Don't know

4. A patient suffered from anaphylactic reaction. What would be your immediate action?
   a. Start CPR
   b. Observe
   c. Put him in recovery position
   d. Administer Corticosteroid
   e. Administer adrenaline IM or IV
   f. Administer antihistaminics IV
   g. Administer Oxygen at high flow to maintain saturation
   h. Refer to higher center

B. Self-reported knowledge about medical emergencies, please tick one option.

1. How do you plan for extraction of a tooth in patients with prosthetic heart valve?
   a. Advice antibiotic prophylaxis
   b. Ask the patient to stop blood thinners
   c. Advise the patient to take consent from the general physician
   d. All of the above

2. Which of the following dental procedures can be performed in patients with prosthetic heart valve without giving antibiotic prophylaxis?
   a. Dental radiographs
   b. Placement of orthodontic brackets
   c. Placement of removable prosthesis and orthodontic appliances
   d. All of the above

3. What is the abbreviation of BLS?
   a. Best life support
   b. Basic life support
   c. Basic lung support
   d. Basic life services

4. What is the location of chest compression?
   a. Left side of the chest
   b. Right side of the chest
   c. Mid chest
   d. Xiphisternum

5. Ratio of CPR, single rescuer in adult?
   a. 15:02
   b. 5:01
   c. 30:02
   d. 15:01

6. If you do not want to give mouth to mouth CPR, the following can be done except
   a. Mouth-mask ventilation and chest compression
   b. Chest compression only
   c. Bag mask ventilation with chest compression
   d. No CPR

7. How do you give rescue breathing in infants?
   a. Mouth to mouth with nose pinched
   b. Mouth to mouth and nose
   c. Mouth to nose only
   d. Mouth to mouth without nose pinched

C. Self-reported medical emergency in dental clinics
Please tick the options which you think is right.

1. Which of the medical emergency situation you have encountered or observed during your dental treatment procedure? (Please write 1 for most common followed by 2 for next most common and follow ascending order for the frequency of occurrence in your dental clinic practice)
   a. Hypoglycemia (……..)
   b. Hyperventilation (……)
   c. Allergic reaction (…….)
   d. Anaphylaxis (……..)
   e. Syncope (…….)
   f. Seizures (……)
   g. Myocardial infarction (…….)
   h. Angina (……)
   i. Others please specify (……)

2. When did the medical emergency occurred in your dental clinic during your dental treatment procedure? (please tick more all the events when the medical emergency occurred)
   a. During local anesthesia administration
   b. During endodontic procedure
   c. During restorative procedure
   d. During minor surgical procedure
   e. During oral prophylaxis
   f. During extraction of tooth
   g. Others please specify (……)
3. Do you think BLS is needed for dental practitioner?
   a. Yes
   b. No
   c. Don't know

4. Do you have training on BLS?
   a. Yes
   b. No
   c. Don't know

5. When do you have training on BLS?
   a. BLS during Bachelor education
   b. BLS during Master education
   c. BLS during practice
   d. No training on BLS

6. Do you think there should be training for dentist on preparedness of medical emergency?
   a. Yes
   b. No
   c. Don't know

7. If yes, what type of training do you think will be there on preparedness of medical emergency?
   a. Seminar
   b. Hands on
   c. Workshop
   d. Other please specify…….