

Basic life support knowledge and skills of Iranian general dental practitioners to perform cardiopulmonary resuscitation

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ABSTRACT

Background: When cardiopulmonary arrest occurs, the dentist's ability to perform cardiopulmonary resuscitation (CPR) is the most important factor to minimize morbidity and mortality. This study assessed the basic life support (BLS) knowledge and performance of general dental practitioners in Hamadan, Iran. **Materials and Methods:** The participants in the study were 80 Iranian general dental practitioners who were chosen randomly. Their CPR knowledge was evaluated by verbal questions and their CPR skills were determined by CPR execution on a special manikin. Nearly 39% ($n = 31$) of dentists answered none of the questions and only 2.50% ($n = 2$) answered all of the questions correctly. Thirty six dentists had been participated CPR course after graduation. **Result:** There was a significant difference between dentists who participated in CPR training course and those that did not participate (P value = 0.000). Only 3.75% ($n = 3$) were able to perform CPR properly. **Conclusion:** The results showed that the amount of CPR knowledge and skills were low in participated Iranian general dental practitioners. However, CPR training courses after graduation increased the amount of knowledge significantly, thus, retraining CPR courses is necessary for dentists.

Key words: Cardiopulmonary resuscitation, general dental practitioners, knowledge, medical emergencies, skill

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INTRODUCTION

Although, the prevalence of medical emergencies in a dental office is uncommon, but emergency situations may happen for patient, dentist, and staffs or even for the patient's attendant or attendants.¹ In a study in Germany, 57% of participant dentists stated that at least, there were three medical emergencies in their dental offices during a year.² On the other hand, some diseases and their treatments increase the risk of medical emergencies, so the dentists should be able to diagnose and manage these emergency conditions. In fact, patients expect dentists to diagnose and control these emergency situations during dental treatments.³

The most important medical emergency that a dentist may encounter is cardiopulmonary arrest, so there should be a diagnosis and management as soon as possible. Sudden death due to cardiac arrest is the most prevalent cause of mortality in developed countries and mortality cases due to cardiac arrest are more than the mortality cases because of lung cancer, breast cancer, and stroke annually.⁴

Occurrence of cardiopulmonary arrest is not common in dental offices, but there are some reports about the death due to cardiopulmonary arrest during dental treatment⁵⁻⁸ and also, some of emergency cases in dental practice may lead to cardiopulmonary arrest if they don't be managed properly.⁹ In the most of patients with cardiopulmonary arrest, the only life-saving way is immediate initiating cardiopulmonary resuscitation (CPR). Nevertheless, the rate of CPR success out of the hospital depends on several factors that the most important of them is the starting time of CPR. Patients who are resuscitated immediately after cardiac arrest, have a two to three times higher survival rate (8.2% vs. 2.5% for patients who did not receive CPR).¹⁰ Also, if CPR does not initiate immediately after cardiac arrest,

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the chance of survival rate would be decreased by 7-10% every minute after beginning the event.¹¹

Thus, dentists as health care provider should be able to recognize cardiopulmonary arrest as well as to perform CPR. Complications of sudden cardiac arrest are directly associated to health care provider's ability of correctly using their knowledge and performing cardiopulmonary resuscitation.

Therefore, the present study was designed for answering to these two definite questions:

1. Do the Iranian dentists have adequate theoretical knowledge about BLS?
2. Are the Iranian dentists capable to perform CPR in the real conditions?

There are not enough studies which have evaluated the dentists' abilities to perform CPR, especially in Iran; and most of the available studies have determined dentists' ability upon their self-assessments.^{2,12-15} The purposes of the present study were to determine the general dental practitioners' CPR knowledge by verbal assessment and also their skills about performing CPR by practical examination in Hamadan, Iran.

MATERIALS AND METHODS

This study was approved by the Ethics Committee of the Hamadan University of Medical Sciences (p/16/35/17428) prior to initiation of the study and then it was conducted over 6 months from January to June 2013. A total of 90 general dentists were recruited using simple random sampling in Hamadan, Iran. The inclusion criteria were: The dentists must have graduated from an Iranian dental school and have more than 1 year of practice. The exclusion criteria were: Absence of dentist in his or her office when the authors go there and the unacceptable cooperation of dentist during verbal or practical examination.

The present study was designed as a descriptive investigation and the authors collected the data from the dental offices of these dentists. The study was carried out in two steps. First, participants answered questions about demographic data, participation in any CPR course after graduation, and questions concerning the basic CPR knowledge. The dentists were asked to determine their knowledge about diagnosis of cardiopulmonary arrest and also effective CPR techniques. Second, for determination of the CPR skills, a training manikin (AMBU, Denmark) was placed on the dental chair. The observer (senior author) told the dentist that he/she should imagine a middle-aged patient collapsed during the dental treatment. The dentist was asked to act as if he/she was in an actual emergency situation and the manikin was the patient. The observer agreed on the dentists' level of BLS performance with a Yes/No check list. The check list was derived from

the textbook which is used as reference for teaching medical emergencies in the dental faculties, in Iran.⁹ It was consisted of the criteria for evaluation of dentists' ability in: 1) diagnosis of cardiopulmonary arrest, 2) performing effective CPR techniques. The aim of the first part was to observe the following actions: Checking the responsiveness; asking for help; opening the airway by hyperextending the head and lifting the chin up; checking for breathing; providing two rescue breathes; checking the carotid pulse correctly. The objective of the second part was to observe the following parts: Correctly position the hands for CPR; performing the chest compression affectively and at an adequate rate (acceptable: Less than 23 second for 30 compressions); carrying out the ventilation effectively and in the acceptable rate (2 rescue breathes after 15 compressions). The chest compressions were considered effective if the thorax was depressed by 4-5 cm.¹¹ The amount of chest movement was observed on a monitor of manikin so that it was not visible to the dentists. The rescue breathes were considered effective if they could elevate the chest without gastric air passage.¹¹ Therefore, the variables of this study were: The asked questions about demographic data, time since graduation, participation in any CPR course after graduation and questions concerning CPR knowledge [Table 1] and items of performing CPR [Table 2].

Table 1: Percentage of dentists who answered correctly to CPR knowledge questions

Questions asked	% of dentists
How do you evaluate the responsiveness in an unconscious adult patient?	28.7
How do you assess airway in a person requiring CPR?	51.3
How do you assess for breathing in a person requiring CPR?	58.7
How do you give rescue breathing in adults?	38.7
How do you evaluate for circulation in adults?	28.7
What is the location for chest compressions in adults?	20
What is the rate of chest compression in adults?	25
What is the proper depth of chest compression in adults?	22.5
What is the ratio of chest compression to respiration in adults?	18.7

CPR – Cardiopulmonary resuscitation

Table 2: Percentage of dentists who performed items of CPR correctly

Items of CPR	% of dentists
Checking for consciousness	25
Opening the airway by hyperextending the head and lifting the chin up	40.3
Checking the breath	40
Providing two ventilation	30
Asking someone to call emergency service	80
Checking carotid pulse	25.6
Positioning the hands correctly for CPR	20
Performing chest compression effectively	15.7
performing rescue breathing effectively	29

CPR – Cardiopulmonary resuscitation

At first, we performed a descriptive analysis of the collected data. Then the data were analyzed using independent samples t-test. An overall $P = 0.05$ was considered statistically significant for comparisons.

RESULTS

Nearly 89% ($n = 80$) of the general dental practitioners agreed to participate in this study. More than 73% of the participant dentists were males with the mean age of 36.5 (\pm standard deviation, SD 9.6) years. The mean time since graduation was 6.3 (\pm SD7.2) years. With regard to CPR training after graduation, 45% ($n = 36$) had attended some types of training after graduation, while others had never been trained.

In the verbal assessment about the CPR knowledge, 35% ($n = 28$) answered none of the questions and nearly only 6% ($n = 5$) answered all of these questions correctly. The percentage of dentists who answered correctly to each verbal question is summarized in Table 1 and the number of correct answers obtained from dentists is shown in Figure 1. There was a meaningful difference between the dentists who had been trained CPR after graduation and those who had not been trained (P value < 0.001).

In the practical examination concerning CPR skills, only 3.75% ($n = 3$) were able to perform all CPR maneuvers properly and all of them had been participated in some CPR courses after graduation. Table 2 demonstrates the percentage of dentists who performed each CPR skills maneuver correctly and Figure 2 shows the number of correct maneuvers performed by dentists.

DISCUSSION

This study investigated the CPR knowledge and skills in the general dental practitioners in Hamadan city as a sample of Iranian general dental practitioners. The undergraduate courses in dentistry and also dental

courses after graduation are equal through Iran because they are determined by the Ministry of Health and Medical Education of Iran. Therefore, the amount of CPR knowledge and skills of general dental practitioners in Hamadan would be indicating the amount of CPR knowledge and skills of all the Iranian general dental practitioners.

In the present study, we decided to assess the dentists CPR knowledge and skills by means of the information which are presented in the latest edition of the reference textbook of medical emergencies in the dental faculties of Iran.⁹ Notably, Iranian dentists are very familiar with this textbook and use it as reference even after graduation. As, the CPR algorithm which is presented in this textbook has been derived from 2005 CPR guideline, inevitably our assessment would be based on this guideline. But the American Health Association (AHA) has changed the guidelines for CPR in 2010. In these new guidelines,¹⁶ the CPR sequence has changed from A-B-C (Airway-Breathing-Circulation) to C-A-B. Accordingly, the chest compressions should be initiated before ventilations. Likewise, the acceptable depth of chest compression is at least 2 inches (2005 recommendation was $\frac{1}{2}$ to 2 inches), and the chest compression rate must be at least 100 per minute (2005 recommendation was about 100 per minute). The final change is elimination of look, listen, and feel maneuver and rescuer should open the airway and deliver two breathes after delivery of 30 chest compressions.

Therefore, there are some differences between these two guidelines. For prevention of underestimation of dentists CPR knowledge and skills, we considered both guidelines (2005 and 2010) in our investigation. Indeed, in accordance with both guideline, we considered two answers for questions number 3, 7, and 8 and for practical examination we decided two different check lists. If a dentist performed CPR on the basis of each of these guidelines, it would be accepted.

But none of the participants were familiar with 2010 guidelines and did not use the steps of those. Therefore, we presented just the traditional CPR guidelines in this article.

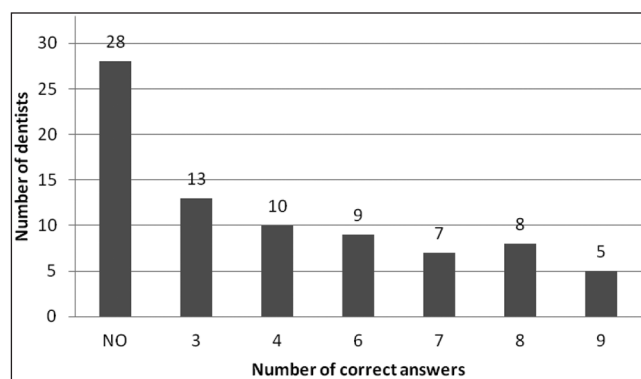


Figure 1: Number of correct answers achieved by dentists during the verbal assessment of Cardiopulmonary resuscitation (CPR) knowledge
CPR – Cardiopulmonary resuscitation

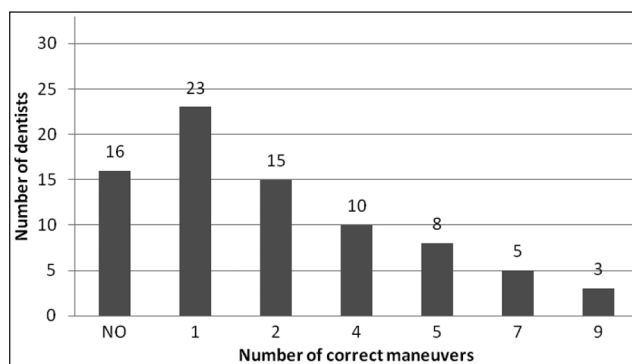


Figure 2: Number of correct maneuvers made by dentists during the practical assessment of Cardiopulmonary resuscitation (CPR) skills
CPR – Cardiopulmonary resuscitation

Based on this study, the general dental practitioners in Hamadan, Iran did not have adequate knowledge and skills about CPR, because nearly 39% were not able to answer any question correctly and nearly only 4% were able to perform CPR properly on manikin. In fact, our study indicated that nearly only 4% of general dental practitioners in Hamadan, Iran had adequate knowledge and skills to perform CPR properly in real condition. Similar with our results, Indian¹³ and Brazilian¹⁴ dentists were not prepared to perform CPR correctly.

In some studies as conducted by Skopa *et al.*,¹⁵ and Laurent *et al.*,¹⁷ close to 50% of participant dentists believed they could perform CPR. Although this is not an acceptable percent, but it is better than our results. The explanation for this difference may be related to the different method of research. It seems that practical examination is more accurate than self-assessment questionnaire for evaluation of CPR skills. For instance, Hussain *et al.*,¹⁸ used practical examination for evaluation of CPR ability of dentists, and all of their candidates failed. Also in the previous study about evaluation of the CPR knowledge of dentists in Iran, 55% of dentists believed that they were able to perform CPR, but only 37% answered CPR questions correctly; whereas none of them had been trained practically.¹²

In contrast with our study, Greenwood *et al.*,¹⁹ reported that 81% of participant dentists believed that they were able to manage cardiopulmonary arrest. However, participants had only one year experience in dentistry and also they had not met any cardiac arrest during that year. As Hamasu *et al.*,²⁰ and Jelink *et al.*,²¹ demonstrated, there is a meaningful relation between dentist's experience and dentist's will for learning CPR.

For increase the dentists' knowledge and skills to recognition and management of medical emergencies, there should be sufficient training hours for both theoretical and practical courses in undergraduate dental curriculum.

In some countries such as Germany, there are many opportunities for dental students to learn medical emergencies; for example, in Dresden, dental students should participate in a 4-week emergency medicine course.² In USA, teaching of medical emergencies is mandatory in more than 95% of dental schools and 3-60 hours are dedicated for training medical emergencies.²²

In Iran, before 2013 (the time of execution of this study), only 4 hours had been dedicated for instruction of medical emergencies without any practical training.²³ But now, training curriculum of general dentistry is changed and upon the new curriculum, 26 hours are dedicated for both theoretical and practical medical emergencies training for dental students.

Nevertheless, it should be emphasized that for improving the CPR knowledge and skills of dentists, it is necessary for dentists to participate in medical emergency courses regularly after graduation. As Kieser and Herbison²⁴ showed that in spite of many training hours for medical emergencies, managing these emergencies was a paramount challenge for dental students and dentists; also there was a high level of stress in managing medical emergencies in dental students. In fact, without enough exercise after 12 months of learning, the significant amount of information will be forgotten and after 18 months there is no remained adequate skill.²⁵

These findings are in consistent with our result, where the level of knowledge and skills of dentists who trained CPR after graduation was significantly higher than the others.

However, theoretical courses are not sufficient in medical emergency training. Le *et al.*, found that, although the dental students were able to verbalize the protocol for administration oxygen in medical emergencies, but only 50% of them were able to operate the tank to administer oxygen properly to a patient during a simulated emergency situation.²⁶ For many years the simulation training has been done successfully for medical students; therefore, it seems that this method should be used for dental students in order to training medical emergencies.^{27,28}

CONCLUSION

The results of this study showed that the amount of CPR knowledge and skills is inadequate in Iranian dentists, although CPR training course increased the dentists' CPR knowledge and skill significantly.

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