

## **GRADUATION PROJECT**

### ***Degree in Dentistry***

# **Level of knowledge in basic CPR techniques in dental degree students**

**Madrid, academic year 2022/2023**

Identification Number: 93

## ABSTRACT

**Introduction:** The ability of dentists to perform cardiopulmonary resuscitation (CPR) when faced with an emergency situation, efficiently and swiftly, depends on the dentist's training on the matter and experience with such situations. **Objectives:** This study aimed to identify the knowledge of basic CPR techniques amongst 5th year dental students of the UEM, focusing on the perception of the students' knowledge on CPR, as well as proposing improvements on the current training. **Methodology:** A questionnaire was used to assess the perception of theoretical knowledge of 53 fifth year dental students on CPR. Multiple choice questions were used for the purpose. The study compared different variables, in order to assess how students who have gone through dissimilar experiences and training, perceive their own knowledge on basic CPR techniques. **Results:** According to the study, the majority of dental students felt more confident in giving CPR after they received the University's training in the simulated hospital. Additional training was welcomed by most students, with a strong preference for regular CPR training. The training received by the dental students does not go into enough depth when teaching students how to use equipment such as the defibrillator. Additional training outside the University showed an improvement in the students' perception of their own abilities on providing CPR. **Conclusions:** The training received by dental students could be improved by expanding the contents of the material to focus more on equipment such as the defibrillator, as well as by increasing its frequency. Repetitive and up to date training may increase dental students' perception of being able to provide CPR, as well as retain their skills and knowledge.

**Keywords:** CPR; Dental Students; University; Knowledge on CPR; Data analysis; CPR techniques

## RESUMEN

**Introducción:** La capacidad del odontólogo para realizar la reanimación cardiopulmonar (RCP) ante una situación de urgencia, de forma eficaz y rápida, depende de la formación del odontólogo en la materia y de su experiencia.

**Objetivos:** Este estudio tuvo como objetivo identificar el conocimiento de las técnicas básicas de RCP entre los estudiantes de odontología de 5º año de la Universidad, centrándose en la percepción del conocimiento teórico sobre RCP y realizar sugerencias sobre la formación.

**Metodología:** Se utilizó un cuestionario para evaluar la percepción del conocimiento teórico de 53 estudiantes de odontología de quinto año sobre RCP. Para ello se hicieron preguntas de opción múltiple. El estudio comparó diferentes variables, con el fin de evaluar cómo han pasado por diferentes experiencias y formaciones, perciben sus propios conocimientos sobre técnicas básicas de RCP. **Resultados:** Según el estudio, la mayoría de los estudiantes de odontología se sintieron más seguros al realizar RCP después de recibir la formación de la Universidad, la mayoría de los estudiantes agradecieron la formación adicional, con una preferencia por el estudio regular en RCP. El conocimiento que reciben los estudiantes de odontología no profundiza lo suficiente a la hora de enseñar a los alumnos a utilizar equipos como el desfibrilador. La formación adicional fuera de la Universidad mostró mejora en la percepción de los estudiantes sobre sus propias habilidades para proporcionar RCP. **Conclusión:** La enseñanza que reciben los estudiantes de odontología podría mejorarse ampliando los contenidos de la formación para centrarse más en equipos como el desfibrilador, y aumentando la frecuencia de la formación. La capacitación repetitiva y actualizada puede aumentar la percepción de los estudiantes de odontología de poder brindar RCP, así como también conservar sus habilidades y conocimientos.

**Palabras clave:** RCP, Estudiantes de Odontología, Universitarios, Conocimientos en RCP, Análisis de datos, Técnicas de RCP

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## 1. INTRODUCTION

### 1.1. Background

In the modern era and its associated lifestyle, where emergencies such as cardiac and respiratory arrest (situations) are an increasingly common phenomenon (1), everyone, but most importantly health professionals are called to be fully prepared (2,3). This includes dentists, as indicated through the surveys of Fast et al. and Malamed, who reported that 30,602 episodes occurred over a 10 year period in the offices of 4309 dentists (4). Every year thousands of lives are saved because they are given CPR immediately after an emergency episode (5).

But what exactly is Cardiac or Pulmonary arrest? By definition, Cardiac and pulmonary arrest is characterised by the American Heart Association and the American College of Cardiology, as the sudden cessation of cardiac activity resulting to the victim becoming unresponsive, with no normal breathing and no signs of circulation. Unfortunately, in case no measures are taken rapidly, this condition progresses to sudden death of the victim (6).

Studies have shown that thousands of emergencies of Cardiac or Pulmonary arrest happen every day all around the world (7). The most established way to respond to such an emergency is to immediately start with Basic Life Support (BLS). The most simplified protocol is called Cardiopulmonary Resuscitation, also known as CPR, which was invented in 1960 (4). This has proven to give the victim the greatest chance for survival (8). In such situations where CPR is required in the practice, every second counts as the patient's life is in the dentists' hands.

This section will provide an introduction to the study by discussing the background and context, followed by the research aims, objectives and questions, the significance of the research and finally its limitations.

## **1.2. Importance of CPR within the dental profession**

Within the realms of healthcare provision, dentists are obligated to be able to perform professional first-aid this is not just limited to ethical, but for legal reasons as well. The aforementioned marks BLS as a rudimentary skill requirement for dental professionals. Furthermore, the current guidelines applying to the graduating dentists in Europe state that all dental professionals should be capable of 'carrying out basic life support', as well as defibrillation for cardiac arrest (9).

Even though possessing the basic skills and knowledge of CPR techniques is of great importance, the majority of people, including some dental students lack this skill (10). Students studying dentistry in fact, feel unprepared when it comes to medical emergencies in the office which actually leads them to requesting more intense training on the subject (11). Specifically, they appear to demonstrate lack of skills in BLS and the correct execution of CPR (9). This ultimately leads to more deaths everyday which could have been avoided by the correct use of this simplified life-saving and worldwide recognized protocol (12). The aim of this research is to explore, identify and evaluate the level of knowledge in basic CPR techniques among dental degree students as future professionals in the medical field. This research will incorporate the use of a questionnaire which will be given to a predetermined number of 5th year students studying dentistry in UEM, which will be carefully selected in order to avoid risk bias.

### **1.3. Current state of practice**

Even though monitoring cardiac arrest can be difficult, over the last several years, a lot of research has been done exploring the subject in more depth. The most recent developments have shown that specific research has proven interventions can lead to an improved outcome. Such interventions are the early identification of the cardiac arrest (4) , the early implementation of bystander CPR, the early activation of the Emergency Medical Services (EMS) system and early defibrillation by Automated external defibrillator (AED), a bold post arrest medical care that can incorporate therapeutic hypothermia, as well as, early cardiac catheterization and seizure control (13).

### **1.4. Divergence between skills of dental professionals**

While we know that many studies have been conducted to demonstrate the knowledge of health professionals on performing CPR, it is generally accepted that there is a gap when it comes to dental students that practise in the University Clinic and dental practitioners (10). Since the University Clinic faces the same circumstances as professional clinics, this resulted in University Clinic practitioners falling behind when it comes to treating and dealing with patients in such situations. All clinics, including University Clinics have proven to be a stressful environment for many patients, increasing the chances of an episode occurring (14), which will require immediate assistance (4). As a result, there is a need to bridge the gap between the knowledge of dental students and dental professionals.

### **1.5. Impact**

The impact of the research is to provide a package to contribute to the body of knowledge on the current skills and understanding of dental students of the University that this study took place, on CPR, as well as recommendations on any required skill development and learning. CPR is widely considered a very important protocol of BLS which has to be mastered by all professionals working in the health sector. This research will further address the strengths and possible limitations of the University's current education on CPR which the participating students receive.

### **1.6. Limitations and mitigations**

This research is bound to have some limitations. Some examples would be the narrow scope of the pool of subjects asked to complete the questionnaire, the different level/stage of the dental students undertaking the questionnaire as some students may have completed courses outside University, that other students may or may not have up to this point and the lack of time, money and equipment to ensure the exact knowledge of each student on the subject studied.

The above limitations will be mitigated by approaching as many dental students of the University as possible that are currently in their 5th year and have undertaken the course of "Emergencies in the Clinic". In order to reduce any risks even further, 5th year student participants will be limited to students which are currently completing the theoretical and practical part of their education in the University. Moreover, before the assessment, students on a similar level of educational experience will be chosen to participate.

## **1.7. Overview**

The following sections will look at the materials and methods used for achieving this study, and the results of the study will be presented, discussed and analysed using visual methods such as graphs. Finally, a discussion will capture the main findings and potential correlations on the findings, as well as any possible unexpected limitation that might appear and recommendations.

## **2. OBJECTIVES**

The main aim of this research is to identify the perception of knowledge of basic CPR techniques among 5th year dental students of the UEM.

This will be achieved by breaking down the aim into the following objectives:

### **MAIN OBJECTIVE**

- I. Identify the perception of knowledge of Dental students of UEM regarding their theoretical understanding around the concept of CPR.

### **SECONDARY OBJECTIVE**

- II. Provide recommendations to improve the current knowledge of UEM dental students.

### **3. MATERIALS AND METHODS**

#### **3.1 Type of experiment**

As discussed in the Introduction above, the research problem this dissertation is testing is the perception which UEM's dental students have of their knowledge on basic CPR technique. In order to investigate this problem and reach a conclusion, a quantitative experiment has been carefully set up to capture the various indicators and information required for further analysis of the research problem, allowing for a holistic analysis and examination of all factors, before developing the results.

#### **3.2. Developing the Methodology**

In order to undergo the research as accurately as possible and minimize error, an online survey was selected and designed as the most suitable method. Use of the survey was selected as it can reach a great number of subjects simultaneously making it easy for them to complete with minimal effort, as well as mitigating any risks arising from the use of already established surveys which may contain questions that are not fit for purpose within them. The questions included in the survey were straightforward, carefully designed to identify the indicators to allow for an optimal analysis. The answers were in the form of multiple choice, designed to significantly minimize personal bias.

Other methods that were considered were personal interviews and open questions, but these were discarded from being the suitable method. This was due to various reasons, including but not limited to such methods demanding greater dedication and efforts by the participating subjects, which was anticipated to lead to a significantly smaller pool of subjects. Using these

methods, would mean that more complicated questions and answers would have to be developed and used, which could potentially compromise the results and increase bias due to perception.

### **3.3. Methodology**

An online survey was designed to assess the level of perception which UEM's students who participated in this study, have on their knowledge regarding basic CPR technique. The results were collected for further assessment and analysis. The survey focused on the perception of the students with regards to their knowledge on the matter to mitigate bias. A survey was designed with the use of Google Forms, and was given to a pool of 53 subjects, who are currently enrolled in the 5th year of the undergraduate degree of Dentistry in the UEM. These subjects have already successfully completed the simulated CPR practice as part of the subject "Emergencies in the Clinic", which has taken place in the simulated hospital within the University premises. The results obtained were further analysed and compared.

### **3.4. The survey**

The survey included nineteen multiple choice questions, each designed to efficiently assess the students' perception of knowledge on the CPR based technique as well as explore any possible recommendations for possible future improvements that can be made to the current training program offered by the University where the study took place to maximize the dental students' knowledge on the matter.

To respond to each question, each subject was given the choice of selecting an answer that best describes their opinion and how they feel around different topics regarding CPR and emergencies. The survey results were collected between February 2023 and March 2023.

### **3.5. Supporting articles**

The articles used to support this research have been obtained through the UEM library (Biblioteca CRAI Dulce Chacon) and NCBI, and have been published after 2012. Since this is a first of a kind research, similar articles have been used to support and shape the methodology, while some results of these existing studies were used in this research's discussion section for the purpose of comparison due to their relevance.

### **3.6. Keywords used:**

CPR; Dental Students; University; Knowledge on CPR; Data analysis on CPR techniques; Cardiac Arrest; CPR training; Regular CPR training; retraining; University Clinic; Response to Cardiac Arrest; Retraining; Basic Life Support; BLS; Defibrillator; Automated External Defibrillator; AED; Medical Professionals; Perception of knowledge; Confidence level.

### **3.7. Inclusion Criteria:**

- Articles published from 2012 to present with exclusion of the article from Chapman PJ. Published in 1995 because of its relevance to this study.
- Articles in complete text
- Academic publications

### **3.8. Exclusion Criteria:**

- Articles published before 2012 have been excluded due to being outdated. with the exception of the article by Chapman PJ. "A questionnaire survey of dentists regarding knowledge and perceived competence in resuscitation and occurrence of resuscitation emergencies." Published in 1995 which was included for the purpose of discussion and comparison because of its relevance with this study.

- Articles that were irrelevant to this study
- Grey Literature

#### **4. RESULTS**

This section will showcase the results of the quantitative analysis obtained by the voluntary participation of 53 subjects that are currently enrolled as students in the Dental degree of the UEM and have all already undergone the subject of “Emergencias en la Consulta” which includes the mandatory task of participating in the simulated hospital workshop of CPR.

As discussed in previous sections, the main objective being studied is to identify the perception of knowledge of dental students of UEM participating in this study around the concept of CPR, as well as to provide possible recommendations in order to improve the current knowledge of the dental students on the matter.

In order to assess the perception of knowledge of the participating dental students, a questionnaire of a total of 19 questions has been conducted concentrating on basic topics around CPR and emergencies in real life which can later help us compare and make correlations on the study’s objectives.

The questionnaire was then shared to the eligible students that fulfilled all the criteria and the results are shared in the form of pie charts and further stated in the details below.

All the 53 subjects gave their consent to participate as volunteers so that the results could be used in this particular final degree project, as seen below in Figure 1.

1. Do you give your consent to participate in the survey as a volunteer so that the results of the survey can be used in the Final Degree Project "Lev... basic CPR techniques in dental degree students" ?

53 responses

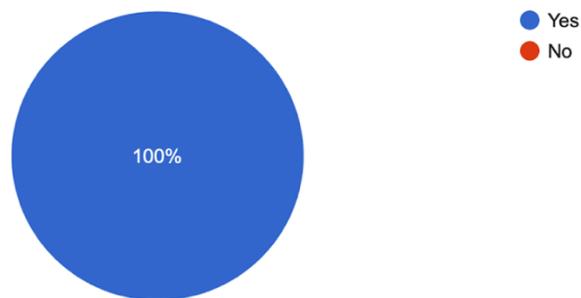


Figure 1- Consent

From those 53 subjects 56.9% stated that are female while the rest (43.1%) stated that are male. This is demonstrated below in Figure 2.

2. Indicate your sex

53 responses

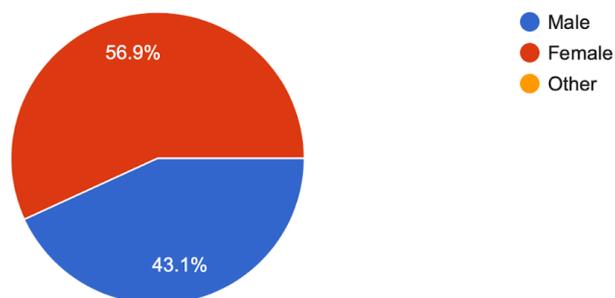


Figure 2- Indication of gender

The majority of them (63.5%) stated that they belong to the age group of 20-25 years old, while 36.5% of the total pool participating stated that they are 25 years old or older. As shown below in Figure 3.

3. Indicate your age group

53 responses

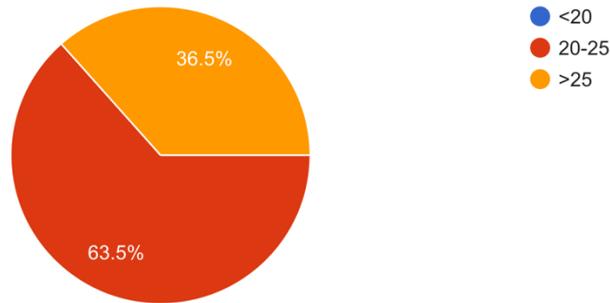


Figure 3- Participant's age group

As stated previously, 100% of the participants are dental students, which is demonstrated in Figure 4.

4. Are you a dental student?

53 responses

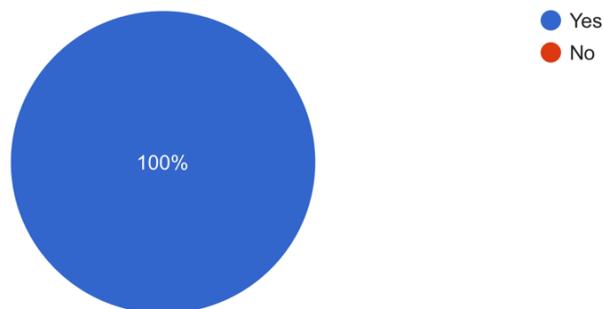


Figure 4- Participant's occupation

On a question where they have been asked to state whether they have ever dealt with a real-life emergency situation either in the clinic or in the street where they had to use CPR, 88.5% of the participants stated “No” while 11.5% answered positively, as seen below on Figure 5.

5. Have you ever dealt with a real life emergency situation in the clinic or in the street where you had to use CPR?

53 responses

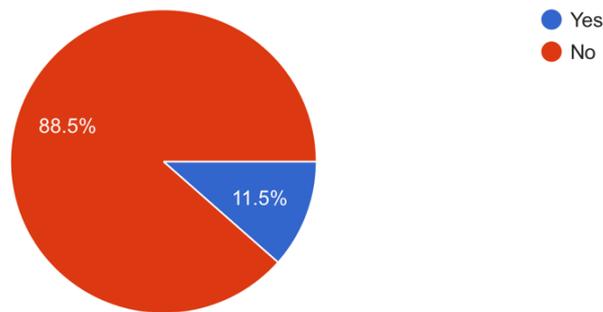


Figure 5- Have you ever dealt with a real-life emergency demanding CPR?

As demonstrated below in Figure 6, 82.7% of the students stated that they received their last CPR training less than a year ago. On the other hand, 11.5% said that their last CPR training took place between one to two years ago, while just 5.8% responded that their last CPR training took place more than two years ago.

6. How long ago did you receive the last CPR training?

53 responses

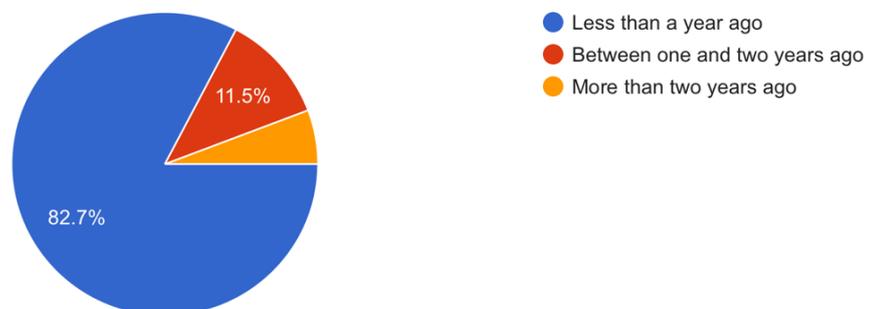


Figure 6- Last CPR training

100% of the participants stated that they have all successfully completed the CPR workshops that took place in the simulated hospital of the UEM under the coordination of the subject “Emergencias en la Consulta”, as indicated below in Figure 7.

7. Have you successfully completed the CPR workshop in the simulated hospital of the University?

53 responses

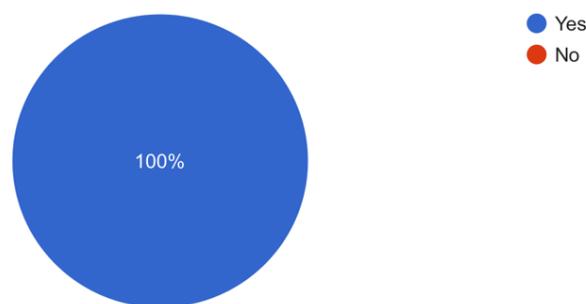


Figure 7- Successfully completed the CPR workshop in the University Campus.

On a question where they were asked if they have received any extra CPR training outside the simulated hospital of the University, 54.9% have answered “Yes” while the rest 45.1% have said “No”, as reflected below in Figure 8.

8. Have you received any CPR training outside the simulated hospital of the University?

53 responses

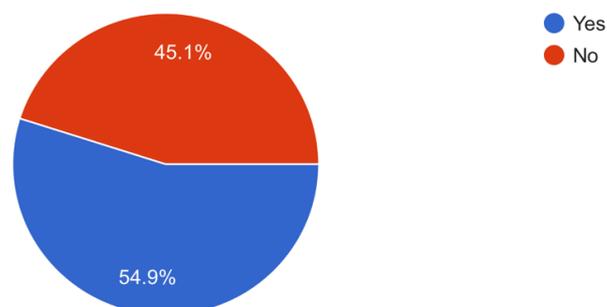


Figure 8- Extra training

Moreover, as shown below in Figure 9, 75% of the students would welcome more hours of training, while 25% of them believe that the CPR workshop that took place in the simulated hospital is sufficient practice for a dentist.

9. Do you believe that the CPR workshop that took place in the simulated hospital is enough for a dentist, or would you welcome more hours of training?

53 responses

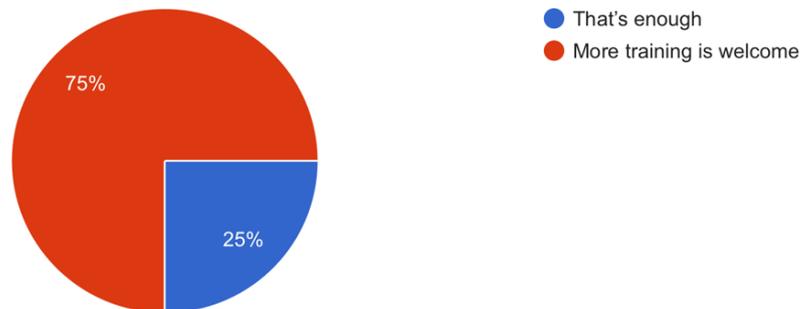


Figure 9- Evaluation of possibly more practice hours on CPR workshops.

On a question on how often they believe CPR training should be repeated, 55.8% answered "Annually", 23.1% answered "Biannually" while just 21.2% replied every two or more years. This is demonstrated below in Figure 10.

10. How often do you think training on CPR should be repeated?

53 responses

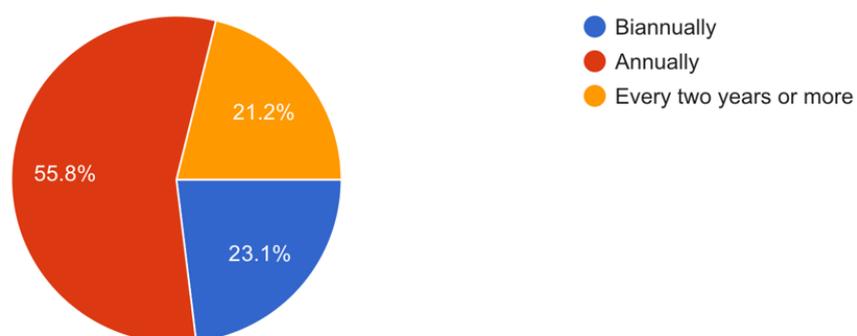


Figure 10- Training repetition.

When the participants were asked whether they believe that the University simulation practices on CRP have made them more comfortable in handling a possible real-life situation of an emergency and were given 5 options, 7.7 % stated that they find themselves “Completely comfortable”, 44.2% said that are “Fairly comfortable”, 34.6% said that are “Somewhat comfortable”, 9.6% chose “Slightly comfortable”, while 3.8% said that are “Not comfortable at all”. These are all being demonstrated below in Figure 11.

11. Based on your experience, do you believe that the simulation practices on the CPR has made you more comfortable in handling a real life situation of an emergency?

53 responses

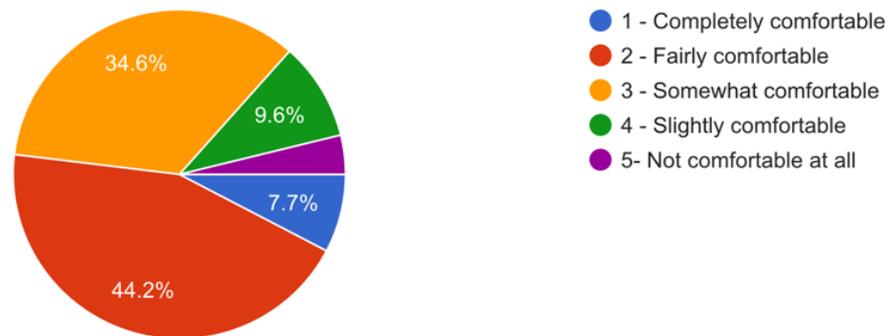


Figure 11- Level of Confidence after the CPR workshop.

In continuation on another question (see Figure 12), exploring the opinion of the participants on whether their level of confidence would improve if they receive extra training **in addition** to what they have already received from the University up to date, 92.3% of them have said “Yes” while 7.7% replied “No”.

12. Would you feel more confident responding to an emergency situation with extra training in addition to what you have received by the University to date?

53 responses

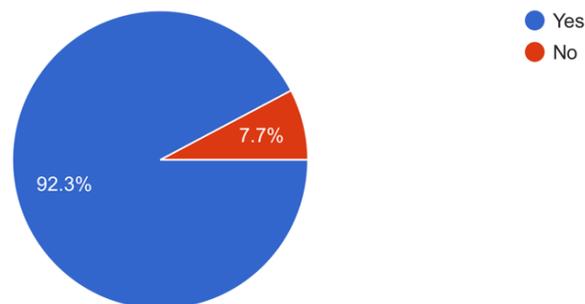


Figure 12- Confidence level related to additional training.

On the other hand, when the students have been asked based on their opinion on whether the whole team or only the dentist should be trained on performing CPR, 98.1% has “The whole team” while 1.9% replied “Only the dentist”. (See Figure 13)

13. Should the whole team be trained on performing CPR or should the training be limited only to the dentist?

53 responses

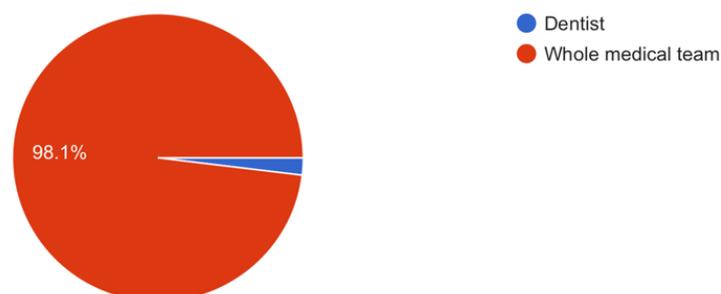


Figure 13- Most suitable for performing CPR.

When the subjects were asked what they would feel more comfortable doing in a scenario of a real life emergency **before** they have undertaken the CPR workshop in the simulated hospital, 21.2% said they would choose to volunteer giving CPR, 67.3% said that they would prefer to assist by calling the emergency services, while 11.5% would prefer to stay on the sidelines and allow someone else to take charge of the situation (as seen below in Figure 14).

14. BEFORE having carried out the CPR workshop in the simulated hospital, in a scenario where CPR had to be given, Would you feel more comfortable:

53 responses

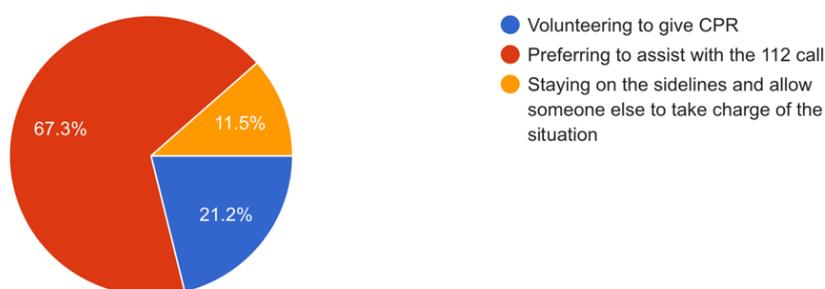


Figure 14- Preference of dealing with an emergency situation **before** undertaking the CPR workshop in the simulated hospital.

When asked what they would feel more comfortable doing in a real-life emergency situation **after** they have undertaken the University's CPR workshop in the simulated hospital, 84.6% of the students said that they would feel comfortable volunteering to give CPR, while 15.4% would prefer to assist with the 112 call. No one replied that they would prefer to stay in the sidelines and allow someone else to take charge of the situation. (See Figure 15)

15. AFTER having carried out the CPR workshop in the simulated hospital, in a scenario where CPR has to be given, Would you feel more comfortable:

53 responses

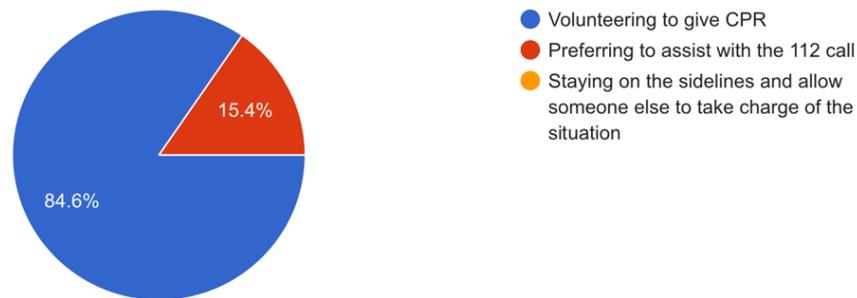


Figure 15- Preference of dealing with an emergency situation **after** undertaking the CPR workshop in the simulated hospital.

On the other hand, when asked if they feel confident using equipment like the defibrillator, 63.5% answered "Yes" while 36.5% replied "No". (See Figure 16)

16. Do you feel confident using equipment, such as the defibrillator?

53 responses

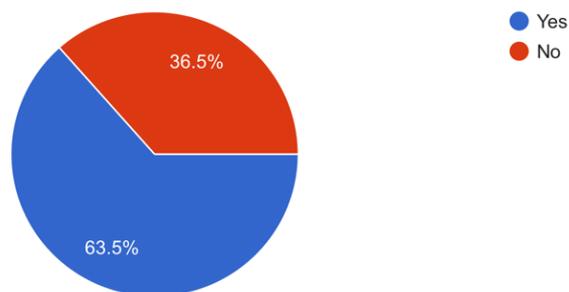


Figure 16- Confidence using equipment like the defibrillator.

When the participants were asked on whether they think that the AED can be dangerous if they don't know how to use it properly, 84.3% replied "Yes", while 15.7% answered "No". (See Figure 17)

17. Do you think the AED can be dangerous if you don't know how to use it properly?

53 responses

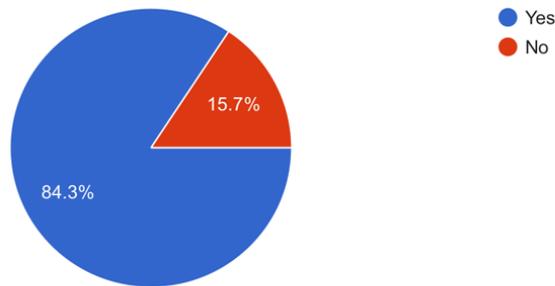


Figure 17 – AED

The students were then asked to describe their level of confidence when using the defibrillator and based on that 13.5% replied that they feel "Completely confident", 28.8% evaluated themselves as "Fairly confident", 32.7% as "Somewhat confident", 21.2% as "Slightly confident", while 3.8% as "Not confident at all". (Shown in Figure 18 below)

18. How confident do you feel using the defibrillator?

53 responses

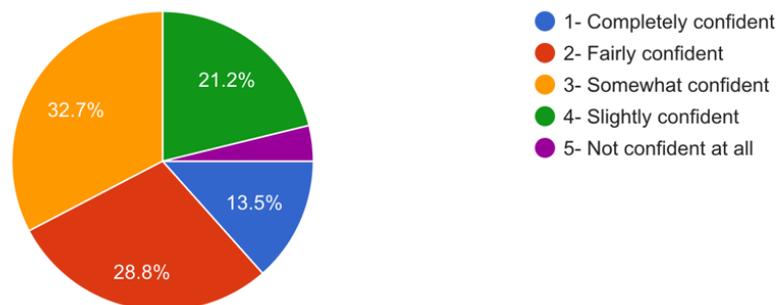


Figure 18- Level of confident on using the defibrillator.

Lastly, when asked which age group they would feel more comfortable handling when fronting with a real-life emergency situation and having to give CPR, 42.3% said “Adults, Children and Infant equally”, while 57.7% replied “Adults only”, noting 0% chose “Children and Infants only”. (See Figure 19)

19. In a case of an emergency, do you feel confident in handling and giving CPR to:  
53 responses

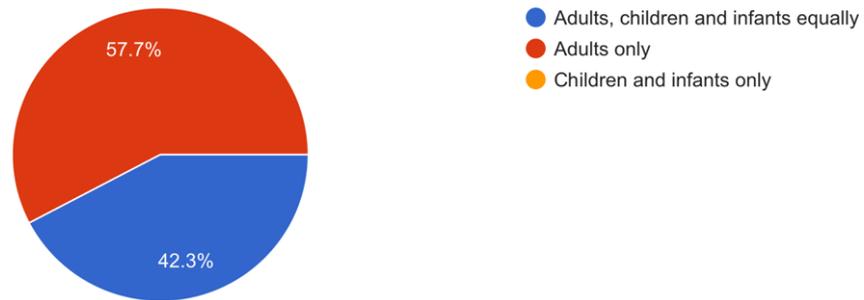


Figure 19- Confidence based on different age groups.

## **5. DISCUSSION**

Understanding the perception of knowledge of basic CPR techniques amongst 5th year dental students of the UEM will allow the correct assessment of readiness and confidence of the students participating in the study, in responding to an emergency situation. The study will make possible recommendations as to whether any changes can be made to the current training offered by the University, in order to optimize the students' ability to perform CPR in cases of an emergency. Furthermore, the study explores the students' perceptions on performing CPR while utilizing necessary equipment such as the defibrillator. A better understanding of the participating students' perceptions will allow the enhancement of the students' self-confidence and maximization of their capability of performing under situations of high pressure and stress.

### **5.1. Real Life Experience**

The questionnaire was completed by 53 students who are currently enrolled in the UEM's dentistry course. 63.5% of students who have completed the questionnaire are currently within the 20-25 age group, compared to 36.5% who are above 25 years old. Only 11.5% of participants have dealt with a real-life emergency situation in the clinic or in the street, where CPR had to be performed. Interestingly, of the 11.5% of participants who have actually dealt with a real-life emergency situation in the clinic or street where CPR had to be performed, 66.7% of them were above 25 years old. This indicates a positive correlation between age and experience of performing CPR in a real-life situation. This can be attributed to various reasons, including more confidence to perform CPR with age, more experience gained over the years as well as being exposed to more situations of this kind (15,16).

## 5.2. Timing and Additional Training

Most students (82.7%) received the CPR training less than a year ago, whereas 11.5% between one and two years ago and 5.8% of participants received the training more than two years ago. 54.9% of students who completed the questionnaire have received additional training outside the simulated hospital of the University. Of the 54.9% of participants who have received additional training, 57.1% were between 20-25 years of age, whereas the remaining participants were all above 25 years of age. This may indicate that younger dental students show more interest and motivation to receive additional training on medical emergencies, as opposed to older dental students. This may be for various reasons, such as older dental students not having enough time to deal with additional work or, interest in extracurricular activities declining with age. In addition, only 14.3% out of the 54.9% of participants who have received additional training have actually dealt with an emergency situation. Whether the participants have actively chosen to avoid dealing with an emergency situation (such as by allowing others to take charge) or whether they have not been exposed to such a situation yet was not assessed in this study.

Interestingly, only 25% of participants thought that the CPR workshop in the simulated hospital of the University is enough to provide dentists with the correct and adequate skills to deal with a real-life emergency situation, compared to 75% of participants who welcomed additional training on CPR. Of the 25% of participants who thought that the CPR workshop is enough to provide dentists with the appropriate skills, 61.5% have stated that they have received additional CPR training outside the University. This may indicate that the additional training received outside the University may have caused the subjects to be more confident with the University's training. The timing of the additional training received outside the University, and whether it predates the University's training or not, was not explored in this study.

Moreover, out of the 25% of participants who thought that the CPR workshop is enough to provide dentists with the correct skills, only 30.8% have faced a real-life situation where CPR was needed to be performed. This indicates that although the students may feel confident that the training provided is enough, they have not yet been faced in a situation where their CPR skills would have to be put at use, which in turn will affect positively or negatively their opinion on the matter. There is an argument that if the students were put in a situation where they had to perform CPR, then not all of them would feel as confident, and would welcome more training, skewing the current results. Of the 75% of participants who thought that the CPR workshop is not enough to provide the correct skills and welcomed more training, only 12.8% have been faced with a real-life situation where CPR had to be given.

Furthermore, of the 75% of participants who thought that the CPR workshop is not enough to provide the correct skills and welcomed more training, 51.3% have received additional CPR training outside the University. This indicates that the confidence of students on performing CPR does not change significantly with the amount of training received outside the University. The extent of training on CPR received outside of the University was not collected as part of this study.

55.8% of participants thought that CPR training should be repeated every year, with just 21.2% of participants suggesting CPR training to be repeated every two years, whereas 23.1% of participants suggested that the CPR training should be repeated biannually. Of the 55.8% of participants who thought that CPR training should be repeated every year, only 17.2% of the participants have received the training more than a year ago, the remaining 82.8%, have received the training less than a year ago. This shows that although the students have recently received CPR training, most of them would still prefer to receive the training every year.

This is further supported by Mokhtari Nori et al who show that retention of CPR skills drastically declines after 2 years of training being given (17). Various studies emphasize the importance of receiving regular CPR training (18–23). Importantly, of the remaining participants who felt that CPR training should be repeated every two years, only 27.3% have dealt with a real-life situation where CPR was required. This shows that students may feel confident in performing CPR, but their skills and confidence have not yet been tested in a real-life environment. Overall, the findings suggest that most students welcome regular CPR training, and this is further supported by other studies (24,25).

### **5.3. Handling a real-life situation**

44.2% of participants felt fairly comfortable that the simulation practices on the CPR workshop were enough to allow them to handle a real-life situation. 34.6% of participants felt somewhat comfortable, 9.6% of participants felt slightly comfortable and only 7.7% of participants felt completely comfortable that the simulation practices on the CPR workshop were sufficient to allow them to handle a real-life situation. 3.8% of participants did not feel comfortable at all. This demonstrates that the CPR training given by the University gives the students enough comfort to perceive themselves as being able to perform CPR in a real-life situation. The findings of this study show that the UEM students participating in this study feel more confident in performing CPR when compared to dentists in Australia and Saudi Arabia at the time of graduation (26,27).

92.3% of participants felt more confident responding to an emergency situation if they received additional training to what they have received to date. The findings of this study are further supported by the study of Jaskiewicz et al., 2022 (16) who show that more hands-on training boosts confidence and readiness to perform CPR. Only four participants did not need extra training to feel more

confident, but three of them indicated that more training in addition to the training received from the University's simulated hospital would be welcome in the previous question. This shows some discrepancy between the results of the participants who would not feel more comfortable if they received additional training.

98.1% of participants felt that the whole team should be trained in performing CPR as opposed to just the dentist. Interestingly, only one participant felt that only the dentist should be trained in performing CPR, and this result has been identified as an outlier.

#### **5.4. Efficiency of CPR Workshop**

Before having carried out the CPR Workshop in the simulated hospital, 67.3% of participants would prefer to assist with the 112 call, 21.2% of participants would volunteer to give the CPR, whereas the 11.5% of the participants would prefer to stay on the sidelines and allow someone else to take charge of the situation, in a scenario where CPR had to be given. Interestingly, after having carried out the CPR workshop in the simulated Hospital, 84.6% of participants would volunteer to give CPR in a scenario where CPR had to be given, whereas only 15.4% would prefer to assist with the 112 call. Importantly though no participants would prefer to stay on the sidelines and allow someone else to take charge of the situation after having carried out the CPR workshop. The findings demonstrate that the CPR training given at the University drastically improves the confidence of the dental students in giving CPR, as well as their willingness and ability to take control of the situation. Participants showed a 399% increase in their willingness to volunteer to give the CPR in a situation of emergency after they have received the University's training, as opposed to before having received the University's training of CPR in the simulated hospital. This demonstrates that the University's CPR training in the simulated hospital provides students with enough skills and knowledge to be able to boost their comfort levels when providing CPR.

Moreover, after having carried out the CPR workshop, 63.5% of participants felt comfortable using equipment such as the defibrillator. However, of these participants who felt comfortable in using the equipment, only 9% have dealt with a real-life emergency situation where CPR had to be used without actually stating if they had the opportunity to use equipment such as the defibrillator during their emergency situation. The actual versus perceptive ability of students being able to use the equipment was not explored further in this study. The results indicated that there is no gender bias between dental students when it comes to the perception of knowledge of CPR techniques. There were no significant differences between male and female participants who took part in this study.

84.3% of participants felt that AED can be dangerous if not used properly. While 15.7% of participants disagreed. It is worth noting that of the 15.7% of participants who disagreed, none of them have experienced a real life situation where CPR had to be performed. 32.7% of participants felt somewhat confident when using the defibrillator, 28.8% of participants felt fairly confident using the defibrillator, 21.2% of participants felt slightly confident when using the defibrillator whereas only 13.5% felt completely confident using the defibrillator. 3.8% of participants did not feel confident at all when using the defibrillator. 50% of the participants who did not feel confident at all when using the defibrillator had already mentioned they felt confident when using equipment such as the defibrillator in a previous question. This causes some discrepancy amongst the results. Of the participants who felt completely confident when using the defibrillator (13.5% was used as a baseline), a striking 85.7% have received additional training outside of the simulated hospital of the University. This may indicate that the University's training does not provide enough depth when teaching dental students how to use the defibrillator, and could be improved.

### **5.5. Perception of knowledge on CPR based on age**

In the case of an emergency, 57.7% of participants felt confident in handling and giving CPR to adults only, whereas 42.3% felt confident in handling and giving CPR to adults, children and infants equally. Of the 57.7% of participants felt confident in handling and giving CPR to adults, 66.7% of participants were within the age group of 20-25. This may indicate that as the age of the dental student increases, they are more comfortable in performing CPR to a wider group of people, such as infants and children. This may be attributed to various reasons, including more experience. This is further supported by Gazal et al., 2021 (28), who found that the knowledge of performing emergency techniques such as CPR, increases with age. Our findings, in line with various studies, show that the experience of dentists and/or dental students has a positive correlation with the dentists' perception of their ability to perform CPR in emergency situations.

### **5.6. Recommendations, limitations and future work**

The study findings indicate that more frequent training on CPR would boost the dental students' confidence to perform CPR, and ensure that their skills are retained over longer periods of time. The study results indicate that dental students welcome more frequent training, with most of the participants preferring CPR training to take place annually.

The study does not investigate whether the participants who have received additional training and have dealt with an emergency situation have purposely chosen to avoid performing CPR (through allowing others to take charge) or whether they have not been exposed to such a situation yet. Moreover, the timing of the additional training received outside the University, and whether it predates the University's training or not, was not explored in this study. Also,

the extent of training on CPR received outside of the University was not collected as part of this study. Investigating more aspects around the additional training received and whether an emergency situation has been faced may indicate how efficient the additional training has been, and if the University should make adjustments to the current training provided.

Only a small number of dental students who have faced a real-life situation where CPR had to be performed thought that the CPR workshop is enough to provide dentists with the appropriate skills. This highlights one of the study's limitations, namely, that the students may feel confident that the training provided is enough, but they have not yet been faced with a situation where their CPR skills would have to be put at use, which could cause the results to shift. Including this aspect in a future study would allow to distinguish between the students' actual confidence versus their perceived confidence when performing CPR.

Moreover, the majority of participants felt comfortable using equipment such as the defibrillator after having completed the University's training. However, only a minimal number of these participants have dealt with a real-life emergency situation where CPR had to be performed and whether any equipment was used has not been collected as part of this study. Future work could assess and compare the actual ability versus the perception of students to use equipment necessary to perform CPR.

## 6. CONCLUSION

In conclusion, the results show a positive correlation between the age of the dental students participating in the study and their experience of performing CPR in a real life situation, and demonstrate that younger dental students have more interest and are more motivated to receive additional training on medical emergencies.

The findings denote that the CPR workshop received by students in the simulated hospital drastically improves the confidence of the dental students in giving CPR or responding in an emergency situation in the clinic or the street, as well as their willingness and ability to take control of the situation. The results also show that the University's CPR workshop provides students with enough skills and knowledge to be able to boost their comfort levels when providing CPR. In addition, the results suggest that the additional training received outside the University may have caused the subjects to be more confident when combined with the University's training. However, the results evince that the confidence of students on performing CPR does not change significantly with the amount of training received outside the University .

Moreover, the findings indicate that although the students may feel confident that the training provided is enough, they have not yet been faced with a real life situation where their CPR skills would be challenged. Furthermore, the findings suggest that the University's training does not provide enough depth when teaching dental students how to use equipment such as the defibrillator. This could be overcome by increasing the frequency of the training provided by the University, as well as focusing the training on handling equipment such as the defibrillator.

In addition, the results point to the conclusion that as the age of the dental students increases, they are more comfortable in performing CPR to a wider group of people, such as infants and children. Also, it illustrates that the experience of dental students has a positive correlation with the dental student's perception of their ability to perform CPR in an emergency situation.

To sum up, the results demonstrate that the CPR training given by the University gives the students enough comfort to perceive themselves as having the basic knowledge and being able to perform CPR in a real-life situation. The results support the importance of receiving regular CPR training, highlighting that most students would welcome more regular CPR training. Finally, the findings of this study show that more hands-on training enhances confidence and readiness to respond to real life emergencies by performing CPR, as well as boosts the students' perception of their own knowledge and confidence on basic PCR techniques.

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