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Research Article

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CPR Knowledge and Attitude among Secondary School Students in Negeri Sembilan, Malaysia

(***Running Title:*** *CPR Knowledge and Attitude among Secondary School Students*)

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Abstract

Background: Early cardiopulmonary resuscitation (CPR) is essential for out-of-hospital cardiac arrest (OHCA) as it increases the chance of survival in two to three folds. Therefore, it is important to improve the public's CPR knowledge as 70-75% of first responders in OHCA are usually the victims' relative, who is more likely a non-medical person.

Objectives: To assess the level of CPR knowledge among students and explore its relationship with the sociodemographic factors (such as age, gender, previous CPR training). Additionally, to determine how the level of knowledge influence students' attitudes towards learning and performing CPR.

Methods: A validated questionnaire consisted of three sections (sociodemographic factors, CPR knowledge, attitudes towards learning and performing CPR) were distributed to a total of 390 students from Form 1, 2 and 4 in SMAP Labu, Negeri Sembilan, followed by CPR and Basic Life Support (BLS) teaching session. Independent t-test, Chi-square and correlations were used to determine the relationship with p-values less than 0.05 were taken as significant at 95% confidence intervals.

Results: The level of CPR knowledge among the secondary school students of SMAP Labu was inadequate (9.97 ± 3.445 out of 18). In overall, majority of students have a positive attitude towards CPR where 69.0% of them scored more than 26 out of 30. Older students (above 15 years old), form 4 students and those with previous CPR training scored significantly higher level of knowledge ($p < 0.01$). The level of CPR knowledge and attitude showed a positive correlation ($r=0.149$, $p < 0.01$).

Conclusion: More studies should be conducted on a larger scale in Malaysia to support the implementation of CPR as a part of the Malaysian curriculum and further improve the survival rates of OHCA as seen in other countries.

Keywords: Cardiopulmonary resuscitation, knowledge, attitude, secondary school students

1. Introduction

CPR is a vital emergency procedure that can significantly improve survival rates during OHCA. In most cases, the first responders are usually laymen, often the victim's relatives, yet many lack adequate CPR knowledge (1–5). Studies show that immediate bystander CPR doubles or triples the chances of survival, emphasizing the urgent need for extensive CPR training (2). Despite this, CPR knowledge remains alarmingly low among the public, with only 28-29% of non-medical individuals trained in countries like Saudi Arabia, Ireland, and New Zealand (1,3,4). Another study conducted among teachers in Japan found that there is a significant improvement in knowledge after an intervention program which suggests that non-medical community can be educated, and they are able to retain a good level of CPR knowledge by attending refresher course. In Malaysia, cardiac arrest was among the leading causes of death in 2022, emphasizing the need for better CPR awareness (6). According to a study conducted, two-thirds of Malaysian college students were willing to perform CPR on their family members while having poor knowledge of CPR techniques was the main concern to refuse to perform hands-only CPR in all the circumstances. This further signifies that knowledge is important improve willingness among the public.

Efforts to integrate CPR training into school curricula have shown promising results. Organizations such as the World Health Organization (WHO) advocate for CPR training for students as young as 12 years old, suggesting that early education can significantly improve knowledge retention and willingness to perform CPR (7,8). Countries that have implemented this have reported significantly higher resuscitation rates which further supports the fact that incorporating CPR training in school is highly recommended. This is seen in Scandinavian countries which have reported a twofold increase in bystander CPR rates and a threefold rise in survival following school-based training programs (8). These

findings underscore the potential of targeting younger age groups to build a more CPR-capable society.

As mentioned, it is important to improve the bystander's CPR knowledge as the survival of OHCA victims heavily relies on their ability to recognize cardiac arrest, activate EMS, and perform BLS. To begin incorporating the CPR knowledge into the younger generation which aligns with WHO advocate, we would like to determine the extent of CPR knowledge among the students before we can recommend integrating CPR course into school curriculum, that is just suitable for the students of a particular age. Moreover, we hope to determine whether the level of knowledge is correlated with the attitude towards performing CPR.

This study aimed to assess the CPR knowledge and attitude towards performing CPR among young Malaysians, by questioning the secondary school students about signs of cardiac arrest, BLS knowledge and to what extent do they agree with the statements provided in attitude section.

2. Methods

Questionnaires were distributed to the form 1, 2 and 4 students from SMAP Labu, Negeri Sembilan. Approval was obtained from the Ministry of Education, Malaysia, the International Medical University Joint Committee (IMU-JC), and the headmaster of the selected school. Participation was voluntary and consent was obtained from the guardian prior to the questionnaire distribution. A briefing was given to the students before answering the questionnaire. The students were given one hour to answer the questions, followed by a CPR and BLS session. A total of 390 students participated in the study.

The questionnaire was adapted from similar studies, translated into Malaysian Language and validated through a pilot study, achieving a Cronbach's alpha of over 0.7. It consisted of three sections: sociodemographic backgrounds, knowledge and attitude towards CPR. The first section included questions on age, gender, school stream, healthcare background and previous CPR training. The second section tested the student's knowledge on risk factors and signs of heart attack, as well as theoretical knowledge related to BLS. Correct responses of "very sure" or "sure" received 1 point each, with a maximum score of 18. Students scoring above the mean were deemed knowledgeable. The last section tested the attitude of students to learn and perform CPR with responses collected via a 5-point Likert scale.

Data analysis was done via IBM SPSS (version 29.0). Independent sample t-test and Chi-square tests were used to assess associations between variables, with significance level set at $p < 0.05$. Correlations was used to assess the relationship between knowledge and attitudes towards CPR.

3. Results

3.1. Demographic Data

Table 1 showed that two-thirds of students participated in the study were below 15 years old, which was 274 (70.3%) out of the total responses. Meanwhile, there was only 116 (29.7%) students which were 15 years old and above. There was a little predominance towards the number of female students which was 197 (50.5%), compared to male students which was 193 (49.5%). Most of the respondents were in the "Others" stream, which accounted for 274 (70.3%) respondents, as the students would not pick their stream until form 4. Meanwhile, the science stream has a total of 116 (29.7%) respondents.

Table 1: Sociodemographic Characteristics of Respondents.

	Number (n)	**Percentage (%)**
Age		
Less than 15 years old	274	70.3
15 years old and above	116	29.7
Gender		
Male	193	49.5
Female	197	50.5
Form		
1	134	34.36
2	140	35.90
4	116	29.74
Stream		
Science	116	29.7
Accountancy	0	0
Literature	0	0
Others	274	70.3
Received CPR training previously		
Yes	48	12.3
No	342	87.7

Note.

3.2. Demographic Characteristics of Students who Received Previous CPR Training

There were 48 students (12.3%) who have received CPR training before, out of 390 students who were involved in the study. Majority of the students received CPR training previously were male (56.25%), while female students constituted 43.75% of the sample. Most of the students (72.92%) were 15 years old and above, whereas 27.08% are less than 15 years old. The largest group of participants is in Form 4 (41.67%), followed by Form 2 (31.25%) and Form 1 (27.08%). According to the data in Table 2, most participants (75.0%) received their last CPR training within the past 12 months, while 25.0% had their last training more than 12 months ago.

Table 2: Sociodemographic Characteristics of Respondents who Received CPR Training.

	Number (n)	Percentage (%)
Gender		
Male	27	56.25
Female	21	43.75
Age		
Less than 15 years old	13	27.08
15 years old and above	35	72.92
Form		
1	13	27.08
2	15	31.25
4	20	41.67
How long ago do they receive last CPR training		
Less than 12 months	36	75.0
More than 12 months	12	25.0

Notes.

3.3. Knowledge

Based on figure 1, the knowledge scored by the students has a mean score of 9.97 ± 3.445 with a maximum score of 18. 167 (42.8%) of students were considered to have poor level of knowledge whereas 223 (57.2%) of them was considered to have good level of CPR knowledge, with regards to the normal distribution curve tabulated.

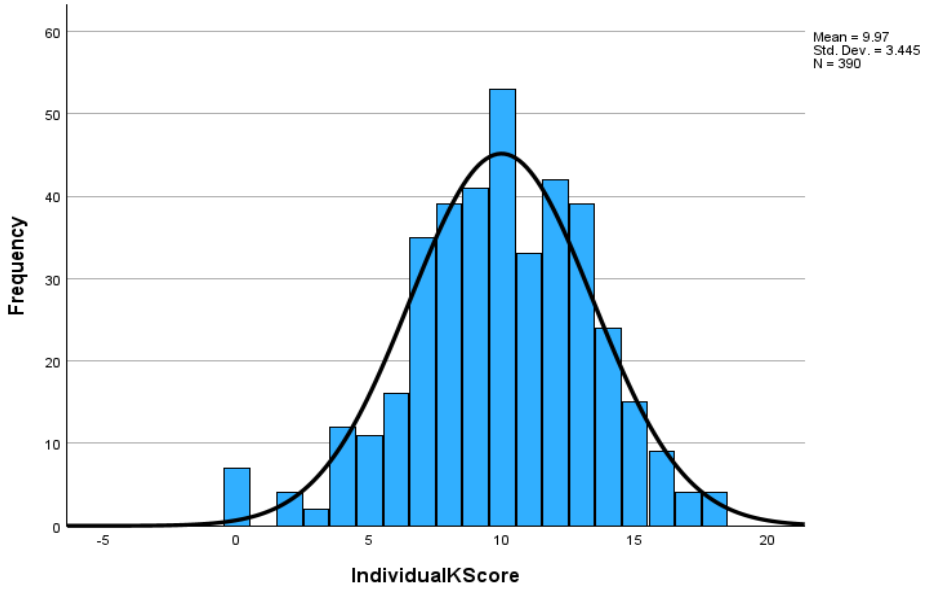

Figure 1: Knowledge Scored by the Students with Mean Score of 9.97.

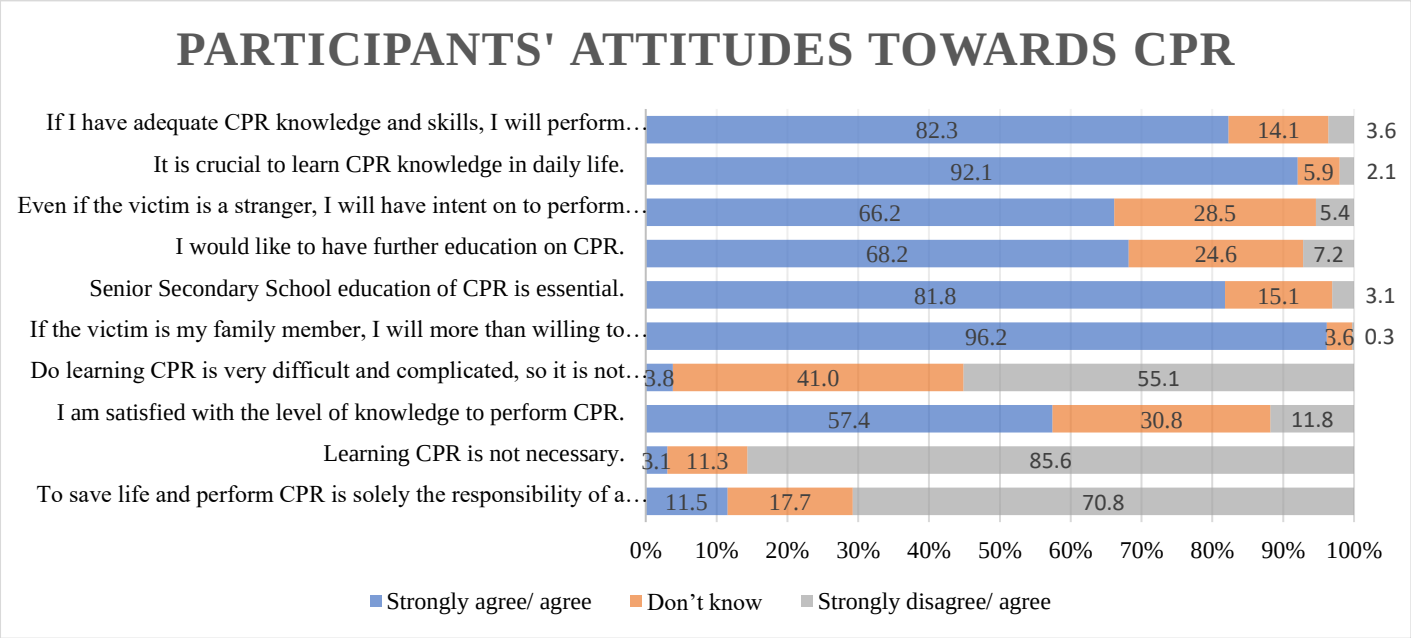

Figure 2: Attitude of Students towards CPR Training (N=390).

The means of questions in the knowledge section were tabulated in Table 3. The higher the mean, the more the students know about the specific topic. For example, the mean of question 5 "Healthy lifestyle reduces the risk of cardiac arrest" under Cardiac Arrest was 4.65 ± 0.730, indicating that the students were very confident regarding healthy lifestyle reducing risk of cardiac arrest. On the other hand, the mean of question 2 "Rate of compression is 100 per minute" under CPR (2010 Guidelines) was 1.94 ± 1.248, indicating the students was very unsure of factual knowledge regarding CPR and BLS.

Table 3: Variables in the Knowledge Section with the Number of Responses.

	Very Sure	Sure	Don't Know	Unsure	Very unsure	N	Mean	Std. Deviation
About Cardiac Arrest								
Cardiac arrest is due to arterial occlusion.	72	106	43	11	158	390	2.80	1.621
Central chest pain is a sign of cardiac arrest.	40	138	138	8	66	390	3.20	1.194
Shortness of breath is a warning sign of cardiac arrest.	68	165	94	12	51	390	3.48	1.203
Cardiac arrest can be treated.	71	172	78	15	54	390	3.49	1.235
Healthy lifestyle reduces the risk of cardiac arrest.	285	90	5	2	8	390	4.65	0.730
Risk Factor of Heart Attack								
Old age	131	193	38	6	22	390	4.04	1.002
Stress	48	156	94	18	74	390	3.22	1.286
Smoking	164	164	40	1	21	390	4.15	0.999
Hypertension	133	169	32	4	52	390	3.84	1.281
Hyperlipidaemia	111	107	40	4	128	390	3.18	1.647
Alcohol	82	122	77	11	98	390	3.20	1.467
Diabetes	18	57	158	34	123	390	2.52	1.206
Overweight	98	151	67	10	64	390	3.54	1.339
Lack of exercise	52	162	105	10	61	390	3.34	1.219
CPR (2010 Guidelines)								
"C-A-B" stands for circulation-airway-breathing	34	57	60	10	229	390	2.12	1.450
Rate of compression is 100/min	13	46	75	25	231	390	1.94	1.248
To check for response, gently tap the victim's shoulder and call the patient with a loud voice.	62	115	71	28	114	390	2.96	1.475
Give two mouth-to-mouth rescue breaths	91	145	52	13	89	390	3.35	1.461

Note.

3.4. Attitudes towards CPR

Most students (96.2%) agreed that they are willing to perform CPR if the victim is a family member. The students scored "don't know" highest (41%) in the statement "Do learning CPR is very difficult and complicated, so it is not suitable for secondary school students". Meanwhile, majority of students (85.6%) disagreed that learning CPR is not necessary. In this study, 80 students (20.5%) scored between 24 and 26, while 269 students (69.0%) scored above 26, showing that overall, the students have a positive attitude towards CPR. The higher the score, the more positive the attitude towards CPR.

Table 4: Number of Students who Scored Below (Poor Knowledge) and Above Mean (Good Knowledge).

	Frequency	Percentage (%)
Below mean (Poor knowledge)	167	42.8
Above mean (Good knowledge)	223	57.2

Notes.

3.5. Knowledge & Attitudes

There was a weak positive correlation between the level of CPR knowledge and attitudes towards CPR (r = 0.149).

Table 5: Sociodemographic factors and level of CPR knowledge.

	Below Mean		Above Mean		p-value
	N	%	N	%	
Age					
Less than 15	133	79.64	141	63.23	0.000 [a]
15 and above	34	20.36	82	36.77	
Gender					
Male	87	52.10	106	47.53	0.373 [b]
Female	80	47.90	117	52.47	
Form					
1	66	39.52	68	30.49	0.000 [a]
2	67	40.12	73	32.74	
4	34	20.36	82	36.77	
CPR training					
No	158	94.61	184	82.51	0.001 [b]
Yes	9	5.39	39	17.49	

Notes.

Table 6: Statements in the Attitude Section with the Number of Responses.

	Strongly agree	Agree	Don't Know	Disagree	Strongly disagree	N
If I have adequate CPR knowledge and skills, I will perform CPR to the people in need.	156	165	55	8	6	390
It is crucial to learn CPR knowledge in daily life.	166	193	23	3	5	390
Even if the victim is a stranger, I will have intent on to perform CPR.	101	157	111	14	7	390
I would like to have further education on CPR.	82	184	96	21	7	390
Senior Secondary School education of CPR is essential.	105	214	59	6	6	390
If the victim is my family member, I will more than willing to perform CPR.	294	81	14	0	1	390
Do learning CPR is very difficult and complicated, so it is not suitable for secondary school students.	4	11	160	149	66	390
I am satisfied with the level of knowledge to perform CPR.	52	172	120	35	11	390
Learning CPR is not necessary.	4	8	44	138	196	390
To save life and perform CPR is solely the responsibility of a medical professional and irrelevant for public.	18	27	69	144	132	390

Table 7: Attitude of Students towards CPR Training.

	Frequency	Percent (%)
Total Score of Attitude towards CPR Training		
20 and below	15	3.8
21 to 23	26	6.7
24 to 26	80	20.5
27 to 30	269	69.0

Note.

Table 8: Correlations between Knowledge and Attitudes towards CPR.

	Level of CPR Knowledge	Attitude towards CPR
Level of CPR Knowledge		.15**
Attitude towards CPR	.15**	

Notes. Correlation is significant at the 0.01 level (2-tailed).

4. Discussions

The study found that majority of respondents (70.3%) were below 15 years old, with a nearly equal gender distribution. Only 12.3% had received prior CPR training, and 75% of them had training within the last 12 months. Knowledge assessment revealed that 57.2% of students scored above the mean, with older students (15 years and above), Form 4 students, and those with previous CPR training significantly outperforming others ($p<0.05$). Gender difference in knowledge scores was not statistically significant. Overall, the students demonstrated a good level of knowledge on signs and risk factors of cardiac arrest but showed uncertainty regarding CPR guidelines. This is similar to a study conducted by Urban J et.al, where only less than 20% of the non-medical population knows how to perform hands-only CPR. (9)

In terms of knowledge among different age groups, the study conducted shown that 72.92% of the students are above 15 years old, and 70.69% of them were found to significantly score a higher score of knowledge than the students below 15 years old (p-value <0.05). In comparison with other studies such as in Slovenia (8) and Germany, the knowledge of CPR is more prominent after CPR training was given, regardless of the age group. Nevertheless, education levels implemented in Malaysia plays a role in terms of CPR knowledge as form 4 students, who study biology which also incorporated organ functions and human anatomy and physiology, have significantly higher CPR knowledge compared to form 1 and form 2. In addition to studies done in Slovenia and Germany (10), studies from Hong Kong, New Zealand, and North Ireland also proved that knowledge in CPR are significantly higher in among students who received CPR training.

Attitude assessment indicated that most students had a positive outlook on CPR, where 96.2% of them were willing to perform CPR on family members and 85.6% disagreeing that learning CPR is unnecessary. Additionally, 69% of students scored high in attitude assessment, reflecting strong receptiveness towards CPR education. The positive attitude towards performing CPR is similar to the high willingness of performing bystander CPR among secondary school students in Hong Kong and Norway. (11,12)

A weak but significant positive correlation ($r=0.149$, $p<0.01$) was found between CPR knowledge and attitude, suggesting that improved knowledge may enhance the willingness to perform CPR. A study conducted among secondary school students in Norway similarly found that the students with higher level of knowledge significantly agreed to perform CPR on a cardiac arrest patient. (12) Another study conducted among the Malaysian college students also showed a significant association ($p < 0.001$) between knowledge and willingness to perform hands-only CPR on family members or relatives. (13) These findings align with global studies advocating for early CPR education in schools, highlighting the importance of integrating CPR training into Malaysia's school curriculum. students exhibited positive attitudes, knowledge gaps, especially regarding practical CPR components, emphasize the need for structured CPR training programs. The study underscores the feasibility and necessity of implementing comprehensive CPR education among secondary school students to enhance preparedness for real-life emergencies. Students as young as 10 to 12 years old were proven to be able to understand the significance of bystander CPR, perform basic CPR, and retain the relevant knowledge after 3 months of a short course. (14) As proposed by WHO, it is important to promote education among the public and therefore it is also logical to include resuscitation training in school programs. (15) The countries that have implemented this have reported significantly higher resuscitation rates which supports the fact that incorporating CPR was proven practical and has shown an outstanding outcome.

This study has several limitations. First, data collection was limited to a single school in Seremban, which may not fully represent the diversity of secondary school students across Malaysia. A broader study involving multiple schools from various regions would provide a more comprehensive understanding of CPR knowledge and attitudes. Second, the study assessed only theoretical knowledge without including a practical CPR evaluation. Hands-on training and post-training assessments could offer better insights into students' actual competency in performing CPR. Another limitation is the reliance on self-reported responses, which may introduce bias as students might overestimate their knowledge or attitude toward CPR. Lastly, while the study identified key sociodemographic factors influencing CPR knowledge, external factors such as exposure to emergency situations was not considered. Future studies should incorporate practical CPR assessments, larger and more diverse samples, and long-term follow-ups to

strengthen the findings and further support the implementation of CPR education in schools.

5. Conclusion

The study was conducted in a limited size of population, with no prior CPR course given to the students by the research team. The findings were consistent with the other similar studies that have been conducted in Malaysia and other countries. It is possible to teach CPR among secondary school students as it was found effective in many studies conducted as proposed by WHO. More studies should be conducted on a larger scale to provide a more accurate data to support the implementation of CPR as a part of the Malaysian curriculum and further improve the survival rates of OHCA.

Author Contributions

Nur Ardini binti Mohd Shahrir and Muhammad Haziq bin Hazani contributed to the literature review and discussion. Adibah Hanis binti Ahmad Hakimi and Haneef Khan bin Hassan contributed to questionnaire and methodology. Every author contributed to manuscript writing. Jane Khor Zhi Xian and Clarence Kavetha S. S. Daniel have critically reviewed and approved the final draft.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Ethical approval

Ethics of Study

This study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and the Malaysian Good Clinical Practice Guideline. Accepted by The International Medical University Joint-Committee of The Research and Ethics Committee (IMU-JC) 277th meeting in 16 November 2023, code (IA509).

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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Competing of Interest

The authors declare that they have no conflicts of interest.

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