MANAGEMENT OF CARDIOVASCULAR MEDICAL EMERGENCIES: AN INSTITUTIONAL BASED ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE AMONG DENTAL STUDENTS

Utsav Singh Gurung,[1] Anjali Bhattarai,[1] Roshani Jwarchan,[1] Rashmi Shakya Gurung,[2] Anmol Bhandari[1]

[1]Department of Oral and Maxillofacial Surgery, [2]Department of Pharmacology, Nepal Medical College, Attarkhel, Gokarneshwor-8, Kathmandu, Nepal

ABSTRACT

Occurrence of cardiovascular accidents inside a dental office is not a surprising event given the stress many patients associate with dental care. Upon graduating from dental school as a dental practitioner, students must be prepared to deliver appropriate measures promptly for successful management of cardiac emergencies occurring in dental clinic. However, there are no documented studies on such preparedness in Nepal yet. Thus, an institutional based cross-sectional study was conducted from June-August 2025 among dental students in Kathmandu, Nepal to assess their level of knowledge, attitude and practice on management of cardiovascular medical emergencies plus it's variation based on age, gender and different academic levels of study. A pre-validated close-ended questionnaire consisting of 22 questions was used to assess the study parameters. Statistical analysis was conducted using the chi-square test and binomial regression. Regarding knowledge assessment, significant gaps were identified in several topics. Out of 138 participants, over half (53.6%) were still confused regarding the CPR (cardio-pulmonary resuscitation) procedure, only 21.7% knew the common cause of cardiac arrest in children and 25.4% understood the functional capacity assessment using metabolic equivalent tasks (METs). About half of the students (52.2%) favored cardio-cerebral resuscitation (CCR) over traditional CPR procedure, with 4th year students showing significantly more positive attitudes (66.7%) compared to interns (41.3%) (p=0.015). Age group and gender were not significant predictors of attitude towards CCR. Only, 44.2% of the students expressed willingness to perform mouth-to-mouth resuscitation on unconscious patients. The practice assessment revealed concerning gaps in emergency preparedness and experience. Only 5.8% of students had encountered cardiac emergencies in clinical settings and merely 11.6% had participated in mock emergency drills. A minority (14.5%) felt capable of managing code blue situations, with interns showing higher confidence (28.3%) compared to 4th year students (2.6%) (p=0.008). However, there was significant variation in continuing education participation, with 4th year students showing higher engagement (66.7%) compared to postgraduate students (29.4%) (p=0.028). Expertise in management of cardiovascular medical emergencies is essential for dental students who will eventually become dental health-care professionals. They have a critical need for clinical exposure and training in managing such situations.

KEYWORDS

Cardiovascular, dental, medical emergency

CORRESPONDING AUTHOR

Dr. Utsav Singh Gurung
Lecturer
Department of Oral and Maxillofacial Surgery,
Nepal Medical College Teaching Hospital,
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal
Email: utdextop23@gmail.com
Orcid No: https://orcid.org/0000-0001-9183-1501
DOI: https://doi.org/10.3126/nmcj.v27i4.88104

***Received on**: September 8, 2025*
***Accepted for publication**: November 10, 2025*

Cite this paper as: Gurung US, Bhattarai A, Jwarchan R, Gurung RS, Bhandari A. Management of cardiovascular medical emergencies: An institutional based assessment on level of knowledge, attitude and practice among dental students. *Nepal Med Coll J* 2025; 27: 283-91.

INTRODUCTION

A medical emergency is a sudden, unexpected situation involving illness or injury that poses an immediate threat to a person's life or health, requiring prompt medical attention.[1] It can happen in any environment, 5.8 times more probable in a dental setting than in a medical office.[2] Cardiovascular disease (CVD) is one of the most common medical conditions encountered in dental practice which can predispose to a medical emergency.[3] Patients with underlying ischemic heart disease, arrhythmias and valvular heart disease compose a significant portion of those presenting for dental treatment and many dentists consider their management to be challenging.[4,5] Treatment apprehension, insufficient pain control, lengthy procedures like multiple implant placement, invasive procedures and presence of epinephrine in local anesthetics are some of the factors which can precipitate a cardiovascular emergency.[6]

Upon graduating from dental school as a dental health professional, students must be able to deliver appropriate measures promptly for successful management of medical emergencies occurring in dental clinic. However, previous studies show that dentists all around the world still struggle to manage cardiovascular emergencies in dental clinics and about half of them are not able to perform procedures such as cardiopulmonary resuscitation (CPR) properly.[7-10]

Exploring the preparedness in managing cardiovascular emergencies could help to identify the gaps in clinical learning and train the students which would further improve the care and outcomes for the patient. However, there is no current literature on the preparedness of dental students in Nepal regarding management of cardiovascular medical emergencies. Thus, this study was carried out to assess the level of knowledge, attitude and practice (KAP) on management of cardiovascular medical emergencies (MEs) among dental students.

MATERIALS AND METHODS

A cross-sectional study was conducted at Nepal Medical College Teaching Hospital (NMCTH) in Kathmandu, Nepal from June 2025 to August 2025 after the prior approval from Institutional Review Committee of NMCTH (with the Ref. No.: 04-082/083). A pre-validated, self-administered, multiple-choice questionnaire (based on published literature and guidelines[11]) consisting of close-ended questions reflecting knowledge, attitude and practice regarding cardiovascular medical emergencies encountered during practice, the amount of medical emergency training undertaken by the participants, awareness of essential drugs and preparedness of the participants in handling of such situation occurring in dental office was circulated through Google form links along with the consent form via email and WhatsApp. The participants were informed about the questionnaire survey and their responses kept confidential. Prior permission had been taken from authors of the article from which the questionnaire was adapted and they are acknowledged. The inclusion criteria were dental students (Bachelor of Dental Surgery) from different academic levels of D4 (dental students in the fourth year), D5 (dental students in final year), I (interns) and P (postgraduate students) currently studying in NMCTH, while the exclusion criteria were students who refused to fill out the questionnaire. Based on convenience sampling method all students fulfilling the inclusion criteria were included in the study.

The questionnaire consisted of four sections: demographic data (three questions), knowledge-based (twelve questions), attitude-based (five questions) and practice-based (five questions). For knowledge items, the correct answer to each question was scored as 1 while responses of "do not know" or "no" didn't receive any points. For attitude questions, the participants were asked to indicate their level of agreement on a 5-point Likert scale ranging from strongly disagree to strongly agree. Agree/strongly agree was scored as 1 and neutral/disagree/strongly disagree was scored as 0. For practice-based questions, "Yes" answer was scored as 1 while "No" was scored as 0. For knowledge assessment, the minimum score was 0 and the maximum score was 12. Scores ≥9 were considered as good, 6-8 moderate and ≤5 as poor. For attitude assessment, if participant scored ≥3 it was considered a positive attitude, while <3 was considered a negative attitude. In the practice section, respondents scoring ≥3 were assumed to practice safely while those scoring <3 were assumed to have unsafe practice.

The collected data was compiled, processed and analyzed by SPSS-16. The categorical values were expressed through numbers and percentages. Dependent and independent variables were assessed through the Chi-square test. Binary logistic regression analysis was performed to identify predictors of positive attitude toward cardio-cerebral resuscitation

(A2). The dependent variable was dichotomized as positive attitude (agree/strongly agree = 1) versus negative attitude (neutral/disagree/ strongly disagree = 0). Independent variables included age group (categorized as 17-21 years, 22-26 years, and 27-31 years), academic qualification (BDS 4th year, BDS final year, Interns, and Postgraduates), and gender (male/ female). Reference categories were established as follows: 27-31 years for age group, Postgraduates for academic level, and Female for gender. Model fit was assessed using the -2 log likelihood and Chi-square test.

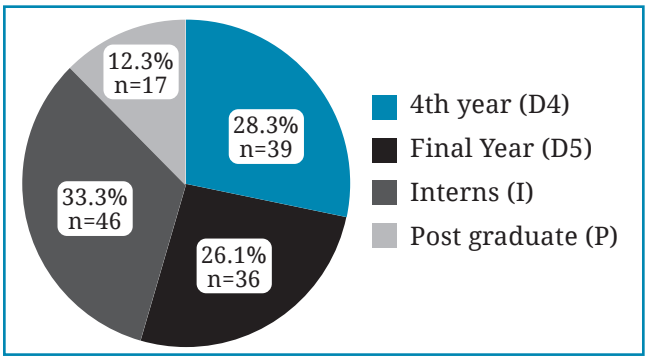

Fig. 1: Percentage distribution of dental students according to their academic level (n=138)

RESULTS

Out of 138 students who completed the questionnaire, most of them were female (84.0%) with mean age of 24 years (SD=1.8). The distribution of participants according to their academic level is shown in Fig. 1.

The assessment of level of knowledge revealed variable understanding of cardiovascular medical emergencies across different topics. Students demonstrated exceptional knowledge regarding chest pain etiology, with 92.8% correctly identifying angina as a cause of chest pain. Good knowledge was observed for identifying coronary heart disease as the leading cause of cardiac related deaths (73.2%), cardiac arrhythmia definition (65.9% correct responses), aspirin's mechanism in cardiac patients (65.9%) and initial diagnosis of congestive heart failure (65.2%). Moderate knowledge level was found for recognizing features of myocardial infarction (60.1%).

However, significant knowledge gaps were identified in several areas. Only 38.4% of students correctly identified the drug of choice in acute angina, and merely 39.1% correctly identified the typical onset timing of acute myocardial infarction. Over half of the students (53.6%) were still confused regarding the CPR procedure. The most concerning finding was that only 21.7% knew the common cause of cardiac arrest in children and 25.4% understood the functional capacity assessment using metabolic equivalent tasks (METs).

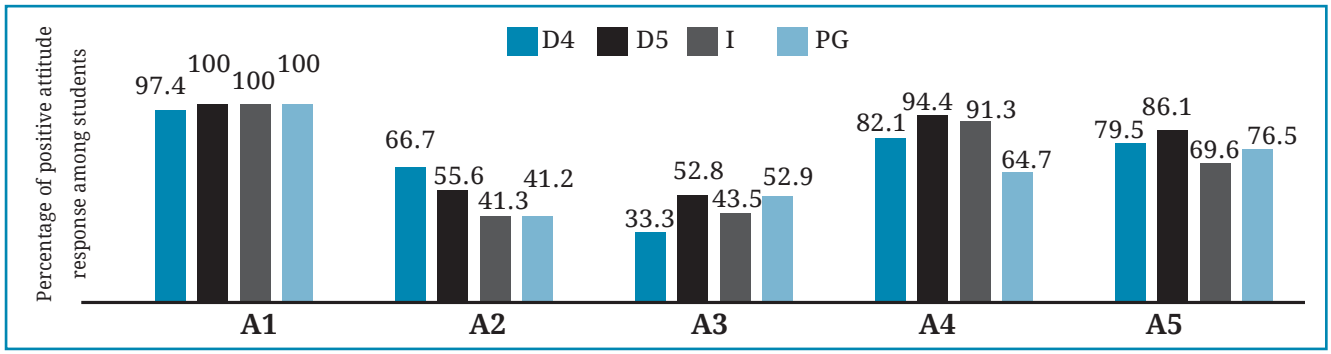

Fig. 2: Responses with positive attitude

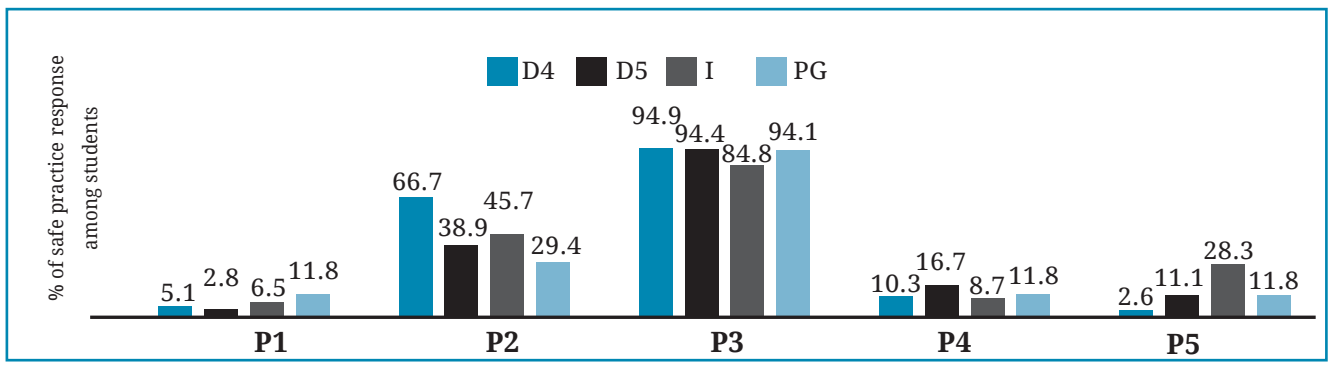

Fig. 3: Responses with safe practice

Table 1: Responses to Knowledge assessment questionnaire regarding Cardiovascular Medical Emergencies among Dental Students by Academic Level (N=138)

SN	Knowledge related questions	Correct answer	Overall percentage of correct response		Best response with correct answers compared to other groups			p- value
			n	%	Group	n	%	
K1	Chest pain occurs in (a) Heart failure (b) Angina (c) Atrial fibrillation (d) Silent myocardial ischemia	b	128	92.8	I	45	97.8	0.703
K2	Which of following conditions has caused the greatest number of deaths with respect to cardiac condition? (a) Coronary heart disease (b) Congenital heart disease (c) Rheumatic heart disease (d) Deep vein thrombosis	a	101	73.2	D5	30	83.3	0.024*
K3	Choice of drug in acute angina (a) Nitroglycerine (b) Aspirin (c) Beta-blocker (d) Calcium channel blocker	a	53	38.4	D4	21	53.8	0.008*
K4	Most common cause of cardiac arrest in children Shock (a) Electrolyte imbalance (b) Airway obstruction and hypoxia (c) Congenital heart disease	b	30	21.7	I	14	30.4	0.217
K5	Onset of acute MI develops maximum during (a) Rest (b) Exertion	a	54	39.1	P	9	52.9	0.054
K6	Ratio of chest compressions to rescue breathes in a two-person-CPR in adults is (a) 30:1 (b) 15:1 (c) 30:2 (d)15:2	c	64	46.4	D4	24	61.5	0.153
K7	Aspirin is prescribed to a cardiac patient because (a) It prevents platelets from adhering together (b) It interferes with clotting factors and slows down clot formation	a	91	65.9	D5	28	77.8	0.220
K8	Initial diagnosis of a patient with distended neck veins with swollen feet and ankles (a) Pulmonary embolism (b) Renal dysfunction (c) Rheumatic heart disease (d) Congestive heart failure	d	90	65.2	D5	25	69.4	0.033*
K9	Patient complains of tight and squeezing chest pain that radiates to neck and mandible. The diagnosis is (a) Ventricular tachycardia (b) Myocardial infarction (c) Angina pectoris (d) Congestive heart failure	b	83	60.1	I	31	67.3	0.615
K10	Cardiac arrhythmia is abnormality of cardiac impulse in relation to (a) rate (b) rhythm (c) both	c	91	65.9	D4	29	74.3	0.529
K11	Stress reduction protocol to ASA category 1and 2 patients include the following except (a) oral anxiolytic drugs (b) compulsory medical consultation (c) positive reinforcement (d) minimize waiting time	b	60	43.5	D4	21	53.8	0.014*
K12	Functional capacity of a person with less than 4 METS (Metabolic Equivalent of Task) is referred as good and can safely withstand stress related to dental treatment. (a) True (b) False (c) Don't know	b	35	25.4	D4	14	35.8	0.112

* Pearson chi-square test applied, p-value < 0.05 statistically significant | D4 - fourth year dental students, D5 - final year dental students, I - Interns, P - Post graduates

Table 2: Responses to Attitude assessment questionnaire regarding Cardiovascular Medical Emergencies among Dental Students by Academic Level (N=138)

SN	Attitude related questions	Agree/Strongly agree i.e. positive attitude		Neutral/Disagree/ strongly disagree i.e. negative attitude		Best academic group response to positive attitude compared to other groups			p-value
		n	%	n	%	Group	n	%	
A1	Dentists should be certified in basic life support (BLS) course.	134	97.4	4	2.5	D5 I P	36 46 17	100 100 100	0.356
A2	Give your opinion on the following statement: Cardio-cerebral resuscitation (CCR) is better than traditional Cardio-pulmonary Resuscitation (CPR).	72	52.2	66	47.8	D4	26	66.7	0.015*
A3	Will you be willing to perform a mouth-to-mouth breathing to a patient who has lost consciousness on the dental chair?	61	44.2	77	55.8	P	9	52.9	0.406
A4	Dental clinics should be equipped with automated external defibrillation.	119	86.2	19	13.8	D5	34	94.4	0.094
A5	Give your opinion on the following statement: dental management of cardiac patients is difficult compared to other patients.	107	77.5	31	22.5	D5	31	86.1	0.193

* Pearson chi-square test applied, p-value < 0.05 statistically significant

Statistical analysis revealed significant differences between academic groups for several knowledge items ($p<0.05$), including mortality due to coronary heart disease (K2, $p=0.024$), drug for acute angina (K3, $p=0.008$), congestive heart failure diagnosis (K8, $p=0.033$) and stress reduction protocols (K11, $p=0.014$) (Table 1).

The attitude assessment demonstrated generally positive perspective of students towards cardiac emergency preparedness. Almost all participants (n=134) agreed that dentists should be certified in basic life support. A strong majority (86.2%) supported equipping dental clinics with automated external defibrillators and 77.5% acknowledged that managing cardiac patients is more challenging than other patients.

However, attitudes were more divided regarding specific emergency procedures. Only 52.2% favored cardio-cerebral resuscitation over traditional CPR, with 4th year students showing significantly more positive attitudes (66.7%) compared to interns (41.3%) ($p=0.015$). Similarly, only 44.2% expressed willingness to perform mouth-to-mouth resuscitation on unconscious patients. (Table 2, Fig. 2)

The practice assessment revealed concerning gaps in emergency preparedness and experience. Only 5.8% of students had encountered cardiac emergencies in clinical settings and merely 11.6% had participated in mock emergency drills. A minority (14.5%) felt capable of managing code blue situations, with significant variation between academic levels - interns showed higher confidence (28.3%) compared to 4th year students (2.6%) ($p=0.008$). On the positive note, 126 students (91.3%) reported access to nearby emergency facilities and 66 (47.8%) had attended certified emergency training courses. However, there

Table 3: Responses to Practice assessment questionnaire regarding Cardiovascular Medical Emergencies among Dental Students by Academic Level (N=138)

SN	Practice related questions	Yes (overall) i.e. safe practice		No (overall) i.e. unsafe practice		Best academic group response to safe practice compared to other groups			P-value
		n	%	n	%	Group	n	%	
P1	Have you ever faced a cardiac emergency at the dental office (department)?	8	5.8	130	94.2	P	2	11.8	0.618
P2	Do you update your emergency clinical skills by attending certified courses or workshops like BLS?	66	47.8	72	52.2	D4	26	66.7	0.028*
P3	If a cardiac emergency occurs in the dental office (department), do you have access to nearby emergency facility?	126	91.3	12	8.7	D4	37	94.9	0.295
P4	Have you anytime performed a Mock drill of management with respect to cardiac emergency in the clinic/department?	16	11.6	122	88.4	D5	6	16.7	0.717
P5	Have you experienced a code blue situation or can manage it if such occurs?	20	14.5	118	85.5	I	13	28.3	0.008*

Table 4: Binary logistic regression analysis - Model fit and predictors of positive attitude towards cardio-cerebral resuscitation.

Variables	B (Unstandardized regression coefficient)	SE	p-value	95% CI for EXP (B)	
				Lower	Upper
Age group (Ref 27-31 years)					
17-21 years	0.251	17108.84	1.286	0.000	
22-26 years	0.240	1.270	1.272	0.106	15.331
Academic level (Ref PG)					
BDS 4th year	-1.297	1.137	0.273	0.029	2.541
BDS final year	-19.80	6565.521	0.000	0.000	
BDS Interns	-19.78	6851.367	0.000	0.000	
Gender (Ref Female)					
Male	-0.121	0.951	0.886	0.137	5.717
Constant	-1.537	1.183	0.194		

Model fit stat: -2 log likelihood: 53.044, Model chi-square: 18.707 (p value = 0.005, df = 6)

was significant variation in continuing education participation, with 4th year students showing higher engagement (66.7%) compared to postgraduate students (29.4%) (p=0.028) (Fig. 3, Table 3).

Binary logistic regression analysis revealed that demographic variables collectively predicted positive attitude toward cardio-cerebral resuscitation ($\chi^2 = 18.707$, df = 6, p = 0.005) (Table 4). Regarding academic qualification, BDS 4th year students and Interns showed significantly different odds of positive attitude compared to postgraduates ($p < 0.001$ for both). However, the extremely wide confidence intervals and odds

ratio (OR) values close to zero suggest model instability, likely due to small sample sizes in some categories or quasi-complete separation. Age group and gender were not significant predictors of attitude toward CCR.

DISCUSSION

In spite of the most meticulous protocols designed to prevent the development of life-threatening situations, medical emergencies will still occur even so more in dental clinics. Cases have been reported of fatal incidents on dental chair following medical emergencies and the reason being lack of knowledge and inadequate training of practitioners in managing such situations.[12,13] Inadequate knowledge about management strategies could lead to delay in treatment and legal complications as well.[14] Fortunately, there are some measures to minimize the development of these situations. These include- detailed medical history questionnaire, physical examination with evaluation of patient and possible modifications in dental care to minimize medical risks.[2]

The European-based study reveals that "sudden cardiac arrest" affects around 350,000 to 700,000 individuals annually. The global mortality rate associated with CVD is around 17.3 million deaths per year.[15,16] In context of Nepal, there is an ever-increasing burden of CVD with more than a million cases and over 45,000 deaths annually.[17] Invasive dental procedures can be complicated by infective endocarditis (IE) in high-risk patients and excessive bleeding in patients using anticoagulant treatment.[18] Additionally, the presence of epinephrine in local anesthetics may contribute to deleterious hemodynamic changes in susceptible patients.[4]

In the present study, level of knowledge assessment among dental students revealed variable understanding of cardiovascular medical emergencies across different topics. Majority of students responded poorly to questions related to choice of drug in acute angina (38.4%), common cause of cardiac arrest in children (21.7%), the onset of acute MI (39.1%), stress reduction protocol (43.5%) and metabolic equivalent task (MET) (25.4%). Similar findings were reported in numerous studies that acknowledged having little awareness of emergency situations, relevant medications, and equipment.[8,11,12] Aspirin is a common antiplatelet drug used in cardiac patients and invasive dental procedures should be performed with caution due to possible risk of excessive bleeding.[19] This is a basic information that every dental student should know. However, 34.1% of respondents still did not have knowledge on it`s implication in cardiac patients. Stress is a common concern related to dental procedures among patients which can precipitate a cardiac emergency.[20] For ASA 1 patients (healthy individuals) and ASA 2 patients (individuals with mild and well controlled systemic disease) in dentistry, a stress reduction protocol primarily focuses on minimizing anxiety and ensuring a comfortable experience during dental procedures which includes strategies like scheduling appointments in the morning, using pain management techniques, and providing clear communication about the procedure. Patients under these categories generally don't require extensive medical interventions. For ASA 3 and 4 patients, conducting a thorough medical consultation and careful planning is necessary along with general stress reduction strategies.[21,22] In the present study more than half (56.5%) of students had poor knowledge on stress management among patients classified according to ASA categories.

In dentistry, Metabolic Equivalent of Task (MET) is a valuable tool for assessing a patient's functional capacity, physical fitness, ability to tolerate dental procedures and possible risks involved especially for patients with cardiovascular or respiratory issues Patient should be able to perform daily tasks equal to at least four METs to be at a low risk for adverse cardiovascular events.[23] However, in the present study only 25.4% students understood the functional capacity assessment using MET which is quiet concerning. This is similar to the finding of a study conducted in a dental institute of Saudi Arabia where students showed poor knowledge for the questions on MET (21%).[11] Overall, low to moderate knowledge scores among students could be due to minimal clinical exposures to the management of cardiovascular patients, less training & not attending regular updated workshops.[24]

In the present study almost all the students showed a positive attitude towards dentists being certified in BLS course. This is similar to studies which have shown an overwhelming desire to learn, experience and use the BLS procedure among dental students.[3,25,26] While some countries have made it mandatory in the curriculum for all health university graduates to complete the BLS course before entering the clinics,[27] Nepal is lacking in this regard. Only 44.2% (n=61) in the present study were willing to perform a mouth-to-mouth breathing, which is similar to findings of some studies. [11,25] This

can be attributed to respondents' concern about contracting airborne and other disease transmission. Almost half of the students (47.8%) lacked the concept of Cardio cerebral resuscitation (CCR). This might be due to inadequate training, lack of keeping periodic update to new guidelines or little exposure to CCR.[28] In contrast to CPR, cardio cerebral resuscitation eliminates mouth-to-mouth ventilation and avoids interrupting chest compressions. Because CCR results in improved survival and cerebral function in patients with witnessed cardiac arrest with a shockable rhythm, recent protocol suggests replacing CPR with CCR for out-of-hospital cardiac arrest and CPR to be reserved for respiratory arrest such as choking or drowning, where assisted ventilations may be appropriate.[29] Furthermore, CCR is more acceptable for those who are unwilling to perform rescue breathes.

In the present study, 86.2% (n=119) agreed that dental clinics should be equipped with automated external defibrillation (AED). CPR in combination with early shock of a defibrillator is known to improve the outcomes of survival rate by up to 75%.[30] Students can familiarize with the device and use it effectively by attending periodic hands-on courses. About 77.5% (n=107) of respondents felt difficulty in managing cardiac-based patients which is higher than in other studies.[11,24] Fear of cardiac emergency, risk of excessive bleeding, need of physician consultation before invasive procedures, need to carefully modify the treatment plan and lack of nearby emergency facility could be some of the reasons behind such finding. Studies have shown that frequent clinical postings in emergency and cardiology units of hospitals could provide students with exposure to the stress, assessment and management associated with cardiac emergencies.[31]

Practice assessment revealed concerning gaps in emergency preparedness and experience among dental students. 85.5% (n=118) had not experienced and were not confident in handling code blue situations, 88.4% (n=122) students had not undergone mock drill management for a cardiac emergency, while only 47.8% (n=66) updated their emergency clinical skills by attending certified courses or workshops like BLS (Basic Life Support). Dental schools generally need to improve their preparedness in managing medical emergencies. While dental students often receive some training in BLS, many feel incompetent to handle medical emergencies in a clinical setting. This gap in preparedness and competency can be attributed to lack of practical training, insufficient emergency drills, and inadequate access to necessary medications and equipment. Without practice, theoretical knowledge and demonstrations are insufficient to establish competency in managing medical crises.[32] Numerous authors have emphasized the importance of receiving refresher training courses, particularly for those who don't regularly perform cardiac resuscitations.[3,27,33]. This study was restricted to a single dental college and convenience sampling was used. There was no comparison between those who had completed BLS training and those who had not. Apart from these limitations, it provides insight, especially for the need of extensive cardiac training in the area specific to MET score, CCR, updating emergency skills and conducting management mock drills for dental students.

The study showed overall moderate level of knowledge and positive attitude of dental students regarding cardiovascular medical emergency. However, there was a significant lack of safe practice which indicates that students require more clinical exposure and training. Moreover, assessment studies like this should be conducted periodically in all dental schools so that concerned stakeholders can in general work upon the gaps and need of the students for skill development in the field of cardiovascular emergency management which would ultimately improve the care and outcomes of the patient.

ACKNOWLEDGMENT

We would like to acknowledge Gopinathan *et al* for granting us the permission to use their pre-validated questionnaire for the study.

Conflict of interest: None

Source of research fund: None

REFERENCES

1. Suter RE. Emergency medicine in the United States: a systemic review. *World J Emerg Med* 2012; 3: 5-10.
2. Malamed SF. Medical Emergencies in the Dental Office. 6th ed. St. Louis: Mosby 2007.
3. Sopka S, Biermann H, Druener S *et al*. Practical skills training influences knowledge and attitude of dental students towards emergency medical care. *Eur J Dent Educ* 2012; 16: 179–86.
4. Jowett NI and Cabot LB. Patients with cardiac disease: considerations for the dental practitioner. *Br Dent J* 2000; 189: 297-302.
5. Lim E, Ali Z, Ali A *et al*. Comparison of survival

by allocation to medical therapy, surgery, or heart transplantation for ischemic advanced heart failure. *J Heart Lung Transplant* 2005; 24: 983-9.

6. Niaz AT. The nature and frequency of medical emergencies in dental offices of Karachi, Pakistan. *Pak J Med Dent* 2020; 9: 104–11.
7. Gupta K, Kumar S, Kukkamalla M *et al*. Dental Management Considerations for Patients with Cardiovascular Disease-Narrative Review. *Rev Cardiovasc Med* 2022; 23: 261-4.
8. Johani K, Jamal B, Mona Hassan *et al*. Knowledge and attitude of dental students towards medical emergencies at King Abdulaziz university, Jeddah, Saudi Arabia. *Ann Dent Spec* 2021; 9: 73-6. DOI: 10.51847/yRxgh18NN1
9. Chapman PJ. Medical emergencies in dental practice and choice of emergency drugs and equipment: A survey of Australian dentists. *Aust Dent J* 1997; 42: 103-8.
10. Gonzaga HF, Buso L, Jorge MA *et al*. Evaluation of knowledge and experience of dentists of São Paulo state, Brazil about cardiopulmonary resuscitation. *Braz Dent J* 2003; 14: 220-2.
11. Gopinathan PA, Alammari F, Alsulaim SA *et al*. Assessment of knowledge, attitude, and practices of cardiovascular medical emergencies among dental students: an institutional-based cross-sectional study. *Cureus J Med Sci* 2023; 15: 48-53.
12. Leelavathi L, Reddy V, Elizabeth C. Experience, awareness, and perceptions about medical emergencies among dental interns of Chennai city, India. *J Indian Assoc Public Health Dent* 2016; 14: 440-4.
13. Ahamed A and Kumar MS. Knowledge, attitude and perceived confidence in handling medical emergencies among dental students. *J Pharm Sci Res* 2016; 8: 645-9.
14. Hasan AM and Qahtani AL. Preparedness of dental clinics for medical emergencies in Riyadh, Saudi Arabia. *Saudi Dent J* 2019; 31: 115–21.
15. Jodalli PS and Ankola AV. Evaluation of knowledge, experience and perceptions about medical emergencies amongst dental graduates (Interns) of Belgaum City, India. *J Clin Exp Dent* 2012; 4: 1–8.
16. Singh S, Gupta K, Garg KN *et al*. Dental management of the cardiovascular compromised patient: a clinical approach. *J Young Pharm* 2017; 9: 453-6.
17. Pandey A, Dhimal M, Shrestha N *et al*. Burden of cardiovascular diseases in Nepal from 1990 to 2019: The global burden of disease study, 2019. *Glob Health Epidemiol Genom* 2023; 11: 232-6.
18. Hong C, Napenas JJ, Brennan M *et al*. Risk of postoperative bleeding after dental procedures in patients on warfarin: a retrospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2012; 114: 464-8. DOI: 10.1016/j.oooo.2012.04.017
19. Napenas JJ, Hong CH, Brennan MT *et al*. The frequency of bleeding complications after invasive dental treatment in patients receiving single and dual antiplatelet therapy. *J Am Dent Assoc* 2009; 140: 690-5.
20. Appukuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. *Clin Cosmet Investig Dent* 2016; 8: 35-50.
21. Malamed SF. Physical and Psychological Evaluation. In: Sedation. 5th ed. California: Elsevier; 2010. p. 23-62.
22. Johnson S, Chapman K, Huebner G. Stress reduction prior to oral surgery. *Anesth Prog* 1984; 31: 165–9.
23. Fleisher LA, Fleischmann KE, Auerbach AD. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/ American Heart Association on Practice Guidelines. *Ciculation* 2014; 130: e278-333.
24. Mohaissen MA, Mehisen R, Lee T. Managing cardiac patients: dentists' knowledge, perceptions and practices. *Int Dent J* 2022; 72: 296–307.
25. Mani G, Annadurai K, Danasekaran R, Ramasamy JD. A cross-sectional study to assess knowledge and attitudes related to Basic Life Support among undergraduate medical students in Tamil Nadu, India. *Prog Health Sci* 2014; 1: 47-52. DOI: 10.52711/0974-360X.2021.00518
26. Priya I, Munir A, Talpur N, Punjabi SK. Medical emergencies; assessment and attitudes in the dental settings of city Hyderabad. *Prof Med J (TPMJ)* 2017; 24: 665-9.
27. Awawdeh M, Alanzi AM, Alhasoun M *et al*. A cross-sectional study investigating the knowledge and attitude of health professions students in Saudi Arabia: are they ready for cardiopulmonary resuscitation? *Cureus* 2023; 15: e43048. DOI: 10.7759/cureus.43048
28. Abebe TA, Zeleke LB, Assega MA, Sefefe WM, Gebremedhn EG. Health-care providers' knowledge, attitudes and practices regarding adult cardiopulmonary resuscitation at Debre Markos Referral Hospital, Gojjam, Northwest Ethiopia. *Adv Med Educ Pract* 2021; 12: 647-54.
29. Ewy G. A new approach for out-of-hospital CPR: a bold step forward. *Resuscitation* 2003; 58: 271-2.
30. Rishipathak P, Vijayaraghavan S, Hinduja A. To assess knowledge, attitude and practice on the use of automated external defibrillation (AED) by emergency medical services (EMS) providers in Pune, India. *Indian J Med Forensic Med Toxicol* 2020; 14: 9297-301.
31. Carvalho RM, Costa LR, Marcelo VC. Brazilian dental students' perceptions about medical emergencies: a qualitative exploratory study. *J Dent Educ* 2008; 72: 1343-9.
32. Mukherji A, Singh MP, Nahar P *et al*. Competence of handling medical emergencies among dental graduates and post-graduate students - a cross-sectional questionnaire study. *J Indian Acad Oral Med Radiol* 2019; 31: 107-16.
33. Jadidi HA and Jufaili MA. Effectiveness of a short refresher course on the retention of cardiopulmonary resuscitation-related psychomotor skills (REF-CPR). *Oman Med J* 2023; 38: e509.