

## Assessment of Knowledge and Practices of University Students of Pediatrics Basic Life Support

Hesham F. El- Sayed, Ahmed M. Abd El Halim, Yasmine G. Mohamed\*

Pediatrics Department, Faculty of Medicine, Suez Canal University, Egypt

\*Corresponding author: Yasmine G. Mohamed, Email: yasmine\_gabr@hotmail.com, Mobile: +201001127536

### ABSTRACT

**Background:** Pediatric cardiac arrest in the out-of-hospital setting is a traumatic event for family, friends, classmates, and school personnel. Children who receive immediate bystander cardiopulmonary resuscitation showed improved survival dramatically. **Aim:** to improve the baseline knowledge and practice of pediatric basic life support among university students who will be responsible for children during their work. **Subjects and methods:** This is a cross sectional study of representative sample of students in the first year from the Faculties of Medicine, Nursing, Dentistry and Education at Suez Canal University. After and before efficacy study of training program assessing knowledge and practice of Pediatric Basic Life Support (PBLs) was done through online questionnaire to prevent grouping during the time of COVID19 pandemic. **Results:** The main outcome of the study was that the overall knowledge score increased significantly after the workshop  $6.07 \pm 1.7$  comparing with before the workshop  $4.67 \pm 1.6$  ( $P < 0.001$ ) and the overall practice score increased significantly after the workshop  $5.65 \pm 1.7$  comparing with before the workshop  $3.97 \pm 1.5$  proving that the web-based learning and video-based self-learning are successful in improving the knowledge and practice of the trainee. **Conclusion:** Overall, there was a significantly improvement of all participants regarding the knowledge and practice of the pediatric life support (PBLs).

**Keywords:** Pediatric cardiac arrest, Cardiopulmonary resuscitation, Automated external defibrillators.

### INTRODUCTION

Children spend a lot of time away from their parents and guardians, whether it could be at school, a training facility, or an amusement center. Even with safety precautions, medical emergencies can still happen at any time. Numerous medical emergencies necessitate prompt attention, including respiratory and airway issues, disorders connected to trauma, severe allergic responses, near drowning incidents, and seizures<sup>(1)</sup>. In the context of an out-of-hospital pediatric cardiac arrest, witnesses were family, friends, and caregivers<sup>(2)</sup>. According to the Central Agency for Public Mobilization and Statistics report from 2017, children in Egypt make up to 40% of the total population. Consequently, initiatives to improve the health of children are extremely important<sup>(3)</sup>.

It is morally required of parents and caregivers to maintain a copy of the child's vital medical records at home, at school, and at daycare centers. They also need to be aware of warning signs of the child's decline and understand pediatric basic life support (BLS), which is the administration of cardio-pulmonary resuscitation (CPR) without the use of any devices or in combination with bag-mask ventilation or barrier devices until advanced life support (ALS) can be given<sup>(4)</sup>. The provision of layperson cardiopulmonary resuscitation (CPR) has been demonstrated to increase the rate of survival, with favorable neurologic result in OHCA victims of all ages, despite the dismal survival rates in OHCA for both adults and children. Consequently, the American Academy of Pediatrics (AAP) recently recommended and supported giving all school employees life support training. Parents, caregivers, and the general public are also in favor of age-

appropriate life support education for kids (e.g., teaching young kids how to help victims of OHCA, teaching older kids CPR, and teaching adolescents CPR and AED use) as a part of the curriculum in schools starting in the primary grades. They also favor the installation of an AED that is suitable for treating adults and kids near every school athletic facility and training school staff and older kids on how to use AEDs properly<sup>(2)</sup>. In order to perform BLS successfully, a range of cognitive knowledge and psychomotor retention skills are needed. These actions are referred to as the "chain of survival," and they include early recognition of cardiac arrest and activation of the emergency response system, effective advanced life support, integrated post-cardiac arrest care, early CPR with an emphasis on chest compressions, and early defibrillation when necessary<sup>(5)</sup>. The implementation of the survival chain phases can increase the survival rate by 10–20%<sup>(6)</sup>. The characteristics of high-quality CPR are effective compressions and opening the airway and delivering ventilation. Compressions are the most important component of CPR and are necessary to maintain circulation to and perfusion of the heart and brain. Whereas compressions-only CPR is acceptable initially for adults, pediatric basic life support (PBLs) updated guidelines recommend giving breaths but, if not possible, then effective chest compressions alone can accomplish bystander CPR<sup>(7)</sup>. According to the 2017 American Heart Association guidelines for Pediatric Basic Life Support, there is no distinction between CPR that involves chest compressions plus breathing and CPR that simply involves chest compressions<sup>(8)</sup>.

So, we aimed to improve the baseline knowledge and

practice of pediatric basic life support among university students who will be responsible for children during their work.

## SUBJECTS AND METHODS

### Subjects:

The study consisted of two phases: Cross sectional study of 175 students from the Faculties of Medicine, Nursing, Dentistry and Education at Suez Canal University. After and before efficacy study evaluation of the training program's content and application of pediatric basic life support (PBLs) through online questionnaire was done at the aim to prevent grouping during the time of the pandemic COVID19.

**Site of the study:** online questionnaire (pre-test) was administered for students of Faculties of Education, Dentistry, Nursing, and Medicine at Suez Canal University before attending video based self-learning administered by the researcher using the web illustrating the PBLs then re-answer the questionnaire (post-test) during the period between 1/3/2020 and 1/9/2020.

**Inclusion criteria:** All registered students in the final year of the four mentioned faculties were invited to participate in the study. **Exclusion criteria:** Students who had previously participated in Pediatric Basic Life Support training program were excluded from the study.

**Methods:** The participants were subjected to a self-administered pretest questionnaire, which was structured after extensive literature review to collect relevant data. It was based on the 2015 ERC P-BLS Guidelines<sup>(4)</sup>. This questionnaire was used for assessment of the baseline knowledge and practices of the PBLs before administration of the PBLs training course, which encompassed two elements as follows:

a) Demographic data, and faculty of the enrolled students. b) Knowledge and practices of the participants towards PBLs and it consisted of 17 multiple choice questions (9 questions assessing knowledge and 8 questions assessing the practice) with four choices each. We used online survey program (google document) to enter the data. The questionnaire was in Arabic for easy analysis and interpretations by the participating students. To verify the internal consistency reliability of the produced questionnaire, sixteen students who were not included in the study completed a pre-test (Cronbach's Alpha value=0.87) and a training course was administered by the researcher and revised by the supervisors in the form of a self-directed video-based learning workshop illustrating all the steps of Pediatric BLS and the video involved a detailed illustration for: Recent guidelines of PBLs and revision of the PBLs steps and standardized performance introduced by the researcher using a manikin for illustration of the right way to practice the PBLs in Arabic<sup>(8)</sup>. Using of feedback devices on the manikins facilitated assessment of rate and depth. Participants might watch this film as

many times as they wanted within the allotted 24-hour period. The video clip lasted for about thirteen minutes.

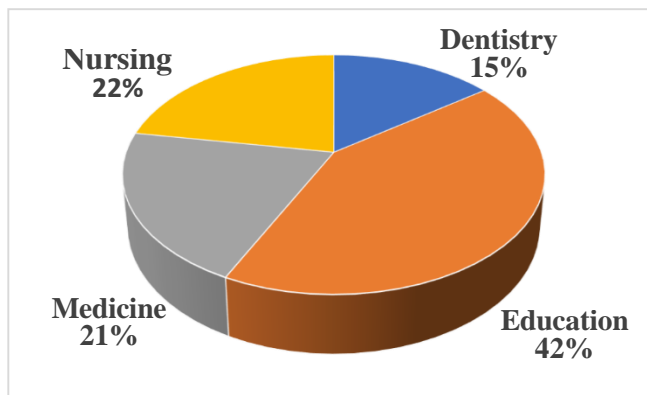
### Ethical approval:

**Approval of Dean and Vice dean for student affairs was obtained for all included faculties before collecting the data from the students, the participating students had an information about the study objective and an online approval was obtained to participate in the study.**

**Statistical analysis:** All Data were coded, analyzed using statistical package for social sciences version 22.0 (SPSS, Chicago, IL, USA). Descriptive data were presented as mean  $\pm$  SD or percentages. Chi-square test or Fisher exact was used for statistical analysis of categorical variables. Distribution of the data was assessed using Shapiro Wilk test. Wilcoxon sign rank test was used to evaluate the mean differences before and after the intervention. A p value  $\leq$  0.05 was deemed statistically significant.

## RESULTS

This study included 175 participants in order to evaluate and also improve the knowledge and practice of students of Suez Canal University of Pediatric Basic Life Support. Most of the study participants were students at Faculty of Education followed by Faculty of Nursing (Figure 1).



**Figure (1):** Distribution of Suez Canal University students according to their faculty.

Regarding the baseline knowledge assessment of the study population, about pediatric BLS before the BLS illustrating workshop, we found that 81.7% of participants gave false answer about "therecommended sequence of CPR", 52.6% of participants gave false answer about "the first response if found unconscious child", 52.6% gave false answer about "the recommended time to start CPR after confirming cardiac arrest", 52% gave false answer about "the recommended number of chest compressions per minute during CRP". Meanwhile 69.7% of participants gave true answer about "the time we should stop CPR", 64% of participants gave true answer about "the time we should start CPR for unresponsive child", 62.3% gave true answer about "the time that the child needs rescue breath" as shown in table (1).

**Table (1):** Distribution of Suez Canal University students according to their answers of knowledge questions before administration of the workshop.

Question	Correct Answer		False Answer	
	Frequency	Percentage	Frequency	Percentage
<b>If you found an unconscious child in the midway, what will be your first response?</b>	83	47.4%	92	<b>52.6%</b>
<b>When you confirm that child is unresponsive, what will be your immediate action?</b>	93	50.4%	82	<b>49.6%</b>
<b>When does the child need rescue breath?</b>	109	62.3%	66	<b>37.7%</b>
<b>What is the recommended sequence of CPR?</b>	32	18.3%	143	<b>81.7%</b>
<b>What is the recommended time to start CPR after confirming cardiac arrest?</b>	83	47.4%	92	<b>52.6%</b>
<b>What is the recommended number of chest compressions per minute during CPR?</b>	84	48.0%	91	<b>52.0%</b>
<b>What is the recommended compression-breath rate during CPR?</b>	99	56.6%	76	<b>43.4%</b>
<b>When should we start CPR for an unresponsive child?</b>	112	64.0%	63	<b>36.0%</b>
<b>When should we stop CPR?</b>	<b>122</b>	<b>69.7%</b>	<b>53</b>	<b>30.3%</b>

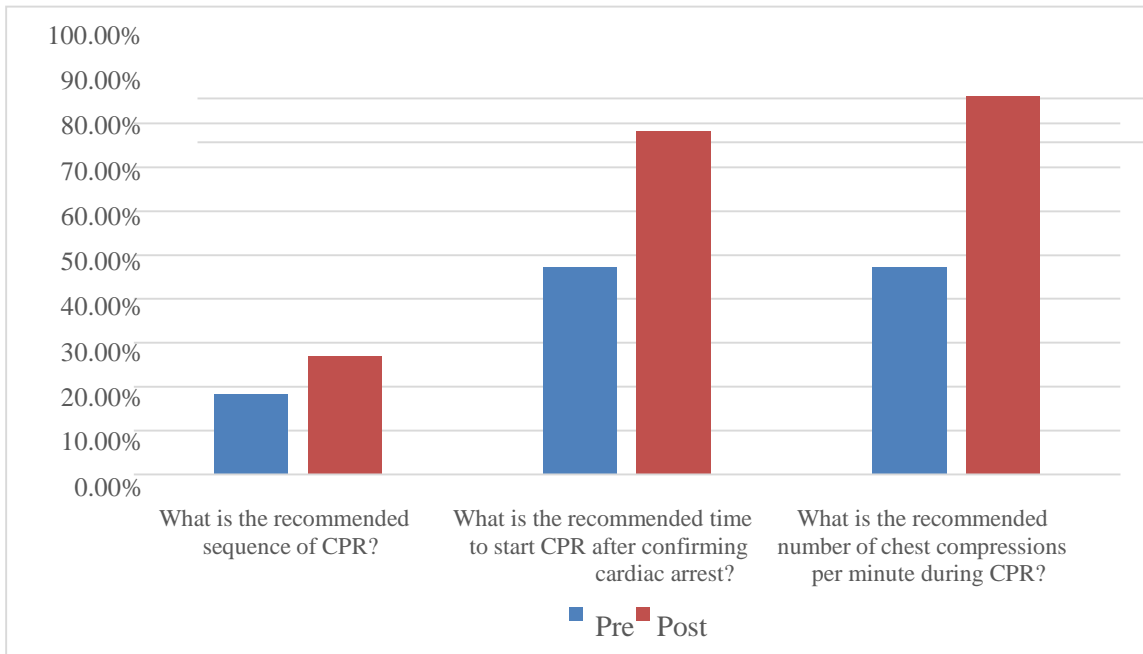
CRP: cardiopulmonary resuscitation.

Re-evaluation of knowledge of pediatrics BLS among participants was done after the workshop by re-answering the same nine questions found that false answers about “the recommended sequence of CPR” decreased to 73.1%, false answers about “the first response if found unconscious child” decreased to 21.1%, giving false answer about “the recommended time to start CPR after confirming cardiac arrest” decreased to 21.7%, and false answer about “the recommended number of chest compressions per minute during CRP” decreased to 13.7%. Meanwhile true answers about “the time we should stop CPR” increased to 27.4%, true answers about “the time we should start CPR for unresponsive child” increased to 85.1%, and true answers about “the time that the child needs rescue breath” increased to 80% as shown in table (2).

**Table (2):** Distribution of Suez Canal University students according to their answers of knowledge questions after the workshop.

Question	Correct Answer		Wrong Answer	
	Frequency	Percentage	Frequency	Percentage
<b>If you found an unconscious child in the midway what will be your first response?</b>	138	78.9%	37	<b>21.1%</b>
<b>When you confirm that child is unresponsive, what will be your immediate action?</b>	87	53.1%	88	<b>46.9%</b>
<b>When does the child need rescue breath?</b>	140	80.0%	35	<b>20.0%</b>
<b>What is the recommended sequence of CPR?</b>	47	26.9%	128	<b>73.1%</b>
<b>What is the recommended time to start CPR after confirming cardiac arrest?</b>	137	78.3%	38	<b>21.7%</b>
<b>What is the recommended number of chest compressions per minute during CPR?</b>	151	86.3%	24	<b>13.7%</b>
<b>What is the recommended compression-breath rate during CPR?</b>	86	49.1%	89	<b>50.9%</b>
<b>When should we start CPR for an unresponsive child?</b>	149	85.1%	26	<b>14.9%</b>
<b>When should we stop CPR?</b>	<b>27</b>	<b>72.6%</b>	<b>48</b>	<b>27.4%</b>

Figure (2) shows that the three questions` answers about knowledge assessment and impact of the workshop on improving the knowledge about pediatrics BLS, as follows, showed improvement. The question entitled **what is the recommended sequence of CPR?** answers showed improvement by 8.6%, regarding the question **what is the recommended time to start CPR after confirming cardiac arrest?** answers showed improvement by 30.9%, while the question entitled **what is the recommended number of chest compressions per minute during CPR?** answers showed improvement by 38.3%. This denotes the significant role of attending the workshop in improving knowledge about pediatric BLS.



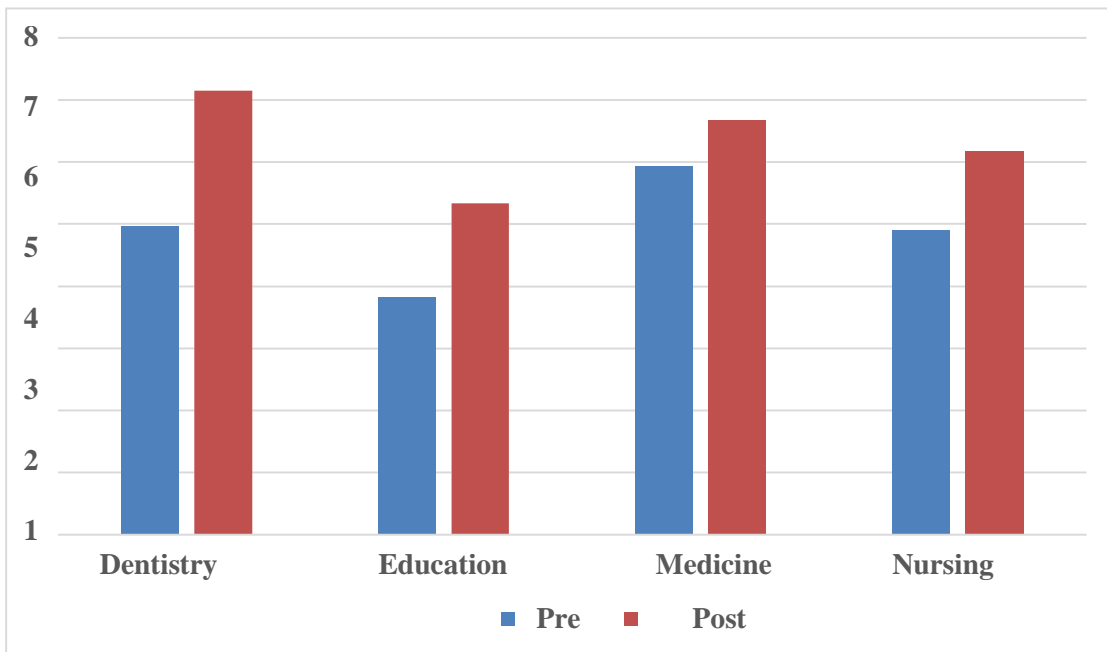
**Figure (2):** Comparison between scores before and after the workshop according to questions with the least scores of knowledge assessment.

Table 3 shows that there was statistically significant increase in the mean of practice post-workshop compared with pre-workshop.

**Table (3):** Comparison between mean practice scores before and after the workshop.

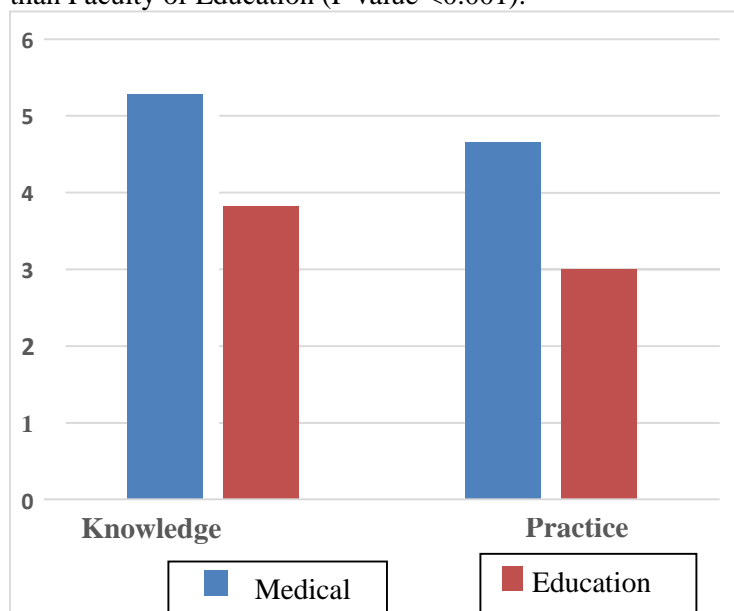
	Pre	Post	p value
Practice Score (Mean ± SD)	3.97±1.5	5.65±1.7	<0.001*

**Figure 3** shows that the comparison between the mean knowledge score before and after the workshop according to the faculty, showed significant differences in Faculty of Dentistry, Faculty of Education and Faculty of Nursing (P <0.001).



**Figure (3):** Comparison between mean knowledge scores before and after the workshop according to faculty.

**Figure 4** shows that faculties of medicine had significantly higher mean score of knowledge and practice than Faculty of Education (P value <0.001).



**Figure (4):** Comparison between mean scores of medical faculties before workshop compared to Faculty of Education.

## DISCUSSION

In terms of resources, BLS needs none, and its significance cannot be disputed. One can perform efficient resuscitation on a victim if they have practice with the necessary procedures and maneuvers. While it is ideal for everyone to know BLS and CPR, medical professionals should be required to have this knowledge in order to work in this sector<sup>(9)</sup>. Several studies were conducted to assess and improve basic knowledge of medical and para-medical personnel about BLS<sup>(10-16)</sup>.

Our study showed that most of included students were females (78.9%), while males were only 21.1%. Most of the study population was students at Faculty of Education (42%). However, the overall medical field (Medicine, Nursing and Dentistry) students represented (58%).

In the present study, the assessment of baseline knowledge of the participating students before attending the workshop showed that, 52% of the students failed to insist on looking for safety as the first step in PBLs if the child is unconscious. This is in agreement with **Srinivas et al.**<sup>(15)</sup> study that was conducted in Mysore among medical, dental, and nursing student to assess knowledge and abilities related to BLS. According to the findings, 80% of people did not prioritize safety.

Applying chest compressions in the proper spot reduces the chance of associated issues like rib fractures and raises the possibility of improving coronary

circulation. Additionally, the depth, pace, and length of the break during the compressions all directly affect how well a cardiac arrest proceeds<sup>(9)</sup>. However, only 69.7% of our study responders identified the correct location of chest compressions for children, 50.3% knew recommended depth during chest compressions in a child more than one year old and 60.6% knew the recommended depth during chest compressions on a child under a year old. This is in the same line with **Chaudhary et al.**<sup>(17)</sup> study, which reported the location of chest compression, the child's compression ventilation ratio, and the depth of chest compression were questions that most applicants did not know how to respond to.

To achieve our goal to improve the knowledge and practice of PBLs among the participating students we introduced a video-based self-education of the PBLs. The use of new information technologies and the internet have led to the evolution of learning and teaching techniques since web-based learning offers more advantages than traditional learning, its conventional analog.<sup>(16)</sup> Impact of attending the web based PBLs workshop, was obvious on improving both the knowledge and the practice of PBLs among the attending students as follows. A statistically significant rise in the mean of knowledge post-workshop, which was  $6.07 \pm 1.7$  comparing with pre-workshop  $4.67 \pm 1.6$  (P value <0.001). The mean practice score also showed statistically significant increase post-workshop  $5.65 \pm 1.7$  comparing with pre-workshop  $3.97 \pm 1.5$  (P value <0.001). This is in agreement with **Elbaih et al.**<sup>(12)</sup> study that was done on emergency nurses to assess their baseline skills about BLS before attending a BLS and PBLs training at Suez Canal University Emergency Department; their mean pre-course practicing score was  $12.4 \pm 3.1$  and post was  $5.65 \pm 1.7$  (P < 0.05)<sup>(12)</sup>. The results were comparable to results in the **Ghanem et al.**<sup>(18)</sup> study that was held on nursing students and showed a significant statistical difference between pretest results regarding PBLs knowledge from  $6.020 \pm 1.563$  to  $13.480 \pm 1.925$  (P value 0.000) post-test with marked improvement after PBLs training and results for PBLs practicing showed significant improvement from pretest score  $40.05 \pm 2.335$  to post-test score  $49.14 \pm 1.432$  (P value 0.003)<sup>(13)</sup>.

In this study, the variation occurred, in the mean knowledge score and mean practice score after attending the workshop, through the participants from medical faculties (Medicine, Dentistry and Nursing) and participants from Faculty of Education was significant (P value <0.001). This shows a significant improvement in the mean understanding and application of pediatric basic life support subsequent to the session among all the participants from all the

faculties. The improvement among Medical Faculties is more than improvement among the other faculties. This is in agreement with **Lami et al.** (19) study, which concluded that the medical curriculum's early adoption of BLS training had a positive impact on medical students than other faculties' students.

## CONCLUSION

Overall, there was a significantly improvement of all participants regarding the knowledge and practice of the pediatric life support (PBLs). The knowledge pre-workshop comparing with post-workshop showed significant difference in all faculties except of Faculty of Medicine. However, regarding to practice the pre-workshop comparing with post-workshop showed significant difference in all faculties. Workshop has a great effect on the short-term knowledge and practice on undergraduate students.

## Disclosure statement:

All authors confirmed that there is no conflict of interest or receiving fund for conducting this work.

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