

## ORIGINAL ARTICLE

# Knowledge and Attitude towards Adult Cardiopulmonary Resuscitation among Nurses in Serdang Hospital: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Nurses are always the first responders in cardiac arrest situations; hence, it is critical to provide nurses with enough understanding of adult CPR and to ensure that they have a favourable attitude towards adult CPR. It can potentially improve cardiac arrest patients' survival rates and quality of life. This study aimed to study the knowledge and attitude towards adult CPR among nurses in Serdang Hospital, Selangor. **Material and Methods:** A convenient sampling method was used to recruit the nurses, and data were collected online. SPSS version 22 was used for data entry and analysis. Knowledge and attitude towards adult CPR were analysed according to the nature of the data. **Result:** A total of 60 individuals took part in the survey. The total scores for knowledge and attitude towards adult CPR were  $8.33 \pm 1.64$  and  $38.07 \pm 6.15$ , respectively. The analysis demonstrated a significant relationship between the time since the last CPR instruction and knowledge ( $p=0.003$ ) and attitude ( $p=0.0001$ ). The study also discovered a link between encountering cardiac arrest episodes and knowledge ( $p=0.003$ ) and attitude ( $p=0.044$ ). Meanwhile, there was no substantial relationship between adult CPR knowledge and attitude. **Conclusion:** The length of previous CPR training and experiences with cardiac arrest occurrences influenced adult CPR knowledge and attitude. As a result, it was vital to increase nurses' understanding and knowledge of the importance of adult CPR, which will remind them to be more vigilant and improve their attitude towards adult CPR.

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## INTRODUCTION

A sudden cardiac arrest is an unforeseen event that can occur at any time and in any location, which can result in death if treatment is not administered immediately. As a result, cardiac arrest remains the leading cause of death, and the majority of sudden cardiac deaths are caused by cardiovascular illnesses (1). According to the World Health Organization (WHO), sudden cardiac death (SCD) is defined as a sudden death that occurs within one hour of symptom onset if witnessed or a sudden death if the person seems to be well within

the preceding 24 hours (1). Every year, 500,000 deaths from in-hospital cardiac arrest (IHCA) and out-of-hospital cardiac arrest (OHCA) are documented around the world (2). Every year, around 375,000 persons in Europe suffer from cardiac arrest (3). Despite the yearly statistical analysis of the reason for fatalities in Malaysia (1, 4), data on cardiac arrest and sudden cardiac death in Malaysia is limited (1,4).

Cardiac arrest can be classified into cardiac and non-cardiac causes (5). In the case of cardiac reasons, cardiac arrest can be induced by myocardial infarction, MI (6), arrhythmias (7), or cardiac failure (8). Cardiovascular illnesses damage the heart's ability to pump blood to all organs, which then leads to cardiac arrest. Following that, respiratory system insufficiency is the second most prevalent cause of cardiac arrest (9-11). Respiratory

insufficiency can lead to respiratory arrest, a potentially fatal condition in which carbon dioxide is not effectively cleared from the bloodstream, generating a buildup of carbonic acid. If not handled, the excess carbonic acid can cause severe issues such as brain damage and heart arrest within minutes.

When a cardiac arrest occurs in a hospital, nurses are frequently the initial responders (12). As a result, nurses with inadequate knowledge of cardiopulmonary resuscitation would surely have a negative attitude and competency level, which potentially cost the patient's life (13-14). Nurses are required to commence resuscitation as soon as possible (5, 15) and to lead the team before and after the resuscitation team or physicians arrive (5,16). As a result, nurses should be well-versed in cardiopulmonary resuscitation techniques such as basic life support (BLS) and advanced cardiac life support (ACLS) to prevent permanent organ damage and improve the odds of survival for cardiac arrest patients (13). Attitude is the outcome of experiences obtained, which include knowledge learnt and everyday practice, demonstrating that knowledge and attitude are related (17). Nurses can also apply their expertise when working with patients and other healthcare staff, resulting in improved cooperation and coordination throughout the course of patient care. Furthermore, nurses with an array of expertise are more prepared to examine and think critically when providing care to patients.

Next, some potential issues could stem from poor knowledge and attitude, such as poor patient outcomes, increased stress for nurses, and damage to institutional reputation. Nurses are often the first responders in cardiac arrest events. If they lack adequate knowledge or have a negative attitude towards CPR, it could hinder their ability to perform effectively and potentially impact the patient's chances of survival. Besides, facing a cardiac arrest situation is already stressful. Poor knowledge and negative attitudes can further amplify this stress, potentially leading to errors and impacting the nurse's well-being. Finally, suboptimally, CPR performance due to knowledge gaps or negative attitudes can reflect poorly on the healthcare institution.

This study was significant for several reasons. The findings can inform the development of targeted CPR training and refresher programs tailored to address identified gaps in knowledge and attitudes. Besides, by equipping nurses with the necessary skills and fostering positive attitudes, the study contributes to better patient survival rates during cardiac emergencies. Moreover, understanding the factors that influence CPR knowledge and attitudes can help create supportive environments for continuous professional development among nurses. Last but not least, the results may guide hospital administrators and policymakers in implementing evidence-based strategies to standardize and enhance CPR practices.

This study aims to identify nurses' knowledge about adult cardiopulmonary resuscitation, attitude towards adult cardiopulmonary resuscitation and also the association between the knowledge and attitude towards adult cardiopulmonary resuscitation among nurses in Serdang Hospital, Selangor.

## **MATERIALS AND METHODS**

### **Study Design**

The present study investigated the knowledge and attitude towards adult cardiopulmonary resuscitation (CPR) among nurses. Ethics approval was granted by the Medical Research and Ethics Committee (MREC) [NMRR-20-2966-57698 (IIR)] and the Clinical Research Centre of Serdang Hospital. A total of 60 participants were enrolled in this cross-sectional study, which was conducted between March 2021 to May 2021. Excluded from the study were nurses who work in the neonatal and pediatric department and nurses who have less than one year of working experience.

In this particular study, a questionnaire used was adopted and subsequently adapted from a study conducted by Professor Dr Chew Keng Sheng from Universiti Malaysia Sarawak (UNIMAS). The questionnaire was updated based on the latest Basic Life Support Training Manual 2017 and Guidelines for Resuscitation Training in the Ministry of Health Malaysia 2016. The knowledge segment of the questionnaire consists of 10 questions answered using "True", "False", and "I don't know". The total score ranges from 0 to 10. Each question answered correctly is given one point and zero for a wrong or no answer as well as an unsure response. Next, the practice section of the questionnaire consists of 10 questions and a 5-point Likert scale is used. The 5-point Likert scale is [5]: strongly agree, [4] agree, [3] neutral, [2] disagree and [1] strongly disagree. The range of scores for this part is 10 to 50.

### **Data Sampling**

The study utilised a cross-sectional design to assess the knowledge and attitude of nurses regarding adult CPR. The population targeted consisted of nurses employed at Serdang Hospital. A systematic approach was followed to determine the appropriate sample size and eligibility of participants. For sample size determination, Cochran's formula was used to calculate the required sample size, starting with an initial estimate of 384 participants based on a 95% confidence level and 5% margin of error. However, considering the finite population size of 900 nurses at Serdang Hospital, the sample size was adjusted to 269 using Cochran's correction formula. Then, convenient sampling was employed, enabling the researcher to recruit participants based on practical criteria such as accessibility, geographical proximity, and willingness to participate. While this method prioritised

ease and feasibility, it ensured that participants met the inclusion criteria for the study.

The inclusion criteria specified that participants must (a) be Malaysian citizens, (b) have at least one year of working experience as a nurse, and (c) be employed at Serdang Hospital. Exclusion criteria were also established to maintain the focus of the study. Nurses working in the neonatal and pediatric departments or those with less than one year of experience were excluded, as their roles and exposure to adult CPR differed significantly from other departments.

### Data Collection

Data collection was meticulously planned and executed to ensure reliability and ethical compliance. Due to pandemic-related constraints, the process included obtaining necessary approvals, designing a comprehensive questionnaire, and leveraging online platforms for data acquisition.

Ethical approval was obtained from the Medical Research and Ethics Committee (MREC), Jawatankuasa Etika Untuk Penyelidikan Melibatkan Manusia (JKEUPM), and relevant authorities at Serdang Hospital. These approvals ensured that the study met all ethical standards and protected the rights of participants.

A structured questionnaire served as the primary instrument for data collection. This tool was divided into three sections:

1. Sociodemographic characteristics: Captured participant details such as age, gender, education, and professional experience
2. Knowledge assessment: Measured participants' knowledge of adult CPR based on factual statements about procedures like chest compression, defibrillation, and medication.
3. Attitude assessment: Evaluated participants' attitudes towards adult CPR using a 5-point Likert scale.

The questionnaire was adopted and modified from a validated instrument, with updates aligned to the latest Basic Life Support Training Manual (2017) and Guidelines for Resuscitation Training in Malaysia (2016). Given the constraints of the COVID-19 pandemic, the questionnaire was distributed electronically via Google Forms. Links to the survey were shared through social media platforms such as Facebook and WhatsApp to reach eligible participants efficiently. The first page of the survey included a participant information sheet outlining the study objectives, inclusion criteria, and confidentiality measures. Participants provided informed consent by clicking a designated button before completing the survey.

All responses were securely stored in the researcher's

Google Drive account, password-protected, and accessible only to the researcher. Identifiable information such as names and addresses were not collected to ensure anonymity. Data were transferred to a password-protected computer for statistical analysis and would be permanently deleted after five years.

### Pilot Study

A pilot study was conducted among nurses at the Serdang Hospital. From the pilot study conducted, Cronbach's alpha score was 0.8, which showed that the questionnaire was reliable and consistent. Next, the score for CVI was 0.8, which showed that the questionnaire was valid. Hence, the questionnaire used in this study was reliable and valid.

### Data Analysis

The collected data was analysed using the Statistical Package for the Social Sciences (SPSS) version 22.0. Descriptive statistics were utilised to present continuous variables in terms of mean  $\pm$  standard deviation (SD) values and categorical variables as frequency (%). Prior to analysis, the Kolmogorov-Smirnov test was used to assess the normality of continuous data. The Pearson correlation test was used for the continuous data. Meanwhile, an independent t-test and one-way independent ANOVA were used for categorical data. A P value  $< 0.5$  was deemed significant for all tests.

## RESULT

The present study involved 60 participants, whose mean age was  $32.17 \pm 6.72$  years old. The majority of the respondents were female (81.7%,  $n=49$ ) and Malay (75%,  $n=45$ ). The highest education level among respondents was a bachelor's degree (38.3%,  $n=23$ ). More than half of the respondents were from non-critical care units (63.3%,  $n=38$ ). Additional details can be found in Table I.

From this study, the mean score for the knowledge of CPR was  $8.33 \pm 1.66$ . Based on the result, the vast majority of the respondents scored higher than 5 (91.7%,  $n=55$ ), and the rest of the respondents scored 5 and below (8.3%,  $n=5$ ). Nineteen (31.7%) out of 60 respondents answered all the questions correctly; meanwhile, 2 (3.3%) respondents scored 4, which is the lowest score. The statement that received the highest percentage of correct answers, at 96.7% with 58 respondents, was related to "Adrenaline is the first-line drug treatment in cardiac arrest". While statements of "it is recommended that all procedures should be performed with minimal interruption to chest compression" and "pulse check is not recommended immediately after shock delivery, instead, it should immediately resume CPR" had the lowest percentage of correct answers, only 70.0% with 42 respondents. These findings are presented in Table II.

**Table I: Sociodemographic characteristics of nurses**

Sociodemographic characteristics	n (%)	Mean ± SD
<b>Age</b>		32.17 ± 6.72
<b>Gender</b>		
Female	49 (81.7)	
Male	11 (18.3)	
<b>Ethnicity</b>		
Malay	45 (75.0)	
Chinese	13 (21.7)	
India	2 (3.3)	
<b>Religion</b>		
Islam	45 (75.0)	
Buddhism	10 (16.7)	
<b>Hindu</b>	2 (3.3)	
Christian	3 (5.0)	
<b>Highest education level</b>		
Dachelor's degree	23 (38.3)	
Post Basic	18 (30.0)	
<b>Diploma</b>	19 (31.7)	
<b>Current working location</b>		
Critical care unit	22 (36.7)	
<b>Non-critical care unit</b>	38 (63.3)	
Basic Life Support (BLS) Certification		
Yes	54 (90.0)	
<b>No</b>	6 (10.0)	
Advanced Cardiac Life Support (ACLS) Certification		
Yes	14 (23.3)	
No	46 (76.7)	
How long ago did you attend CPR training?		22.67 ± 19.98
Years of working experience as a nurse		7.98 ± 6.17
<b>Do you read the latest CPR guidelines</b>		
Yes	41 (68.3)	
No	19 (31.7)	
<b>Do you encounter a cardiac arrest case?</b>		
Yes	49 (81.7)	
No	11 (18.3)	
<b>If you ever encounter a cardiac arrest case, did you resuscitate the cardiac arrest victims?</b>		
Yes	45 (75.0)	
No/Never encounter	15 (25.0)	

As per the findings of the study, the mean score for attitude towards adult cardiopulmonary resuscitation in this study was 38.07 ± 6.2. Based on the analysis done, 95.0% or 57 respondents strongly agreed with that “aware of the importance of CPR in clinical practice”. Meanwhile, more than half of the respondents strongly disagree that “Most of the time I just pretend to do CPR instead of performing proper CPR as stipulated in appropriate guidelines” (63.3%, n=38). Table III provides a clear representation of the data.

Table IV shows the correlation between sociodemographic characteristics and knowledge of adult CPR. The findings indicated a significant association between the period of the last CPR training (p=0.003), reading the latest CPR guidelines (p=0.009) and encountering cardiac arrest cases (p=0.003) with the knowledge of adult CPR among nurses.

**Table II: Knowledge of Adult CPR**

Questions (N=60)	Cor-rect	Incor-rect
	n(%)	n(%)
1. According to the Basic Life Support Training Manual 2017, the compression to ventilation ratio in two rescuers CPR is 30:2	55 (91.7)	5 (8.3)
2. Rescue breathing for an adult victim should be delivered at a rate of 10-12 breaths per minute	52 (86.7)	8 (13.3)
3. Defibrillation is indicated for documented ventricular fibrillation and pulseless ventricular tachycardia	54 (90.0)	6 (10.0)
4. Adrenaline is the first-line drug treatment in cardiac arrest	58 (96.7)	2 (3.3)
5. Defibrillation is recommended for asystole patient*	43 (71.7)	17 (28.3)
6. It is recommended that all procedures (for example insertion of an advanced airway, administration of medications and reassessment) should be performed with minimal interruption to chest compression	42 (70.0)	18 (30.0)
7. It is recommended that all procedures (for example insertion of an advanced airway, administration of medications and reassessment) should be performed with minimal interruption to chest compression	51 (85.0)	9 (15.0)
8. It is recommended that only one shock is given and follow immediately by chest compression instead of giving three stacked shocks for treatment of ventricular fibrillation or pulseless ventricular tachycardia	48 (80.0)	12 (20.0)
9. It is recommended that only one shock is given and follow immediately by chest compression instead of giving three stacked shocks for treatment of ventricular fibrillation or pulseless ventricular tachycardia	57 (95.0)	3 (5.0)
10. Pulse check is not recommended immediately after shock delivery, instead, it should immediately resume CPR	42 (70.0)	18 (30.0)

\*Wrong statement

The study discovered a noteworthy correlation between age (p=0.014), period of last CPR training (p=0.0001), working experience as a nurse (p=0.020), gender (p=0.0001), current working location (p=0.041), encountering cardiac arrest cases (p=0.044) and involvement in cardiac arrest cases (p=0.003) with attitude towards adult CPR. The data for the study is presented in Table V.

Last but not least, the findings from this study showed that there was no significant association between knowledge and attitude towards adult CPR among nurses in Serdang Hospital (p=0.855). The data is shown in Table VI.

## DISCUSSION

### Socio-demographic characteristics

The respondents in this study ranged in age from 21 to 46, with a mean age of 32.17 ± 6.72, which was consistent with studies conducted in Kuwait (18) and Uganda (19). According to the age categorisation used by the Institute of Medicine and National Research Council, the majority of respondents were young adults aged 27 to 35, followed by the middle-aged group aged 36 to 45 (20).

**Table III: Attitude towards Adult CPR**

Questions (N=60)	n(%)				
	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1. Aware of the importance of CPR in clinical practice	0 (0)	0 (0)	0 (0)	3 (5.0)	57 (95.0)
2. I feel that my working experience as a nurse is adequate to equip me to handle resuscitation confidently	0 (0)	4 (6.7)	9 (15.0)	15 (25.0)	32 (53.3)
3. I feel that my working experience as a nurse is adequate to equip me to handle resuscitation confidently	0 (0)	1 (1.7)	5 (8.3)	3 (5.0)	51 (85.0)
4. All nurses should have Advanced Cardiac Life Support (ACLS) course training before practice	0 (0)	4 (6.7)	9 (15.0)	13 (21.7)	34 (56.7)
5. The BLS and ACLS course should be recertified every two years	0 (0)	3 (5.0)	6 (10.0)	9 (15.0)	42 (70.0)
6. BLS course should be taught during undergraduate years	2 (3.3)	0 (0)	3 (5.0)	7 (11.7)	48 (80.0)
7. BLS course should be taught during undergraduate years	24 (40.0)	7 (11.7)	10 (16.7)	6 (10.0)	13 (21.7)
8. In my opinion, in many resuscitation cases, the nurses just follow the orders from the senior doctor/team leader without understanding the principles behind the interventions	23 (38.3)	7 (11.7)	6 (10.0)	8 (13.3)	16 (26.7)
9. Most of the time I just pretend to do CPR instead of performing proper CPR as stipulated in appropriate guidelines	38 (63.3)	4 (6.7)	6 (10.0)	1 (1.7)	11 (18.3)
10. Most of the time I just pretend to do CPR instead of performing proper CPR as stipulated in appropriate guidelines	10 (16.7)	8 (13.3)	7 (11.7)	8 (13.3)	27 (45.0)

Aside from that, the majority of respondents (81.7%, n=49) were female, which was consistent with the research conducted in Uganda (19), a comparative study between Sweden and Norway (21), Canada (22), Pakistan (23-24), Saudi Arabia (25), Spain (26), and India (27-28). This result indicated that nursing is still a female dominant profession in current society. On the other side, the majority of respondents (75.0%, n=45) were Malay, followed by Chinese (21.7%, n=13) and Indians (3.3%, n=2).

According to this study, the great majority (38.3%, n=23) of nursing professionals surveyed had a Bachelor's degree as the highest educational level. Diploma (31.7%, n=19) was the second most prevalent educational level, subsequent to post-basic (30.0%, n=18). These findings give light on nursing professionals' educational backgrounds, which might impact methods of recruiting, training, and advancement in the sector. These findings matched those studies conducted in Northwest Ethiopia (13, 29), Saudi Arabia (25), and India (28) where their respondents had a Bachelor's degree

**Table IV: Relationship between sociodemographic characteristics and knowledge of adult CPR**

Variable	Knowledge of adult CPR	
	Mean (95% CI)	p-value
Age	r = 0.010	0.939a
Gender		
Female	8.24 (7.73 – 8.76)	0.176b
Male	8.73 (8.20 – 9.26)	
Ethnicity		0.165c
Malay	8.16 (7.67 – 8.64)	
Chinese	9.08 (8.05 – 10.11)	
India	7.50 (-11.56 – 26.56)	
Religion		0.187c
Islam	8.16 (7.67 – 8.64)	
Buddhism	8.80 (7.46 – 10.14)	
Hindu	7.50 (-11.56 – 26.56)	
Christian	7.90 (-10.50 – 25.56)	
Highest education level		0.119c
Bachelor's degree	8.61 (7.80 – 9.42)	
Post Basic	8.67 (7.98 – 9.35)	
Diploma	7.68 (6.95 – 8.42)	
Current working location		0.086b
Critical care unit	8.82 (8.17 – 9.47)	
Non-critical care unit	8.05 (7.49 – 8.62)	
Basic Life Support (BLS) Certification		0.305b
Yes	8.41 (7.94 – 8.87)	
No	7.67 (6.58 – 8.75)	
Advanced Cardiac Life Support (ACLS) Certification		0.249b
Yes	8.79 (7.79 – 9.78)	
No	8.20 (7.71 – 8.68)	
How long ago did you attend CPR training?	r = -0.382	0.003*a
Years of working experience as a nurse	r = -0.062	0.637a
Do you read the latest CPR guidelines		0.009*b
Yes	8.71 (8.20 – 9.21)	
No	7.53 (6.78 – 8.27)	
Do you encounter a cardiac arrest case?		0.003*b
Yes	8.63 (8.18 – 9.09)	
No	7.00 (6.10 – 7.90)	
If you ever encounter a cardiac arrest case, did you resuscitate the cardiac arrest victims?		0.073b
Yes	8.56 (8.03 – 9.08)	
No/Never encounter	7.67 (6.98 – 8.35)	

\*p ≤ 0.05 considered as statistically significant

aPearson correlation test

bIndependent t-test

cOne-way independent ANOVA

as the highest educational level. Meanwhile, previous studies conducted in India (27), Uganda(19) and Canada (22) revealed that the majority of their respondents had a diploma level in nursing. To become a registered nurse with the Malaysia Nursing Board, nurses in Malaysia can select between a three-year diploma curriculum and a four-year bachelor's degree program in nursing (30). Furthermore, the majority of respondents for this study (63.3%, n=38) work in a non-critical care unit, which was similar to previous research conducted in India (28) and Northwest Ethiopia (29). Next, the majority of respondents in this study (90.0%, n=54) hold a basic life support (BLS) certificate, which was consistent with studies conducted in Canada (22) and Pakistan (24). Meanwhile, more than half of the respondents in our

**Table V: Relationship between sociodemographic characteristics and attitude towards adult CPR**

Variable	Attitude towards adult CPR	
	Mean (95% CI)	p-value
Age	r = -0.316	0.014*a
Gender		0.0001*b
Female	36.65 (35.13 – 38.18)	
Male	44.36 (40.21 – 48.52)	
Ethnicity		0.201c
Malay	37.71 (35.75 – 39.67)	
Chinese	40.15 (37.27 – 43.04)	
India	32.50 (26.15 – 38.85)	
Religion		0.261c
Islam	37.71 (35.75 – 39.67)	
Buddhism	41.00 (37.31 – 44.69)	
Hindu	32.50 (26.15 – 38.85)	
Christian	37.33 (34.46 – 40.20)	
Highest education level		0.476c
Bachelor's degree	39.17 (36.63 – 41.72)	
Post Basic	36.78 (34.05 – 39.50)	
Diploma	37.95 (34.47 – 41.43)	
Current working location		0.041*b
Critical care unit	36.09 (33.97 – 38.21)	
Non-critical care unit	39.21 (37.01 – 41.41)	
Basic Life Support (BLS) Certification		0.139b
Yes	38.46 (36.77 – 40.16)	
No	34.50 (29.04 – 39.96)	
Advanced Cardiac Life Support (ACLS) Certification		0.434b
Yes	39.21 (35.68 – 42.75)	
No	37.72 (35.86 – 39.57)	
How long ago did you attend CPR training?	r = -0.465	0.0001*a
Years of working experience as a nurse	r = -0.300	0.020*a
Do you read the latest CPR guidelines		0.614b
Yes	37.76 (35.99 -39.52)	
No	38.74 (35.14 – 42.33)	
Do you encounter a cardiac arrest case?		0.044*b
Yes	37.31 (35.68 – 39.93)	
No	41.45 (36.37 – 46.54)	
If you ever encounter a cardiac arrest case, did you resuscitate the cardiac arrest victims?		0.003*b
Yes	36.71 (35.15 – 38.28)	
No/Never encounter	42.13 (38.10 – 46.17)	

\*p ≤ 0.05 considered as statistically significant

aPearson correlation test

bIndependent t-test

cOne-way independent ANOVA

**Table VI: Association between knowledge and attitude towards adult CPR**

Variable	Attitude towards adult CPR	
	Mean (95% CI)	p-value
Knowledge of adult CPR	r = 0.024	0.855 <sup>a</sup>

\*p ≤ 0.05 considered as statistically significant

<sup>a</sup>Pearson correlation test

study (76.7%, n=46) did not have advanced cardiac life support (ACLS) certification, which was consistent with the findings of a comparative study in Sweden and Norway (21) and research conducted in Canada (22). All registered nurses are required to have BLS certification. An individual can be recruited as a fresh registered

nurse without an ACLS accreditation, but if a nurse is assigned to an intensive care unit, the nurse must earn one according to their hospital policy.

Last but not least, the results of this survey revealed that the respondents' most recent CPR training occurred between 3 and 96 months (8 years) ago, with a mean of 22.67 ± 19.98 months ago. Aside from that, studies conducted outside of Malaysia, such as in Spain (26) and Uganda (19), reported that their last CPR training lasted between 3 and 24 months. In Malaysia, BLS certification expires after two years, based on the Basic Life Support Training Manual 2017 and Guidelines for Resuscitation Training in the Ministry of Health Malaysia 2016. The grace period for BLS has expired after 30 days. Following that, a recertification course must be completed, and the recertification test must be passed within 30 days of the expiration date (31).

### Knowledge of adult CPR

The mean score for knowledge of adult CPR in this study was 8.33 ± 1.64. According to the findings of this study, more than 70.0% of respondents correctly answered questions about BLS, such as Question 1 (According to the Basic Life Support Training Manual 2017, the compression to ventilation ratio in two rescuers CPR is 30:2) and Question 3 (Defibrillation is indicated for documented ventricular fibrillation and pulseless ventricular tachycardia). From there, it showed the majority of those who participated in this study had their BLS knowledge updated. This can be supported by the fact that 90.0% (n=54) of the respondents for this study had their BLS certificate.

Furthermore, 95.0% (n=57) of responders correctly answered the question about checking the pulse following five cycles or two minutes of CPR (Question 9). Surprisingly, only 70.0% (n=42) of respondents correctly answered Question 6 (It is recommended that all procedures be performed with minimal interruption to chest compression) and Question 10 (Pulse check is not recommended immediately after shock delivery; instead, it should immediately resume CPR), which stated that nurses should perform chest compression with minimal interruption. Furthermore, a Chi-square test was done, and it showed no significant relationship between the percentage who answered correctly for Question 9 with the percentage who answered correctly for both Question 6 (p=0.305) and Question 10 (p=0.461). Question 10 is a sequel to Question 6, where a pulse check is a process that may disrupt the flow of resuscitation, and nurses should only do a pulse check after two minutes or five cycles of CPR. (32) As a result, it was discovered that there was a significant correlation (p=0.0001) between the proportion of people who correctly answered Question 6 and the percentage of people who correctly answered Question 10. In summary, nurses must comprehend the reasoning

behind all BLS measures.

Last but not least, 58 of 60 responders (96.7%) correctly answered Question 4 about adrenaline being the first-line pharmacological treatment in cardiac arrest. This was backed further by our findings that 90.0% (n=54) of our responders held a BLS certificate. Furthermore, the majority of respondents (81.7%, n=49) experienced cardiac arrest cases at work, and the majority of them (75.0%, n=45) participated in the resuscitation of cardiac arrest patients. Most of the time, nurses who participate in resuscitation assist doctors in the preparation of medication for the patient, and they will have learned and gained knowledge from the event. Hence, they know what to do right away for the cardiac arrest patient. The results indicated that nurses at Serdang Hospital have a moderate level of knowledge about adult CPR. The average knowledge score underscores that while foundational understanding exists, significant gaps require addressing. These gaps are particularly evident when considering the influence of time elapsed since the last CPR training. Nurses who had recently attended CPR training demonstrated higher knowledge retention, emphasising the importance of frequent and updated training programs.

Despite the moderate scores, the findings align with global studies highlighting the deterioration of CPR knowledge over time without regular refreshers. This decline can compromise nurses' ability to deliver high-quality resuscitation during emergencies, reinforcing the need for continuous education initiatives.

### **Attitude towards adult CPR**

The mean score for attitude towards adult CPR in this study is  $38.07 \pm 6.15$ . According to the findings of this study, the majority of respondents (70.0%, n=42) strongly disagreed and disagreed with the assertion that nurses only pretend to administer CPR rather than perform proper CPR as specified in the recommendations (Question 9). This outcome was expected given that the majority of respondents in this survey had a Bachelor's degree in nursing (38.3%, n=23) and had studied the most recent CPR recommendations (68.3%, n=41). Furthermore, over half of our respondents (51.7%, n=31) strongly disagreed or disagreed with the notion that resuscitation ought to be initiated by a senior medical official (Question 7). This was due to the fact that primary healthcare providers, such as nurses, were the initial link in the chain of survival of in-hospital cardiac arrest (IHCA). (32) This was supported by a study conducted in Botswana (12), which stated that nurses were always the first responder for cardiac arrest events, so nurses were expected to perform resuscitation promptly (5, 15) and lead the group before and after the arrival of the resuscitation team or physicians. (5, 16) Hence, this also explained why half of the respondents strongly disagreed and disagreed with the statement that nurses

follow the orders from the senior doctor without actually understanding the principles behind the interventions (Question 8) (50.0%, n=30).

The majority of the respondents said that nurses should have BLS (90.0%, n=54) and ACLS (78.3%, n=47) certification before working. Eighty-five per cent of the respondents (n=51) also mentioned that nurses should recertify their BLS certification every two years, which was similar to a finding from research conducted in Pakistan (23), where nurses were recommended to attend a BLS course once every two years. The respondents were aware of the importance of being able to perform CPR correctly during their work. Besides, most of the respondents (91.7%, n=55) strongly agreed and agreed that BLS should be taught in undergraduate schools of nursing. Hence, BLS and ACLS should be included in the nursing curriculum in Malaysia, which was also mentioned in other studies involving different professionals. (33-34)

Most nurses displayed a positive attitude towards adult CPR, reflecting their understanding of its importance in clinical settings. Nurses with Basic Life Support (BLS) and Advanced Life Support (ACLS) certifications tended to exhibit stronger confidence and a proactive mindset regarding resuscitation. However, disparities in attitudes were observed, particularly between nurses with varying levels of experience. Less experienced nurses often reported lower confidence in performing CPR, which could stem from limited exposure to real-life resuscitation scenarios.

These findings underline the significance of fostering positive attitudes, as they can influence nurses' willingness to engage in CPR promptly and effectively. Mentorship programs and hands-on training could help bridge the confidence gap, especially for junior nurses.

### **Association between sociodemographic characteristic and knowledge of adult CPR**

Several inferential analyses, as shown in Table IV, revealed no significant relationship between age, gender, ethnicity, religion, level of education, working experience, current working location, BLS certification, ACLS certification, and participation in resuscitation with knowledge of adult CPR among nurses in Serdang Hospital. However, there was a significant relationship between the time since the last CPR training ( $p=0.003$ ), reading the most recent CPR guidelines ( $p=0.009$ ), and encountering cardiac arrest incidents ( $p=0.003$ ) with knowledge of adult CPR among Serdang Hospital nurses. An individual with recent CPR training was expected to have greater knowledge, yet just a handful of the respondents (20.0%, n=12) got their CPR training within six months in this study. This could be due to nurses in Serdang Hospital being preoccupied with their duties, and recently, all healthcare professionals in

Malaysia were facing a worsening issue of COVID-19 infection. Thus, they had no time to attend CPR training on a regular basis. However, as recommended by the Ministry of Health Malaysia (31), CPR education should be held on a regular basis, at least once a year, to ensure that healthcare staff retain their expertise. Furthermore, a study that took place in Botswana (12) found that information retention was significantly lower after six months of training. As a result, nurses with recent CPR training performed better than those without, which was consistent with previous studies. (12-13, 19, 28, 35-36) Furthermore, our study found that nurses who studied the most recent CPR recommendations had a higher understanding than those who did not, which was consistent with the research conducted in Northwest Ethiopia (13). This could be because nurses who study the most recent CPR recommendations have the latest information regarding resuscitation, which helps them retain knowledge better. In the present research, nurses who witness cardiac arrest occurrences had a higher understanding of adult CPR, which was consistent with the findings of earlier studies (12-13, 29, 37). Subsequently, nurses with more knowledge were able to initiate the resuscitation (5, 15) and lead the resuscitation while waiting for the arrival of the blue code team (5, 16).

There was no significant relationship between education level, working location, and knowledge of adult CPR in our investigation, which was consistent with previous research. (12, 27-28) In contrast, studies conducted in Northwest Ethiopia (29), Kuwait (18) and Botswana (12) found a significant relationship between education level and knowledge of adult CPR. Furthermore, nurses who worked in high-risk units such as intensive care units (ICU) showed a substantial correlation with adult CPR knowledge (13, 22, 27, 29, 35, 37). This was most likely due to critical care nurses having increased exposure to cardiac arrest occurrences in their working environment, which unstable patients largely populated. However, because our respondents were not evenly dispersed between critical care units and non-critical care units, our study did not find a link between working location and knowledge.

#### **Association between sociodemographic characteristics and attitude towards adult CPR**

Age ( $p=0.014$ ), gender ( $p=0.000$ ), current working location ( $p=0.041$ ), period of last CPR training ( $p=0.000$ ), working experience ( $p=0.020$ ), encounter cardiac arrest events ( $p=0.044$ ), and involvement in resuscitation ( $p=0.003$ ) were all associated with attitude towards adult CPR in our study. These findings were corroborated by Canadian research (22), which found that age and working experience were key factors influencing attitudes towards adult CPR. It was known that attitude could be changed over time. Hence, individuals with more clinical experience had more probability of

experiencing CPR cases, which led them to have a better attitude towards adult CPR. Previous research has shown that nurses who have just completed CPR training will have a positive attitude towards adult CPR (25, 26, 29). Furthermore, nurses who witnessed cardiac arrests and participated in resuscitation had considerably better views about adult CPR (25) which was consistent with our findings. However, no additional studies could be utilised to demonstrate the importance of employment location and gender in attitudes about adult CPR.

Furthermore, there was no significant relationship between nurses' BLS certification, ACLS certification, reading the most recent CPR guidelines, ethnicity, religion, or education with their attitude towards adult CPR in this study. Conversely, previous quasi-experimental research conducted in Saudi Arabia found that nurses with BLS and ACLS certification have a positive attitude towards adult CPR (25). Furthermore, a study found that nurses who read the most recent CPR guidelines have a better attitude (13), which was contrary to our findings. Finally, a few researches demonstrated that nurses with higher education levels have a more positive attitude towards adult CPR (12, 18, 29).

#### **Association between knowledge and attitude towards adult CPR**

Last but not least, a Pearson correlation analysis found no association between knowledge and attitude towards adult cardiopulmonary resuscitation among nurses in Serdang Hospital ( $r=0.024$ ,  $p=0.855$ ). Hence, the null hypothesis was accepted. Previous studies conducted in Northwest Ethiopia (13) and Pakistan (24) also demonstrated equivalent results that there was no association between knowledge and attitude. However, a cross-sectional study conducted in Spain (26) showed a significant positive correlation between knowledge and attitude towards adult CPR among nurses in Spain. The result may be different because this study was conducted during the COVID-19 pandemic. Hence, the adaptation process in a new working environment affected the knowledge and attitude towards adult CPR as nurses had to follow new standard operating procedures (SOP).

#### **CONCLUSION**

Because attitude is an approach of conceiving or feeling regarding a matter instead of a skill which takes time to master and is difficult to change. As a result, it was important to increase understanding and promote knowledge about the importance of adult CPR. Instead of seminars and lectures, activities such as simulations were more interesting and effective in communicating the importance of adult CPR. This was due to nurses' ability to comprehend their patients' needs and, as a result, be more attentive to them. Both understanding and attitude towards adult CPR will increase over time.

## LIMITATION

This study was conducted with a small sample size. As a result, the findings may not apply to other states of Malaysia. Secondly, this study did not investigate the educational qualification in detail specifically for those who have post-basic. This caused the researcher only to be able to assume indirect factors and unable to explain the phenomena that are happening among the study population a result of this study showed that nurses with higher education qualifications did not have good knowledge and attitudes towards adult CPR. Furthermore, this study was conducted during a pandemic. Hence, the questionnaire was delivered via an online platform. Hence, this could allow nurses to copy the response from their coworkers or obtain it from the Internet. As a result, the response supplied by the nurses may not accurately reflect their response. Last but not least, there was a scarcity of similar or relevant research on adult CPR knowledge and attitudes in nursing. As a result of the restricted investigation, particularly in Malaysia and among nurses, the researcher was unable to make a comparison between the studies.

## RECOMMENDATION

To improve the reliability of findings and enhance nurses' knowledge of adult CPR, future research should be limited to a specified subset of respondents. Probability sampling, on the other hand, should be utilised since it is more accurate and methodical. In the future, a larger sample size may be employed since replication of the study in other states and regions would increase the generalizability of the results. To get a more exact and accurate result, other types of research designs may be employed, such as randomised controlled trials to assess the efficiency of BLS education or observational studies to monitor nurses' attitudes in real-life scenarios. This can ultimately improve the knowledge and attitude towards adult CPR in nurses.

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