

## Basic Life Support Knowledge and Skills Among Students and Faculty Members at the College of Dentistry, Umm Al-Qura University, Makkah, Saudi Arabia

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### Abstract

**Objectives:** Assess the level of BLS knowledge and CPR skills among dental students and faculty members at the College of Dentistry, Umm Al-Qura University, Makkah, Saudi Arabia.

**Methods:** A cross-sectional study was conducted using a self-administered questionnaire consisting of 30 closed-ended questions on demographic data, knowledge, attitude, practice, and training status in BLS. CPR skills were evaluated using a training mannequin and software that provided real-time and summative feedback consistent with the American Heart Association (AHA) guidelines.

**Results:** Sample size was 286, of which 210 subjects participated with a response rate of 73.4%. Of the respondents, 52% were males, and 48% were females. A significant number of faculty members knew about CPR and BLS, while the level of awareness among students was significantly lower. As regards to CPR skills low scores were recorded among trained faculty members and students.

**Conclusions:** Faculty members and students at the College of Dentistry, Umm Al-Qura University had average knowledge and positive attitude about BLS and CPR. Despite previous training, skill levels among both students and faculty were poor. Therefore, repeated training courses are recommended to improve BLS knowledge, attitude, and skills to respond appropriately and manage emergencies.

**Keywords:** Basic Life Support; Cardiopulmonary Resuscitation; Dental; Knowledge; Skills

### Abbreviations

AHA: American Heart Association; BLS: Basic Life Support; CPR: Cardiopulmonary Resuscitation; AED: Automated External Defibrillator; BLS-HCP: Basic Life Support Healthcare Provider; SPSS: Statistical Package for Social Sciences

### Introduction

Saudi Ministry of Health statistics reported that 31,116 Saudis died at emergency departments in 2012. Most of those deaths were attributed to ill-defined symptoms that later presented as circulatory system diseases, including ischemic heart attacks [1].

Basic life support (BLS) is the care that healthcare professionals provide to patients who are undergoing cardiac arrest, respiratory arrest, or airway obstruction [2]. It's an essential part of emergency resuscitative care intended to maintain adequate ventilation and circulation until the cause is recognized and eliminated [3]. BLS includes several techniques like cardiopulmonary resuscitation (CPR), Defibrillation and first aid treatments to sustain a patient's life [4].

CPR was invented in 1960 as a simple, effective procedure that increases the possibility of patient survival in the critical minutes following cardiac or respiratory arrest [4]. Numerous studies have recommended that all healthcare professionals involved in patient interaction receive compulsory CPR training and the resuscitation equipment should always be available [5].

The appropriate practice of BLS and CPR techniques with sufficient knowledge and training is required to resuscitate a victim [5]. In Saudi Arabia, CPR training and the automated external defibrillator (AED) are in widespread use in all healthcare system sectors and the Saudi Commission for Health Specialties requires healthcare providers to update their certification for licensure [6].

Several articles on dental emergencies suggest that dentists should be certified in BLS and can provide appropriate life support for emergencies in the dental office. BLS Healthcare Provider (BLS-HCP) courses are an effective means of practicing essential skills to manage emergencies in dental offices. BLS certifications and advanced cardiac life support training have led to significant improvement in resuscitation outcomes [7].

To our knowledge, no previous study in Saudi Arabia correlates the knowledge and practice of study participants to their BLS training. Further, there are no previous studies that evaluate BLS skills in dental students or faculty members.

The objective of this study was to assess the level of BLS knowledge among students and faculty members at College of Dentistry at Umm Al-Qura University and to assess the skills of CPR in BLS-trained study participants.

## **Materials and Methods**

### **Study design**

Between September 2019 and March 2020, a descriptive cross-sectional study was conducted at the College of Dentistry, Umm Al-Qura University, Makkah, Saudi Arabia.

### **Ethical considerations**

Before the study (No. 134-19) began, ethical approval was obtained from the Institutional Review Board, College of Dentistry, Umm Al-Qura University. Verbal explanation of the study was given to the participants before the survey. Participation was voluntary, answering the questionnaire was considered as an acceptance. Serial study codes and initials identified participants who answered the questionnaire.

### **Study population**

Study participants were recruited from the College of Dentistry, Umm Al-Qura University. They included students in clinical training years (4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup>-year), together with faculty members (n = 286). Non-clinical dental students and faculty members who declined to participate in the study were excluded.

### **Study questionnaire**

Self-administered questionnaire consisted of 30 closed-ended questions in four sections. The first section focused on demographic data (gender, student grade, and faculty members' years of experience). The second section included 12 questions about the participant's

knowledge of basic life support (BLS) [4]. The third section, seven questions focused on the attitudes toward BLS. Finally, the fourth section focused on the status of BLS training the participant may have completed [8].

### **Validity and reliability of the questionnaire**

A pilot study to test the precision of survey questions was conducted with 10 participants; based on their responses, three questions were modified. A second pilot study was conducted with another 10 participants to confirm the feasibility, validity, and reliability of the questionnaire. The level of agreement was 65% (substantial, Kappa = 0.65).

### **Study procedure**

The study was conducted in two phases. In the first phase, participants were asked to complete the questionnaire. Based on the survey results, the participants divided into two groups based on their BLS training. Group 1 included participants without BLS training. Group 2 included participants with BLS training.

In the second phase, Group 2 participants were asked to perform two cycles of single-rescuer adult CPR on a training mannequin (Laerdal, Little Anne QCPR) under observation by the researchers. The mannequin connected to a software application (Laerdal, QCPR Instructor app) that provided real-time and summative feedback on compression rate, compression depth, full release, ventilation volume, and CPR protocols consistent with the American Heart Association (AHA) guidelines. For each CPR provider, a score and one hint for improvement were shown and saved on the device for future debriefings and performance tracking.

### **Statistical analysis**

Data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 24 for Macintosh OS (<https://www.ibm.com/support/pages/downloading-ibm-spss-statistics-24>). Two persons performed data entry; after verification, data was transferred to the statistical database. Incorrect answers were given a score of 0, while a correct answer assigned a score of 1. Knowledge and attitude were evaluated as follows: a score of less than 40% was low, 40 - 70% was average, and 70 - 100% was high [9]. Descriptive statistics were used to describe the data, and the frequency and percentage of categorical variables were determined. A Chi-square test was used to facilitate comparisons between groups. The level of significance was set at  $p < 0.05$ .

## **Results**

### **Knowledge and attitude about BLS**

A total of 210 participants, including students and faculty members, completed the questionnaire. The sample included 110 males (52%), 100 females (48%). The response rate was 73.4%. The data was analyzed based on occupation and academic level. Thirty-eight (18%) of the study participants were faculty members, while 172 (82%) were dental students. Of the dental students, 56 were 4<sup>th</sup>-year, 43 were 5<sup>th</sup>-year, and 73 were 6<sup>th</sup>-year.

The overall level of BLS knowledge and attitude was 56% among faculty members and 43% among all dental students. As shown in table 1, results were evaluated using the mean of correct answers [9]. Most of study participants were familiar with the abbreviations of CPR and BLS (90% and 92% of faculty members, and 88% and 95% of students respectively). In contrast, 5% of the faculty participants and 17% of students knew the depth of chest compression in adults. Only 16% of students knew the first response to a suspected foreign body obstruction in an adult. Further, 20% of students knew the rate of chest compression and 18% were familiar with the abbreviation AED (Table 1).

**Table 1:** Comparison of knowledge and attitude about BLS among faculty and students, and among students in different grades.

Questions	Correct Answers		X <sup>2</sup> (p-value)	Correct Answers			X <sup>2</sup> (p-value)
	Faculty	Students of All Grades		Students' grade			
				4 <sup>th</sup> Grade	5 <sup>th</sup> Grade	6 <sup>th</sup> Grade	
Emergency dial number	58%	48%	1.30 (0.25)	48%	54%	44%	1.02 (0.60)
Abbreviation BLS	92%	95%	0.4 (0.52)	91%	93%	99%	4.00 (0.13)
Abbreviation CPR	90%	88%	0.03 (0.84)	91%	91%	85%	1.46 (0.48)
Location of chest compression in adults	47%	50%	0.08 (0.76)	48%	56%	48%	0.77 (0.67)
Rate of chest compression	50%	20%	14.3 (0.00)**	21%	23%	18%	0.55 (0.75)
Chest compression ventilation ratio	61%	34%	8.99 (0.00)**	34%	42%	30%	1.65 (0.43)
Depth of chest compression in adults	5%	17%	3.57 (0.05)*	16%	21%	16%	0.48 (0.78)
Depth of chest compression in children	53%	37%	3.3 (0.06)	41%	28%	38%	1.97 (0.37)
Awareness of CPR without mouth-to-mouth breathing	42%	44%	0.05 (0.81)	30%	47%	53%	6.96 (0.03)*
First response in unresponsive person	58%	40%	4.00 (0.04)*	14%	58%	49%	23.9 (0.00)**
Abbreviation AED	58%	18%	26.2 (0.00)**	21%	14%	18%	0.92 (0.63)
Abbreviation EMS	76%	70%	0.54 (0.46)	75%	81%	60%	6.64 (0.03)*
Activating EMS	45%	33%	1.83 (0.17)	41%	33%	27%	2.68 (0.26)
First response in suspected foreign body obstruction in an adult	32%	16%	4.72 (0.03)*	14%	21%	15%	0.92 (0.63)
The need for recovery position	34%	23%	2.22 (0.13)	27%	28%	16%	2.83 (0.24)
Recognition of stroke and appropriate immediate action	68%	40%	10.0 (0.00)**	46%	40%	36%	1.55 (0.46)
Recognition of acute coronary syndrome and appropriate immediate action	82%	58%	7.28 (0.00)**	55%	65%	56%	1.15 (0.56)
Total Mean	56%	43%		42%	47%	42%	

\*\*highly significant  $\leq 0.00$ , \*significant at p level  $\leq 0.05$ ,  $\chi^2$ =Chi-square.

The faculty knowledge of BLS was higher than the students. The difference was highly significant for the rate of chest compression, chest compression ventilation ratio, AED abbreviation, recognition of stroke and appropriate action, and identification of acute coronary syndrome and proper response (P = 0.00). While students scored higher than faculty members in their understanding of the depth of chest compression in adults (P = 0.05).

The mean percentage of total correct answers in 5<sup>th</sup>-year students (47%) was higher than both the 4<sup>th</sup>-year and 6<sup>th</sup>-year students (42%). For the question about the first response in case of unresponsive victim, 5<sup>th</sup>-year students scored the highest (58%) compared to 4<sup>th</sup>-year (14%) and 6<sup>th</sup>-year students (49%), the difference being highly significant (P = 0.00). For awareness of CPR without mouth-to-mouth breathing, 6<sup>th</sup>-year students scored higher (53%) than 4<sup>th</sup>-year (30%) and 5<sup>th</sup>-year students (47%). The difference was significant (P = 0.03) (Table 1).

**Previous BLS training**

As noticed in table 2 and figure 1, of 210 participants, 59% had previous BLS training, and 51% had that training outside of college (P = 0.00). Most of them (52% to 68%) had their previous BLS training from 1 to 2 years earlier. Of the faculty members, 76% reported that the reason for their lack of knowledge was the need for regular updates about the program. In response to the same question, 33% of the students focused on the absence of professional training, from 32% to 36% (depending on academic year) had the same response. The number of students reporting that the reason for their lack of knowledge was the absence of regular updates on BLS information ranged from 14% in the 4<sup>th</sup>-year to 33% in the 5<sup>th</sup>-year.

**Table 2:** Comparison between answers of faculty and students and between students' grades about BLS attitude, practice and training expressed as percentages.

Questions	Answers	Faculty	Students of All Grades	X <sup>2</sup> (p-value)	Students			X <sup>2</sup> (p-value)
					4th Grade	5th Grade	6th Grade	
Ready to perform resuscitation	Yes	58%	46%	2.90 (0.40)	37%	63%	42%	14.99 (0.02)*
	No	21%	22%		34%	9%	21%	
	I don't know	21%	29%		27%	28%	30%	
	It's not my job	0	3%		2%	0	7%	
Reasons to refuse resuscitation	Fear of causing further harm to the patient	40%	44%	0.84 (0.83)	38%	53%	44%	9.96 (0.12)
	Fear of acquiring infection	10%	12%		12%	7%	14%	
	Fear of taking responsibilities	24%	17%		25%	5%	19%	
	Not confident	26%	27%		25%	35%	23%	
Have you had previous training?	Yes, in college	5%	5%	28.9 (0.00)**	7%	9%	0	17.35 (0.00)**
	Yes, outside the college	87%	44%		29%	56%	48%	
	No	3%	49%		62%	30%	51%	
	Yes, both in and outside the college	5%	2%		2%	5%	1%	
When was your previous training?	Less than 1 year	11%	17%	3.04 (0.38)	14%	34%	6%	20.04 (0.00)**
	1-2 years ago	68%	52%		71%	50%	42%	
	3-4 years ago	16%	26%		10%	13%	47%	
	5 years ago or more	5%	5%		5%	3%	5%	
Do you want more training?	yes	66%	77%	3.55 (0.31)	82%	72%	75%	5.37 (0.49)
	No	8%	5%		7%	2%	4%	
	I don't know	8%	9%		4%	14%	11%	
	I must have annual training	18%	9%		7%	12%	10%	
Why do you want more training?	Family history of heart disease	3%	3%	0.25 (0.96)	2%	2%	6%	12.60 (0.05)*
	Avoiding unnecessary deaths in the community	35%	38%		52%	40%	25%	
	Important for my future work	38%	38%		31%	29%	48%	
	Other reasons	24%	21%		15%	29%	21%	

<b>Reasons for no training</b>	Little interest	0	8%	2.48 (0.47)	6%	9%	9%	1.83 (0.93)
	No time	0	49%		56%	46%	44%	
	Cost	0	15%		10%	18%	19%	
	Not sure where courses are held	100%	28%		28%	27%	28%	
<b>Training should be mandatory.</b>	Yes, in health college only	21%	14%	12.17 (0.00)**	18%	14%	11%	4.53 (0.60)
	Yes, in all college	5%	32%		36%	32%	27%	
	No, BLS training should be optional	3%	5%		7%	5%	4%	
	Yes, in all workplaces regardless of occupation	71%	49%		39%	49%	58%	
<b>Reasons for lack of knowledge</b>	Busy curriculum	8%	19%	38.0 (0.00)**	20%	12%	23%	8.14 (0.22)
	No professional training available	5%	33%		36%	30%	32%	
	Lack of interest	11%	24%		30%	25%	18%	
	The need for regular update of BLS knowledge of dentist	76%	24%		14%	33%	27%	
<b>Should it be a part of the dental curriculum?</b>	Yes, it should be mandatory	95%	72%	9.25 (0.02)*	70%	79%	70%	3.79 (0.70)
	Yes, but should be elective	3%	15%		13%	14%	18%	
	I don't know	0	8%		12%	5%	7%	
	No	2%	5%		5%	2%	5%	

\*\*highly significant  $\leq 0.00$ , \*significant at p level  $\leq 0.05$ ,  $\chi^2$ =Chi-square.

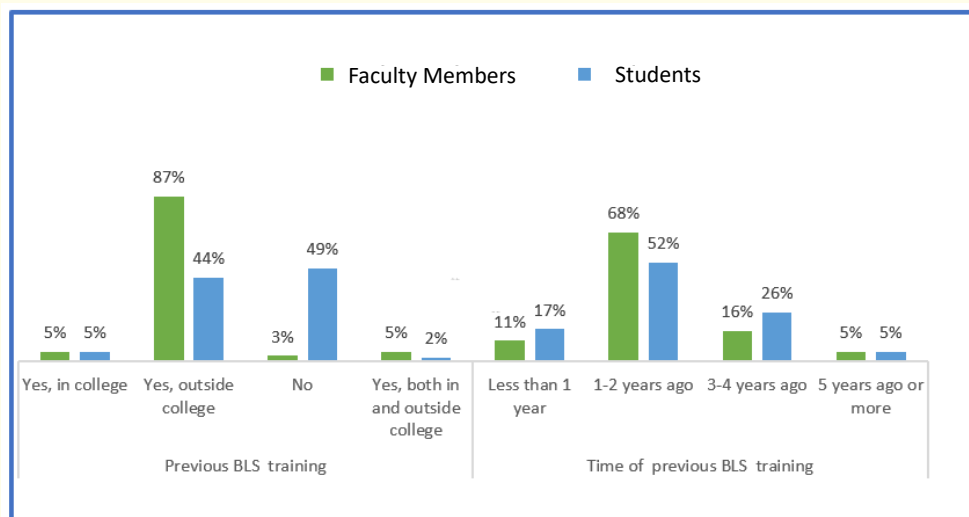
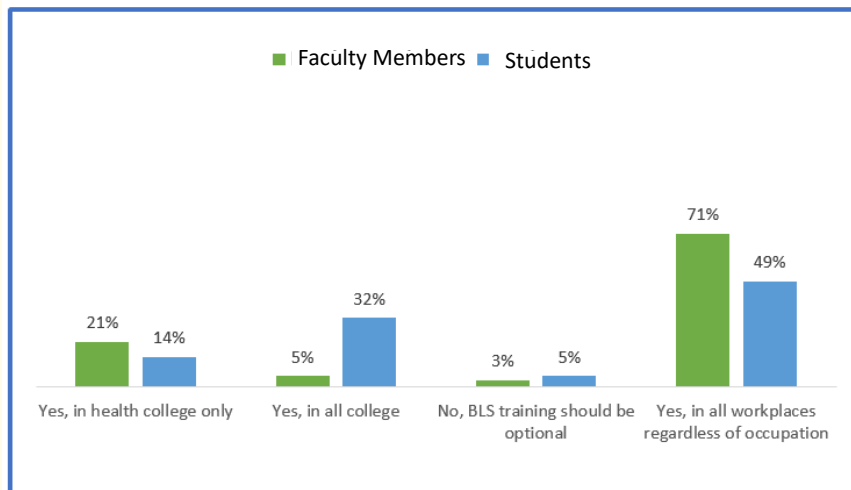


Figure 1: Previous BLS training and the time it was taken among study participants.

A majority of faculty members (84%) and students (86%) reported that they wanted annual or frequent BLS training. Plurality of faculty members (95%) and 72% of the students thought BLS should be part of the dental curriculum ( $P = 0.02$ ). Most of them supported mandatory BLS training (total mean, 95%, and  $P = 0.00$ ) (Figure 2).

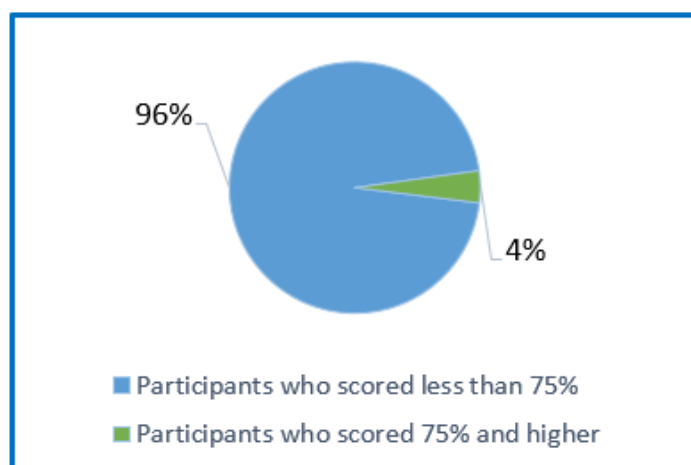


**Figure 2:** Comparison of the study participants' opinions about mandatory BLS training.

Significant difference between students based on their academic level was reflected in their readiness to perform resuscitation ( $P = 0.02$ ), having previous training ( $P = 0.00$ ) and time of prior training ( $P = 0.00$ ).

**CPR practice among trained study participants**

Of the 210 participants, 124 (59%) had previous BLS training, but only 97 (78%) agreed to perform CPR on a training mannequin. According to the software application, the training goal was a score of 75% or higher and only 4% of them achieved it (Figure 3).



**Figure 3:** Scores for CPR skills.



## **Discussion**

This study explored the knowledge of BLS and CPR among students and faculty members in the College of Dentistry at Umm Al-Qura University, Makkah. This study's the first in Saudi Arabia to include faculty members with dental students in testing practical CPR skills on a mannequin, additionally to knowledge and attitudes about BLS.

Compared with previous studies, the level of knowledge and attitudes among students and faculty members about BLS was slightly higher, but inadequate for saving lives. The overall means for correct answers among faculty members (56%) and dental students (43%) was average possibly because most of them (52% to 68%) had their previous BLS training from 1 to 2 years earlier. This finding confirms the assumption of the assumption of Mac Giolla Phadraig *et al.*, [10] that lower knowledge possibly attributable to a decline in the retention of BLS knowledge over time.

Our findings are consistent with a study performed among medical students at King Abdul Aziz University that reported 40% with adequate knowledge of BLS practices and attitudes. However, they found that students who attended more than one BLS training session scored higher than those who attended one obligatory class [11]. The levels of knowledge and attitude were also investigated in health and non-health students at Jazan University, Ahmad *et al.*, [12] as well as in the northern region (Jouf, Hail, Northern Borders, and Tabuk) of Saudi Arabia [13]. The study at Hail concluded that overall knowledge of CPR among the university students wasn't satisfactory. However, attitudes about CRP training were positive [13].

In the current study, the mean percentage of total correct answers as regards to BLS knowledge in 5<sup>th</sup>-year students were higher than the 6<sup>th</sup>-year and 4<sup>th</sup>-year that was the same. In contrast, an Indian dental college found that students with higher academic levels showed higher knowledge than those with lower academic levels [14]. The difference between the two studies perhaps explained by the smaller number of 5<sup>th</sup>-year students participating in the present study compared to 4<sup>th</sup> and 6<sup>th</sup>-year students. Furthermore, students in the study of Bindu *et al.*, [14] attended general medicine and surgery clinics in their pre-final year.

Based on the survey results in this study, 21% of the faculty members and 22% of the students were reluctant to perform CPR resuscitation; mostly common reasons were fear of further harm to the victim, lack of confidence, fear of being responsible and fear of getting an infection. Beside to these fears, inadequate knowledge, attitudes, and lack of practical training explain the reluctance to perform CPR.

Similar findings were reported among dental students at King Saud University in Riyadh, Saudi Arabia. They found that 63% of the participants were reluctant to perform resuscitation and revealed that the reasons were the fear of further harm to the victim, fear of getting an infection, and fear of being responsible. Inadequate knowledge of BLS was reported among students who participated in the study. Almost all of them had attended previous BLS training sessions within the last five years [3]. Fear as a reason for poor knowledge was also stated by Nasr *et al.*, [15] in nearly one-third of their student participants.

Nearly all of our participants expressed the need for improved knowledge of BLS and CPR skills. They agreed that training should be in the undergraduate dental curriculum. Similar results were reported in a study at the health colleges at Princess Nourah bint Abdulrahman University in Riyadh, Saudi Arabia [8]. The majority (77%) of 1,349 participants expressed a desire for more BLS training and 78% supported mandatory BLS training. These results are consistent with that of Vaughan, Park, Sholapurkar, & Esterman, [16] who stated that nearly 94% of dental students believed that BLS training should be a compulsory part of their training.

There are no required or optional courses for BLS and CPR skills in our dental colleges. Not surprisingly, the common explanation for the lack of BLS knowledge and CPR skills offered by the participants was the need for regular updates on BLS practices for dentists, and the absence of professional training. Although 59% of participants had previous BLS training and 60% of them had it within the past 1 or 2 years, they still indicated a desire for regular updates. Similar outcomes were reported at Qassim University in Buraidah [17].



Several studies of BLS training focused primarily on the knowledge of initial life-support care. In real situations, CPR skills and the right attitude are important, this study evaluated CPR skills in participants with previous BLS training. Skills were assessed in two cycles of single-rescuer adult CPR on a training mannequin (Laerdal, Little Anne Q CPR). Although 59% of the participants had previous BLS training, 96% of them scored poorly. Based on the assumption that retention of BLS skills diminishes over time as reported by Özçakır-Tomruk, Noyan, & Oktay, [18], these low scores probably attributed to the fact that only small percentages of our participants recently received BLS training. This finding supports the recommendation of Charlier, Van Der Stock, & Iserbyt, [19] that health care practitioners should receive frequent BLS training with feedback from the trainers, who should review and update skills multiple times a year until satisfactory performance are achieved.

The strength of this study is that it's the first in a Saudi dental college to correlate the knowledge and practice of study participants to their BLS training, including practical tested CPR training on a mannequin. It also included faculty members additionally to dental students. The study experienced a high response rate (73%), and the questionnaire was substantially reliable (65%). However, every study has limitations, this study was limited to one dental college, the findings of poor skills among trained dental practitioners cannot be generalized.

## Conclusions

Faculty members and students at the College of Dentistry, Umm Al-Qura University have average BLS knowledge and a positive attitude. However, CPR skills were poor despite previous training. Thus, findings of this study suggest mandatory BLS courses and CPR training for all the students and faculty to enhance their skills and increase confidence in their ability to perform in emergencies during dental procedures. Moreover, further research should be conducted to evaluate students' BLS skills in practice after training.

## Conflict of Interest

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