

Knowledge and Practice of Cardiopulmonary Resuscitation (CPR) For Drowning Victims Among Primary School Children

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Introduction: Drowning is one of the cases that contribute to a high number of death cases as unintentional injury cases worldwide. The victims of this issue are higher among primary school children. Cardiopulmonary resuscitation (CPR) can be performed for drowning victims who showed an absence of breathing and pulse to regain their consciousness and their life. Furthermore, providing the knowledge and practice of CPR should not only be limited to adults but also the children including at the primary level.

Objectives: This study aimed to identify knowledge and the practice of CPR for drowning victims before and after the intervention given.

Methods: A pre-post interventional study design with a purposive sampling method was conducted at the primary school. The studied participants were primary school children who live near the coastal areas. Developed self-administered questionnaires and CPR educational videos were used in this study to identify the knowledge and practice of the studied participants. The data were analysed by using IBM SPSS statistics version 25.0.

Results: The studied participant's ages were 10 and 11 years old. They were capable of comprehending the information delivered to them. Both knowledge and practice of CPR for drowning victims were increased after the educational video intervention was given to them.

Conclusion: The findings showed that although they lacked knowledge and practice of CPR for drowning victims before the intervention, they were able to show improvements in their total score for both parts after the intervention. Educating the children as early as 10 years old regarding CPR for drowning victims was capable to be carried out in the local setting. Hence, the implementation of CPR courses in the curriculum of school children starting from the primary level may happen in the future.

Keywords: Knowledge; Practice; Cardiopulmonary resuscitation; Drowning; Primary school children

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INTRODUCTION

Globally, drowning victims contribute to a higher number of death cases under unintentional injury cases among children at a young age compared to adults (1). Moreover, it is not surprising drowning cases are often recorded in recreational areas such as rivers, beaches, ponds or lakes (2). The numbers of incidents also tend to incline during the weekend and public holidays. Death due to drowning is preventable since some of the victims can be saved by the people who witness the incident including the school children themselves.

Cardiopulmonary resuscitation (CPR) can be performed for drowning victims who showed an absence of breathing and pulse to regain their consciousness. Moreover, the knowledge of CPR should not only be limited to adults only since the World Health Organization (WHO) has endorsed that children are encouraged to participate in life-saving situations (1). Based on this statement, choosing primary school children as a target community to be exposed to CPR education may be beneficial in decreasing the number of deaths due to drowning among school children.

Based on the year 2016's statistics, 320 000 drowning cases have been recorded worldwide, 7% of the death rate and it also became the 3rd prime killer of unintended injury death (1). As stated in the Global Report on Drowning (2014) by the WHO, drowning ranked within the top 5 mortality cases among children under 14 years old (3). Besides, the death due to drowning was high among children from 1 to 4 years old in Bangladesh, Cambodia, Vietnam, Thailand, Beijing and Jiangxi. Among those countries, Thailand has been recorded by WHO as the country with the highest drowning deaths among ASEAN countries (4). Whereas in Malaysia, every year almost 500 victims drown based on the study done by Perak Clinical Research Centre (5). From this finding, drowning has ranked second place as the cause of mortality among children aged 1 to 18 years old.

Although drowning victims have been rescued from drowning, their survival chances still cannot be promised. Mortality may still occur to them if there is no or ineffective resuscitation performed following their drowning rescue.

Cardiopulmonary Resuscitation (CPR) is one of the life-saving skills that involve chest compression and artificial ventilation to enhance the survival potential of the victims who experienced cardiac arrest (6). Performing CPR on cardiac arrest victims required adequate knowledge and proper technique (practice) to increase the potential survival rate for the victims (7).

Furthermore, performing early CPR by bystanders was one of the most successful measures to save a life (8). Since death cases due to drowning highly affected children, introducing and implementing CPR among school children as early as possible may bring positive impacts to the community (8 & 9). This strategy will be beneficial because school children may build their confidence and willingness to perform CPR in helping their friends in real-life situations (9 & 10). In addition, they can help in disseminating their CPR knowledge and proper technique to their friends or family (8). Providing CPR education to school children at a young age such as during primary school may help in reducing the mortality rate caused by drowning (3 & 9). Moreover, a recent study found that primary school children showed a significant change in their attitudes and barriers toward performing CPR for drowning victims after receiving the intervention (9).

In this study, knowledge of CPR for drowning victims refers to the primary school children's understanding of initiating early CPR for drowning victims to revive their life. Whereas the practice of CPR refers to the capability of the primary school children to answer the practice of CPR for drowning victims with the proper sequence and techniques. Although, very limited study has been done in Malaysia to determine the potential of Malaysian children, especially at the primary school level to introduce and learn CPR to save lives. Therefore, this study will be preliminary findings among Malaysian school children aged 10 to 12 years old as participants to determine their knowledge and capability of learning CPR skills practice for drowning victims of same-aged. Thus, this study aimed to survey the knowledge and practice of CPR for drowning victims among primary school children.

METHODS

Method

A quasi-experimental design with educational videos about understanding and performing CPR rescue techniques for drowning victims by applying the pre-and post-intervention method.

Sample Size

In this study, we have included all primary school children that currently studying in the coastal area of Kuantan, Pahang who fulfil the study inclusion criteria. The study sample was calculated using Raosoft Sample Size Calculator with a margin error of 5%, confidence interval of 95% and response rate of 80%. A total of 8 primary schools from Kuantan agreed to participate in this study. Thus, the recommended sample size was 118 for this study. Unfortunately, due to the COVID-19 pandemic situation, this study was unable to conduct face to face. Furthermore, seven schools were withdrawn from the initial plan. Hence, we recalculated the sample size, and the recommended sample size was 14 for this study.

Study instrument

In this study, the researcher and the teams have developed the study instruments. Those were educational videos about understanding and performing CPR for drowning victims, and self-administered questionnaires for pre and post evaluations. The content of educational videos and questionnaires were based on the literature review, Basic Life Support Training Manual of the Ministry of Health Malaysia and American Heart Association 2020 guidelines (11). All those instruments were available in English and Malay language. The educational video about understanding CPR contained information about the anatomy and function of the heart whereas the performing CPR video consisted of step by step doing CPR. The duration of both videos were less than 6 minutes.

Regards with the self-administered questionnaire, there were 3 parts namely Part A, Part B and Part C. Part A consists of sociodemographic characteristics which consist

of age, gender, race, swimming ability, experience in drowning, and CPR learning experience, having witnessed CPR for drowning. While Part B consists of the question related to knowledge regarding CPR for drowning. There are nine questions, and the participants were required to answer either "Yes", "No" or "Not Sure". The sample of questions measuring knowledge of CPR was "Do you know what is CPR?" "Do you know CPR can save the lives of drowning victims?" In Part C of the questionnaire, we measure about studied participant's practise of CPR. In this part, there were 12 questions with multiple choices of answers. For each question of this part C, 4 choices of answers were provided with one correct answer. An example of practice CPR questions is "What should you do after the drowning victim has been out of the water? (Cry out loudly and seek help quickly, Seek help as fast as possible, Ensure to take off the victim's clothes carefully, and ensure the environment is safe for the victim and rescuer).

Validity and Reliability of instruments

Prior to the actual study, our team carried out the validation process. For this study, we used content and face validity which are measured by Content Validity Index (CVI). All instruments used in this study were evaluated by experts from the Nursing and Medicine field. A total of 7 experts were involved to validate the questionnaires and the video developed by the researcher and the team. The cumulative scores of the questionnaire were divided by the number of validators and the average score obtained was 0.81. Since the CVI obtained value was >0.7 , the content of the instrument was appropriate to be used in this study. For the reliability of the questionnaire, the internal consistency of the questionnaire was determined by using the Cronbach's Alpha test. For this study, the Cronbach's Alpha obtained was 0.72 which showed strong internal consistency.

Data Collection

Due to the pandemic COVID-19, data collection was carried out via online communication mediums which were WhatsApp and Telegram. Although this study was conducted online, the researcher and the team hoped that today's children are very familiar with gadgets based on the previous study (12). The links for

the consent form, questionnaire form and education video were created to collect the data from the participants. The link for the consent form was distributed to the school a week before the programme. The class teacher distributed the link for the online consent form to the parents of students aged 10 and 11 years old to obtain agreement from them. On the day of the programme, a brief explanation regarding the study was given to the parents of the consented students. Along with the explanation message, a link to the pre-questionnaire link was attached for the students to access. The participants were given 15 minutes to answer the pre-questionnaire based on their knowledge. After that session, a link to an educational CPR video consisting of the content related to knowledge and practice of CPR was distributed to the participants through the same medium. The studied participants were given a minimum of one week time to understand the contents of the videos. Once they have watched the educational CPR videos, participants were called again and given a link to a set of post-questionnaires for them to answer. All the collected data and information were kept by the researcher confidentially.

Statistical analysis

All the data were recorded as predefined categorical values, and individual scores for each section were calculated. The data of this research study was coded and entered into IBM Statistical Package Social Science (SPSS) Version 25 for data analysis. The descriptive statistical method which is the frequency and percentage was used to analyze the data since we are comparing the pre- and post-intervention results.

Ethics approval and consent of participants

In this study, ethical approval was obtained from the International Islamic University Malaysia Research Ethics Committee (IREC2020-KON2) and the Ministry of Education Malaysia (KPM 600-3/2/3-eras (8557)). Approval from the school principal and from parents through schoolteachers was also obtained. This was the participants of this study were aged between 10-12 years old. The participants were also informed at the beginning of the study that participation was

voluntary, results were confidential, and they have the right to withdraw at any time without penalty. All responses were recorded anonymously in this study.

RESULTS

The data collection period was from February 2021 until March 2021 in this study. A total of 14 students were involved in this study with a response rate of 100%. Pre- and post-intervention were carried out for one month in this study. **Table 1** described the sociodemographic characteristics of this study. The participants consisted of 6 male students (42.9%) and 8 female students (57.1%). The age of the participants was 10 and 11 years old with 4 students (28.6%) and 10 students (71.4%) respectively. Among these participants, 7 of them claimed they can swim with a percentage of 50.0% while 4 students (28.6%) were unable to swim, and 3 students (21.4%) were not sure about their ability to swim. Half of them have experienced a drowning episode with a total of 7 students (50.0%) and the rest of them never experienced a drowning episode before. Almost all the participants did not have any CPR learning experience with a total of 13 students (92.9%) and only 1 student (7.1%) having learnt CPR before. 4 students (28.6%) from these participants have witnessed CPR procedures performed to drowning victims whereas 9 students (64.35) and 1 student (7.1%) never witnessed and not sure regarding witnessing CPR being performed to drowning victims.

Table 2 showed the studied participants' knowledge of CPR for drowning victims before introducing the educational videos. Most of the participants, 12 (85.7%) were able to answer correctly questions regarding the location of the heart and only 2 students (14.3%) answered wrongly. Only 3 (21.4%) participants were able to answer the question "Do you know what is CPR and Do you know the steps to save drowning victims." Meanwhile, 10 participants (71.45) answered correctly "Do you know CPR can save the lives of drowning victims. Among 14 participants, 8 (5.1%) knew that the drowning rate is high among school children. Half (50%) of the participants agreed "Do you know children aged 10-12 years old can perform CPR", "Do you know the education of CPR has been implemented in the school

syllabus of developed countries” and “Do you know learning CPR at an early age can help primary school children in adapting to the CPR practice better in the future”. For questions regarding the similarity between CPR for

drowning and cardiac arrest only 5 (35.7%) participants answered “Yes” while the rest of them, 4 (28.6%) participants and 5 (35.7%) participants chose “No” and “Not Sure” respectively.

Table 1: Sociodemographic characteristics of participants (n=14)

Variables	N (%)
Gender	6 (42.9)
<i>Male</i>	8 (57.1)
<i>Female</i>	
Age	4 (28.6)
<i>10 years old</i>	10 (71.4)
<i>11 years old</i>	
Races	14 (100.0)
<i>Malay</i>	
<i>Chinese</i>	
<i>Indian</i>	
<i>Others</i>	
Do you have the ability to swim?	7 (50.0)
<i>Yes</i>	4 (28.6)
<i>No</i>	3 (21.4)
<i>Not Sure</i>	
Have you ever experienced a drowning episode?	7 (50.0)
<i>Yes</i>	7 (50.0)
<i>No</i>	
<i>Not Sure</i>	
Do you have any Cardiopulmonary Resuscitation (CPR) learning experience before education?	1 (7.1)
<i>Yes</i>	13 (92.9)
<i>No</i>	
<i>Not Sure</i>	
Have you ever witnessed any Cardiopulmonary Resuscitation (CPR) procedure performed for drowning?	4 (28.6)
<i>Yes</i>	9 (64.3)
<i>No</i>	1 (7.1)
<i>Not Sure</i>	

Table 2: Pre-intervention: knowledge of CPR for drowning victims (n=14)

Knowledge	N (%)
Where is the location of the heart?	
A	2 (14.3)
B (Correct)	12 (85.7)
C	0 (0.0)
Do you know what is Cardiopulmonary Resuscitation (CPR)?	
Yes	3 (21.4)
No	8 (57.1)
Not Sure	3 (21.4)
Do you know CPR can save the lives of drowning victims?	
Yes	10 (71.4)
No	3 (21.4)
Not Sure	1 (7.1)
Do you know the drowning death rate is high among school children?	
Yes	8 (57.1)
No	3 (21.4)
Not Sure	3 (21.4)
Do you know children aged 10-12 years old can perform CPR?	
Yes	7 (50.0)
No	5 (35.7)
Not Sure	2 (14.3)
Do you know the education of CPR has been implemented in the school syllabus of developed countries?	
Yes	7 (50.0)
No	4 (28.6)
Not Sure	3 (21.4)
Do you know learning CPR at an early age is able to help primary school children in adapting to the CPR practice better in the future?	
Yes	7 (50.0)
No	6 (42.9)
Not Sure	1 (7.1)
Do you know the steps to save drowning victims?	
Yes	3 (21.4)
No	8 (57.1)
Not Sure	3 (21.4)
Do you know if CPR for drowning and CPR for cardiac arrest is the same?	
Yes	5 (35.7)
No	4 (28.6)
Not Sure	5 (35.7)

Table 3 showed the result of post-education of knowledge of CPR for drowning victims. Studied participants' knowledge was improved after being given the educational videos. They could answer correctly for most of the questions. For post-intervention results, the participants who were able to answer "Yes" categorized as "Correct" and those who were answered "No" or "Not sure" categorized as "Wrong". Despite these improvements, the question "Do you know learning CPR at an early age can help primary school children in adapting to the CPR practice better in the

future" shows the number of participants declined after taking the education. Five (35.7%) participants answered "Yes" for pre-intervention but only 4 (28.6%) participants were able to answer correctly for post-intervention. The questions with the highest percentage of correct answers were the location of the heart and a question regarding learning CPR at an early age can help primary school children in adapting to the CPR practice better in the future with 13 students (92.9%). The question "Do you know what is CPR" has shown significant improvement in the correct

answer from a total of 3 (21.4%) participants were able to answer correctly to 10 (71.4%)

participants after watching the CPR educational videos.

Table 3: Post-intervention: knowledge of CPR for drowning victims (n=14)

Knowledge	N (%)
Where is the location of the heart?	
<i>Correct</i>	13 (92.9)
<i>Wrong</i>	1 (7.1)
Do you know what is Cardiopulmonary Resuscitation (CPR)?	
<i>Correct</i>	10 (71.4)
<i>Wrong</i>	4 (28.6)
Do you know CPR can save the lives of drowning victims?	
<i>Correct</i>	12 (85.7)
<i>Wrong</i>	2 (14.3)
Do you know the drowning death rate is high among school children?	
<i>Correct</i>	10 (71.4)
<i>Wrong</i>	4 (28.6)
Do you know children aged 10-12 years old can perform CPR?	
<i>Correct</i>	12 (85.7)
<i>Wrong</i>	2 (14.3)
Do you know the education of CPR has been implemented in the school syllabus of developed countries?	
<i>Correct</i>	8 (57.1)
<i>Wrong</i>	6 (42.9)
Do you know learning CPR at an early age is able to help primary school children in adapting to the CPR practice better in the future?	
<i>Correct</i>	13 (92.9)
<i>Wrong</i>	1 (7.1)
Do you know the steps to save drowning victims?	
<i>Correct</i>	7 (50.0)
<i>Wrong</i>	7 (50.0)
Do you know if CPR for drowning and CPR for cardiac arrest is the same?	
<i>Correct</i>	4 (28.6)
<i>Wrong</i>	10 (71.4)

Table 4 showed the comparison results from pre-and post-intervention about CPR knowledge in studied participants. The number of participants who were able to obtain a score of 5 to 9 was categorized as good knowledge. It

was found that the number of participants increased from 7 (50.0%) to 11 (78.6%) for good knowledge on their knowledge of CPR for drowning victims.

Table 4: Comparison of knowledge of CPR for drowning victims (n = 14)

Total Score Obtained	The correct answer, N (%)	
	Pre-education	Post-education
0 - 4	7 (50.0)	3 (21.4)
5 - 9	7 (50.0)	11 (78.6)

Table 5 showed the comparison results from pre- and post-intervention CPR practice in the studied participants. The score numbers also increased after the intervention was given. The finding showed that 9 (64.3%) participants were able to correctly answer the CPR practice

Table 5: Comparison of the practice of CPR for drowning victims (n = 14)

Total Score Obtained	The correct answer, N (%)	
	Pre-education	Post-education
0 - 6	8 (57.1)	5 (35.7)
7 - 12	6 (42.9)	9 (64.3)

questions after the intervention was given. Lastly, the mean score for knowledge and the practice of CPR for drowning victims also improved from 4.4 to 6.4 and from 6.3 to 7.2 respectively as shown in **Table 6**.

Table 6: Mean score comparison pre- and post-intervention (n=14)

	Pre- education	Post-education
	Mean (SD)	Mean (SD)
Knowledge	4.4 (2.1)	6.4 (2.3)
Practice	6.3 (3.1)	7.2 (3.6)

DISCUSSION

This study showed that primary school children as early as 10 years old were able to understand the information delivered to them. Though this study was conducted online with a few sample sizes, the studied participants were able to capture the importance of learning CPR and how to save the drowning victim. Previous studies have shown that the wisely usage of the internet can improve a person’s studies and future career benefits, as well as the implementation of regular educational programs with structured modules, which will have an impact on students (13 -15). A study showed that school children of older age have higher knowledge compared to younger school children, they claimed that their theoretical knowledge has shown significant development after training was provided to these younger participants (16). This statement was similar to our findings regarding the improvement of knowledge of CPR. The same result was also shown by another study, they found that 97.7% of 1899 participants aged 10 to 12 years old were able to understand CPR after the education given (17). After the course, more than 80% of the participants encouraged CPR

education should also be delivered to the public.

A study also had stated in their six-year longitudinal study regarding CPR among school children at the age of 10 years old that their knowledge of CPR was able to increase for both teachings given by schoolteachers and emergency physicians (18). Moreover, the students show an increase in knowledge although it was not really significant despite the medium of education is through educational videos. This supports the statement found in a previous study where students were able to obtain CPR knowledge with different types of instructors (17). Although the knowledge of CPR for drowning was improved after the intervention. These findings were not significantly inclined compared to the pre-intervention phase which may suggest that delivering the knowledge through an educational video may also come along with real-life education.

A study also showed that their studied participants’ practice of CPR scores were increased after post-training compared to before training is given (19). This finding has similar to our study findings. However, face to

face learning can enhance their ability to absorb more knowledge and help them retain their theoretical knowledge (16). In this study, high numbers of participants with above 70 % were able to give correct answers for action to be taken for unconscious drowning victims, action for conscious and normal breathing victims, correct hand position and correct hand placement for cardiac compression with 71.4%, 78.6%, 71.4% and 85.7% respectively. Some of these findings were the same as the data from the previous finding in which the participants were able to give positive outcomes in aspects of actions that should be done for the unconscious victim, the correct position of the hand and correct chest compression depth and frequency (16).

Another study also remarked that the number of participants with correct answers in handling unconscious victims was able to increase from 2 % to 83 % after taking the training. However, due to the young age of 10 to 12 years old of the studied participants, they can achieve a minimal standard of compression rate but poor chest compression (19).

Meanwhile, the percentage of correct answers for the question regarding the steps for victims who are conscious and can breathe normally and questions in which the victim is not breathing normally was declined. There were unclear reasons for these findings since the result of a study showed that the success rate for school children aged 10 to 12 years old was more than 80% after the training (20). Besides, there were no changes in correct answers for hand position questions. While a study found that 55.42% of the participants in their study were able to obtain 100% correct answers for hand posture after the training (21 & 22). These findings obtained from this study may be due to confusion in choosing the correct answer for the participants based on the CPR education given during the intervention. Moreover, CPR educational videos may cause them to think of different ways to answer the question since there were few situations which required different types of intervention according to the situations provided.

Last but not least, this study was able to collect theoretical data for the practice of CPR for drowning. The exact capability of the students aged 10 and 11 years old cannot be determined through the findings of this study only. Real-

life training may give them different exposure and information on CPR for drowning in aspects of practices. Hence, theoretical knowledge education should also come along with practical sessions of CPR for drowning are required to be delivered among these school children to ensure more effective intervention. Thus, the researcher and the team hope to conduct similar studies with a bigger sample size in the future for the benefit of school children in the coastal area to save more lives if they encounter with drowning situation.

CONCLUSION

We hope this study's findings serve as an introduction and preliminary data for future studies related to CPR for drowning victims among primary school children. The data findings can give some ideas to further researchers on which area can be improved to ensure the participants can obtain more knowledge and practice CPR for drowning victims. Moreover, some improvements in knowledge and the practice can be seen among the primary school children showing that they were still able to gain the information that was being delivered although they were at a young age. Proper and frequent exposure to CPR for drowning including real-life training was needed to ensure these primary school children can also get a clear method for them to perform more effective CPR in a real drowning situation.

The main limitations faced by the researcher and the teams were especially for data collection, it was due to the Covid-19 pandemic situation during that time. This study was planned to be conducted physically, and questionnaires should be disseminated face to face to the participants. However, our team had to obey the National Security Council and University authorities regarding the implementation of Movement Control Order (MCO) instruction.

From this study finding, we suggest the inculcation of CPR for drowning victims in the curriculum of primary school children in Malaysia should be initiated. Thus, Malaysia will be able to be a Centre of Excellence as stated in KEGA proposed by the Malaysian government and can achieve the fourth goal of SDGs 2030 World Vision which is Quality Education in the aspect of school curricula for primary school.

CONFLICT OF INTEREST

The authors declared that there are no conflicts of interest.

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REFERENCES

1. World Health Organization. Drowning. 2020. WHO, <https://www.who.int/news-room/fact-sheets/detail/drowning>.
2. Franklin, Richard Charles, Peden, Amy E, Hamilton, Erin B, Bisignano, Catherine, Castle, Chris D, Dingels, Zachary V, Roberts, Nicholas LS. The burden of unintentional drowning: global, regional and national estimates of mortality from the Global Burden of Disease 2017 Study. *Injury prevention*. 2020; 26(Supp 1), i83-i95.
3. World Health Organization. Global report on drowning: preventing a leading killer. Drowning. 2014
4. Khidhir S. Gasping for air: Thai kids are drowning. *The Asean Post*. 2019. <https://theaseanpost.com/article/gasping-air-thai-kids-are-drowning>.
5. Jay BN. With 500 drownings annually, Malaysian hotspots need more warning signs. *The New Straits Times*. 2019. <https://www.nst.com.my/news/nation/2019/06/494205/500-drownings-annually-malaysian-hotspots-need-more-warning-signs>.
6. Bon CA. *Cardiopulmonary Resuscitation (CPR): Practice Essentials, Preparation, Technique*. 2018. Retrieved August 17, 2020, from <https://emedicine.medscape.com/article/1344081-overview>.
7. Meaney et al. *Cardiopulmonary Resuscitation Quality: Improving Cardiac Resuscitation Outcomes Both Inside and Outside the Hospital: A Consensus Statement From the American Heart Association*. *Circulation*. 2013; 128(4), 417-435. doi:10.1161/cir.0b013e31829d8654.
8. Bohn A, Van Aken HK, Möllhoff T, Wienzek H, Kimmeyer P & Wild et al. Teaching resuscitation in schools: annual tuition by trained teachers is effective starting at age 10. A four-year prospective cohort study. *Resuscitation*. 2012; 83(5), 619-625. doi:10.1016/j.resuscitation.2012.01.020.
9. Nurumal MS, Jamaludin TSS, Shamsudin LA & Ramli MZ. Attitudes and Barriers of Primary School Children on Cardiopulmonary Resuscitation for Drowning Victims. *Jurnal Pendidikan Keperawatan Indonesia*. 2012; 7(2), p. 104-111. Doi: 10.17509/jpki.v7i2.39994.
10. Böttiger BW & Van Aken H. Kids save lives Resuscitation. 2015; 94, A5-A7. doi:10.1016/j.resuscitation.2015.07.005.
11. American Heart Association. *CPR & First Aid Emergency Cardiovascular Care*. AHA. 202. <https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines>
12. Othman N, Kelana MKS & Jamaludin TSS. The Impact of Electronic Gadget Uses with Academic Performance among Secondary School Students. *Prac Clin Invest*. 2020. 2(2): 56-60.
13. Jamaludin TSS, Awang Kechik N & Chan CM. The Impact of Internet Usage for Academic Purposes on Nursing Students' Achievement. *Sch. J. App. Med. Sci*. 2017; 5(10A):3857-3861.
14. Jamaludin TSS, Awang Kechik N, Saidi S & Chan CM. Usage of Internet for Academic Purposes on University Students' Achievement: A Literature Review. *Nursing & Healthcare International Journal*. 2018; 2 (1).
15. Jamaludin TSS, Zakaria MA, Saidi S, Chan CM. Knowledge, awareness and attitude of first aid among health sciences university students. *International Journal of Care Scholars* 2018;1(1).
16. Pivač, et al. The impact of cardiopulmonary resuscitation (CPR) training on schoolchildren and their CPR knowledge, attitudes toward

- CPR, and willingness to help others and to perform CPR: mixed methods research design. *BMC Public Health*. 2020; 20(1). doi:10.1186/s12889-020-09072-y
17. Kitamura et al. Compression-only CPR training in elementary schools and student attitude toward CPR. *Pediatrics International*. 2016; 58(8), 698-704. doi:10.1111/ped.12881.
 18. Lukas RP, Van Aken H, Mölhoff T, Weber T, Rammert M, Wild E & Bohn A. Kids save lives: a six-year longitudinal study of schoolchildren learning cardiopulmonary resuscitation: Who should do the teaching and will the effects last? *Resuscitation*. 2016; 101, 35-40. doi:10.1016/j.resuscitation.2016.01.028.
 19. Calicchia S, Cangiano G, Capanna S, De Rosa M & Papaleo B. Teaching Life-Saving Manoeuvres in Primary School. *BioMed Research International*. 2016; 1-6. doi:10.1155/2016/2647235
 20. Campbell S. Supporting mandatory first aid training in primary schools. *Nursing Standard*. 2012; 27(6): 35-39.
 21. Banfai B, Pek E, Pandur A, Csonka H & Betlehem J. "The year of first aid": effectiveness of a 3-day first aid programme for 7-14-year-old primary school children. *Emergency Medicine Journal*. 2017; 34(8), 526-532. doi:10.1136/emered-2016-206284.
 22. Li et al. Bystander cardiopulmonary resuscitation training in primary and secondary school children in China and the impact of neighbourhood socioeconomic status. *Medicine*. 2018; 97(40), e12673. doi:10.1097/md.00000000000012673.