

# Knowledge and attitude of basic cardiopulmonary resuscitation among home-based child daycare caregivers in Kelantan

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## ABSTRACT

**Introduction:** Cardiopulmonary resuscitation (CPR) is indeed a basic skill that should be acquired by everyone in the community. Early CPR is an important element in the chain of survival and home-based child daycare (HBCD) caregivers play a vital role as early responders in case of out-of-hospital cardiac arrest (OHCA). The study aims to determine the level of knowledge and attitude of CPR among HBCD caregivers in Kelantan and the factors that contribute to them. This study covers a research gap in Kelantan, Malaysia, evaluating HBCD caregivers' knowledge and attitudes towards CPR.

**Materials and Methods:** This was a quantitative cross-sectional study conducted from November 2020 until March 2021 which involves 139 HBCD caregivers in Kelantan. Validated questionnaire was used which consisted of 27 questions based on demography, knowledge and attitude towards CPR. The data was keyed in and analysed using software SPSS version 26.

**Results:** A total of 139 respondents participated in the study. The mean attitude score obtained by the caregivers was 16.67 with SD = 4.22. There were 89 caregivers (64%) with poor knowledge among the 139 HBCD caregivers in the study compared to 50 HBCD caregivers (36%) who had good knowledge. Caregivers who were exposed with CPR training had 5.91 higher odds of having good CPR knowledge compared to those without being exposed to CPR training (Wald-statistic (df) = 21.12 (1), OR (95% CI) = 5.91 (2.77, 12.61),  $p < 0.001$ ). Caregivers with experience in handling CPR were 5.91 of higher odds in having good CPR knowledge compared to those without the experience in handling CPR when adjusted for the duration of caregiver's experience (Wald-statistic (df) = 21.12 (1), OR (95% CI) = 5.91 (2.77, 12.61),  $p < 0.001$ ). HBCD caregivers' experience was the only variable that had a significant p-value when tested in the regression model ( $p = 0.023$ ).

**Conclusion:** The findings revealed that HBCD caregivers in Kelantan had inadequate CPR knowledge, potentially increasing the risk of OHCA. Planned and regular training for them is mandatory. Exposure to CPR was the associated factor that contributes to knowledge level among HBCD

caregivers whereas years of experience as HBCD caregivers influence attitude towards CPR.

## KEYWORDS:

Knowledge, attitude, Cardiopulmonary resuscitation, HBCD caregivers, Cardiac arrest

## INTRODUCTION

Cardiopulmonary resuscitation (CPR) has evolved into life-saving procedure and is no longer limited to healthcare personnel.<sup>1</sup> There is a theory that without CPR, a person's chances of survival drop by 7-10% per minute.<sup>2</sup> The Resuscitation Council of Asia had conducted large observational studies that show the positive impact of bystander CPR on survival following out-of-hospital cardiac arrest.<sup>3</sup>

There were more than 5000 cases of paediatric cardiac arrest out-hospital annually in the United States of America.<sup>4</sup> The majority of the cases were caused by respiratory causes rather than heart origin.<sup>5</sup> Like adults, most children who experience out-of-hospital cardiac arrest did not receive CPR from a bystander.<sup>6</sup>

Because of the parents' job obligations and busy schedules nowadays, child daycare caregivers are in high demand. In the last two decades, Malaysia's child daycare gross enrolment ratio had risen from 55 to 80%. Therefore, it is critical that child daycare caregivers have the necessary knowledge and expertise to deal with cardiac arrest (CA).<sup>7</sup> In Malaysia, parents have the options of sending their children to kindergarten, nurseries, or home-based daycare. While most kindergarten and nurseries were supervised and registered under Jabatan Kebajikan Masyarakat and / or Kementerian Pendidikan Malaysia, home-based child daycare is not obligated to do so (as they only cater for three children and below under their care). Therefore, in Kelantan state, they were regulated under Secretariat Welfare, Woman & Family Development (U-KeKWa). Despite the fact that emergencies often occur in child daycare centres, the caregivers, who were typically the first responders, frequently lack basic training skills including CPR.<sup>8</sup>

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Cardiac arrest in children might be a rare encounter. However, as most of the cases stemmed from respiratory issue (eg. choking etc, especially in young child), the risk of getting CA in a daycare centre is real and should not be dismissed lightly. Since home-based child daycare (HBCD) caregivers may encounter cases of cardiac arrest at any point of time and due to the limitation of information regarding CPR among this population in Malaysia particularly Kelantan, the current study aims to assess the gap of knowledge and attitude of basic CPR among HBCD caregivers as well as the factors associated with them. It is hoped that the findings of this study can be used to design more effective and appropriate intervention strategies.

## MATERIALS AND METHODS

### *Study design and duration*

This observational, cross-sectional study was conducted between 1st November 2020 until 31st March 2021 in the state of Kelantan. The study population involved 139 caregivers who fulfilled the study criteria.

### *Reference population*

HBCD caregivers in Kelantan, Malaysia.

### *Source population*

HBCD caregivers in Kelantan that acquired from U-KeKWa in the state of Kelantan, Malaysia.

### *Sample frame*

HBCD caregivers in Kelantan, Malaysia that acquired from U-KeKWa in the state of Kelantan, Malaysia who fulfil the inclusion criteria.

### *Sample size and sampling method*

Sample size calculated was 70. Sampling method was done using non-probability sampling (convenient sampling) where all participants who fulfil the inclusion and exclusion criteria were included. There are about 200 HBCD caregivers registered with U-KeKWa office of Kelantan. They were interviewed either primarily through child daycare visit or telephone call.

### *Research tools*

Data collection was done using a questionnaire (Malay language) from a validated survey, adapted from Rahman et al (2013) titled Knowledge and Attitude about CPR among School Children in Malaysia. The questionnaire was divided into 3 sections, namely demographic, knowledge and attitude, with total of 27 questions. Each question contributes 1 mark, making a total of 12 marks for knowledge assessment. Respondents are considered to have good knowledge if they score  $\geq 8$  out of 12. However, in this study participants would be considered to have good knowledge if they score  $\geq 8$  out of 10 questions under the knowledge domain which addresses their knowledge understanding specifically (Question 5-12) and not their exposure to knowledge (Question 1-4).

There are 8 questions in the attitude and perception section. Responses to the statements were "strongly agree," "agree," "not sure," "disagree" and "strongly disagree." The items

were given a score of four for strongly agree, three for agree, two for not sure, one for disagree and zero for strongly disagree. A total possible maximum score in the attitude domain was 32.

As far as the validity of the questionnaire is concerned, in terms of knowledge domain on CPR, all loadings of items in this domain construct range 0.527 to 0.856. In attitude domain, factor loading for attitude ranges from 0.462 to 0.922.

Cronbach's alpha was used to assess internal consistency of the factors. For knowledge domain on CPR, the Cronbach's alpha was 0.435 and 0.572. For attitude domain, the Cronbach's alpha was 0.651 and 0.871.

### *Data collection method*

Eligible subjects were briefed regarding the study details for about 5 minutes and were given the written consent form. The written consent form and questionnaire were handled in Bahasa Malaysia as all eligible participants did not have good English proficiency skills. Subjects were instructed to answer the questions within 30 minutes and the questionnaire was collected after 30 minutes. Investigator checked the questionnaire for completeness.

### *Ethical considerations*

Data privacy and protection is kept confidential only by the researcher. Consent was also taken using the consent form prepared. All ethical concerns were already being taken care of as per the ethical committee recommendation. This study received ethical boards approvals from Human Research Ethics Committee of USM (USM/JEPeM/20060325).

### *Statistical analysis*

All statistical analyses were done using IBM Statistical Package for the Social Science (SPSS) version 26. Frequency and percentage were reported for categorical variables. For numerical variables, mean and standard deviation (SD) were reported when the observations were normally distributed. Otherwise, median and interquartile range (IQR) were reported.

For descriptive analysis, frequency and percentage of poor and good were reported for knowledge level while mean and SD were reported for attitude score.

To study the factors associated with good knowledge among HBCD caregivers, univariable analysis, the simple logistic regression, was done to screen independent variables (exposed to CPR, previous CPR training and caregivers' experience) that at least had an association with knowledge. The model goodness-of-fit was then assessed by performing Hosmer-Lemeshow test,<sup>9</sup> overall correctly classified percentage, and area under the Receiver operating characteristic (ROC) curve.

Simple linear regression was done to determine variables that at least had an association with attitude towards CPR. Significant p-value ( $p < 0.05$ ) indicates significant association between independent variable and attitude towards CPR. Next, independent variable with  $p < 0.25$  was included in

**Table I: Descriptive analysis of experience and willingness to do CPR by HBCD caregivers (n = 139)**

Variable	Frequency (%)
HBCD caregivers experience	
<1 year	1 (0.7)
1-5 years	63 (45.3)
5-10 years	30 (21.6)
>10 years	45 (32.4)
Number of children under their care	
<5	123 (88.5)
5 – 10	9 (6.5)
>10	7 (5.0)
Exposed to CPR	
No	84 (60.4)
Yes	55 (39.6)
Previous CPR training	
<6 months	33 (23.7)
>6-12 months	6 (4.3)
1-2 years	1 (0.7)
>2 years	14 (10.1)
Not related <sup>a</sup>	82 (59.0)
Missing observations	3 (2.2)
Willingness to do Mouth to mouth CPR to family member	
No	10 (7.2)
Yes	112 (80.6)
Don't know	17 (12.2)
Willingness to do Mouth to mouth CPR to outsiders	
No	43 (30.9)
Yes	14 (10.1)
Don't know	82 (59.0)
Keen to learn CPR	
Disagree	2 (1.4)
Agree	122 (87.8)
Not sure	15 (10.8)

<sup>a</sup> Caregivers who never exposed to CPR

**Table II: Frequency of right and wrong answer in knowledge towards CPR section**

Question number	Item	Frequency (%)	
		Right	Wrong
1	A is for Airway	99 (71.2)	40 (28.8)
2	B is for Breathing	78 (56.1)	61 (43.9)
3	C is for Circulation	55 (39.6)	84 (60.4)
4	Chest compression per minute	75 (54.0)	64 (46.0)
5	Ratio of chest compression	74 (53.2)	65 (46.8)
6	Quick response	85 (61.2)	54 (38.8)
7	Number of breaths	64 (46.0)	75 (54.0)
8	Location of chest compression	111 (79.9)	28 (20.1)
9	Emergency number	136 (97.8)	3 (2.2)
10	Open airway technique	110 (79.1)	29 (20.9)

**Table III: Descriptive analysis of attitude score by independent variables**

Variable	Frequency (n)	Attitude score, Mean (SD)
Exposed to CPR		
Yes	55	16.55 (3.91)
No	84	16.75 (4.44)
Previous CPR training <sup>a</sup>		
≤2 years ago	38	15.95 (3.94)
>2 years ago	14	17.00 (7.00) <sup>b</sup>
Caregivers experience		
<5 years	64	16.00 (8.00) <sup>b</sup>
≥5 years	75	16.00 (4.00) <sup>b</sup>

<sup>a</sup> Analysed among caregivers being exposed to CPR (n = 52)

<sup>b</sup> Median (IQR)

**Table IV: Associated factors of CPR knowledge level among HBCD caregivers by simple logistic regression analysis and multiple logistic regression analysis**

Variable	Knowledge level, n (%)		Regression coefficient (b)	Wald statistic (df)	Odds ratio, OR (95% CI)	p-value
	Poor (n = 89)	Good (n = 50)				
<b>Model: Simple logistic regression</b>						
Exposed to CPR						
No	67 (75.3)	17 (34.0)	0	21.12 (1)	1	<0.001
Yes	22 (24.7)	33 (66.0)	1.78		5.91 (2.77, 12.61)	
Previous CPR training <sup>a,b</sup>						
>2 years ago	5 (23.8)	9 (29.0)	0	0.17 (1)	1	0.677
≤2 years ago	16 (76.2)	22 (71.0)	-0.27		0.76 (0.22, 2.72)	
HBCD caregivers experience <sup>a</sup>						
<5 years	45 (70.3)	19 (29.7)	0	2.02 (1)	1	0.155
≥5 years	44 (58.7)	31 (41.3)	0.67		1.67 (0.82, 3.38)	
<b>Model: Multiple logistic regression<sup>c</sup></b>						
Exposed to CPR						
No	67 (75.3)	17 (34.0)	0	21.12 (1)	1	<0.001
Yes	22 (24.7)	33 (66.0)	1.78		5.91 (2.77, 12.61)	

<sup>a</sup> Recode into two categories

<sup>b</sup> Analysed among HBCD caregivers whose being exposed to CPR (n = 55, missing observation = 3 were excluded from the analysis); Poor knowledge (n = 21) and good knowledge (n = 31).

<sup>c</sup> Forward LR Multiple Logistic regression was applied.

Multicollinearity and interaction checking were not applicable.

**Table V: Associated factor of Attitude towards CPR by simple linear regression and multiple linear regression analysis**

Variable	Regression coefficient, b (95% CI)	t-statistic	p-value	Coefficient of determination, R <sup>2</sup>
Exposed to CPR				
No <sup>a</sup>	-			
Yes	-0.21 (-1.66, 1.25)	-0.28	0.781	0.001
Previous CPR training <sup>b</sup>				
>2 years ago <sup>a</sup>	-			
≤2 years ago	-2.34 (-4.80, 0.12)	-1.91	0.062	0.068
HBCD caregivers experience				
<5 years <sup>a</sup>	-			
≥5 years	-1.63 (-3.03, -0.23)	-2.30	0.023	0.037
<b>Model: Multiple linear regression<sup>c</sup></b>				
HBCD caregivers experience				
<5 years	-			
≥5 years	-1.63 (-3.03, -0.23)	-2.30	0.023	0.037

<sup>a</sup> Analysed among HBCD caregivers whose being exposed to CPR (n = 52)

<sup>b</sup> Reference group

<sup>c</sup> Stepwise multiple linear regression method applied. Multicollinearity and interaction checking were not applicable. Model assumptions (Normality distribution of residual, equal variances, and linearity) were fulfilled.

multiple linear regression analysis for variable selection by forward selection, backward elimination, and stepwise method. Multicollinearity and interaction checking were not applicable.

Assumptions for the linear regression model were checked.<sup>10</sup> Normality distribution of the residual was determined by plotting histogram and boxplot. Variances were equal when there was no divergent or convergent pattern on the scatter plot. Regression coefficient with 95% CI, t-statistic, and p-value were reported as the results of the analysis. The variable with significant p-value (p<0.05) and 95% CI of

regression coefficient not across zero was considered as a significant associated factor. Coefficient of determination (R<sup>2</sup>) was also reported.

## RESULTS

A total of 139 respondents participated in the study. All of them were Malay female where most of them were between 41 to 50 years old (40.3%). There were only two caregivers above 60 years old (1.4%). The education background of most of them was secondary school (n (%) = 129 (92.8)). A total of 79.1% of them were married.

As for the knowledge, among 139 HBCD caregivers in the study, there were only 50 (36%) caregivers possessed good knowledge, ie. able to score at least 8 out of 10 questions correctly.

Table II showed the frequency and percentage of participants answering the right and wrong answers for each item in knowledge section. Almost all items were correctly answered by the participants except for question number 3 and 7, where more than 50.0% of participants answered the wrong answer.

For response frequency of items in attitude and perception towards CPR among HBCD caregivers, more than 40.0% of respondents answered "Unsure" in all eight items.

The mean attitude score obtained by the caregivers was 16.67 with SD = 4.22. The minimum and maximum score were 6 and 27, respectively. Table III below showed a descriptive analysis of attitude scores by independent variables.

Table IV showed the result of simple logistic regression analysis to determine the associated factors of good CPR knowledge among HBCD caregivers. Exposed to CPR resulted in high significant odds ratio (OR) and p-value in the regression analysis. It was found that, caregivers who were exposed with CPR training were 5.91 higher odds in having good CPR knowledge compared to those without being exposed with CPR training (Wald-statistic (df) = 21.12 (1), OR (95% CI) = 5.91 (2.77, 12.61),  $p < 0.001$ ). However, previous CPR training resulted in insignificant p-value ( $p > 0.05$ ). Same holds true with duration of experience as a caregiver ( $p > 0.05$ ).

The result in Table IV for the multiple logistic regression analysis showed that there was a significant association between exposed to CPR training status and level of CPR knowledge. Caregivers with experience in handling CPR were 5.91 higher odds in having good CPR knowledge compared to those without the experience in handling CPR when adjusted for the duration of caregiver's experience (Wald-statistic (df) = 21.12 (1), OR (95% CI) = 5.91 (2.77, 12.61),  $p < 0.001$ ). The model could correctly classify 71.9% of cases. Area under the ROC curve was 0.71, which indicates the acceptable discrimination between cases.

*Multicollinearity and interaction checking were not applicable.* P-value of Hosmer-Lemeshow test for goodness-of-fit was not generated by the software; Overall correctly classified percentage = 71.9%; Area under the ROC curve = 0.71 ( $p < 0.001$ ).

Table V showed the results of simple linear regression analysis. HBCD caregivers' experience was the only variable that had a significant p-value when tested in the regression model ( $p = 0.023$ ). The result indicated that, caregivers with the experience of five years and above had 1.63 less score of attitudes towards CPR as compared to those with the experience of less than five years (b (95% CI) = -1.63 (-3.03, -0.23),  $p = 0.023$ ).

The result in Table V for the multiple linear regression analysis showed that there was a significant linear negative relationship between duration of caregivers' experience and attitude towards CPR score. Those with above five years' experience as a caregiver had 1.63 less score in attitude as compared to those with less than five years' experience (b (95% CI) = -1.63 (-3.03, -0.23),  $p = 0.023$ ). Furthermore, the coefficient of determination implies that only 3.7% of the variation in attitude score is explained by duration of caregivers' experience according to the linear regression model ( $R^2 = 0.037$ ).

## DISCUSSION

OHCA in Malaysia had a survival rate of fewer than 1% whereas, in developed countries, life expectancy is found to be better than 25%.<sup>11</sup> CPR, especially bystander CPR, had been recognised as critical for surviving cardiac arrest, as many cardiac arrest events occur at home and in public locales.<sup>12,13</sup> The "chain of survival" which includes early access to the Emergency Medical System, early chest compression, early defibrillation, and early advanced life support has been shown to improve OHCA outcomes as advocated by American Heart Association.<sup>14</sup>

International studies on a bystander's willingness to do mouth-to-mouth ventilation, also known as rescue breathing on a stranger had discovered significant differences. In Australia, 47% of people would perform rescue breathing on a stranger, whereas in the United States 15%, and in Japan only 2-3%.<sup>15-17</sup> Comparatively, our study showed about 80% of participants were willing to do rescue breathing on their family members but only 10% were willing to do rescue breathing on a stranger. In American study, the main concern was the risk of contracting HIV, despite the fact that the risk of getting HIV by rescue breathing is extremely low.<sup>16</sup> On the other hand, worry of not conducting rescue breathing correctly was reported as the major barrier in the Japanese study, despite the imminent outcome of untreated apnoea.<sup>17</sup> The 2017 Paediatric Basic Life Support Recommendations suggested that chest compressions with rescue breathing should be provided for paediatric cardiac arrest. However, if laymen were unwilling or unable to deliver rescue breathing, they recommended that rescuers provide chest compression only.<sup>18</sup>

We found that in our study, exposure to CPR was found to be a factor that contributed to the knowledge level among HBCD caregivers ( $p < 0.01$ ) whereby 64% of participants had poor knowledge. The result came to no surprise as more than half of the participants had never been exposed to CPR. Therefore developing structured training is highly needed.<sup>19</sup> Increased education efforts can be aided by public awareness campaign and active participation by primary healthcare clinicians. In addition, online courses may help in gaining theoretical knowledge of CPR but might not be effective for practicing CPR skills.<sup>20,21</sup> Many studies had shown that teaching CPR to non-medical personnel is the ideal way to educate the public at large about this lifesaving procedure.<sup>12,22,23</sup>

Another aspect to consider for effective resuscitation is positive attitude. Reluctance to perform CPR was seen in nearly one-fourth of the participants, and a shift to a more positive attitude was linked to more experience, seniority, and previous training.<sup>24</sup> We found that years of experience as HBCD caregivers influence attitude towards CPR ( $p=0.023$ ). It was mentioned that those with less experience would have a better attitude towards CPR. The possible reason behind this is that those who are new in working as HBCD caregiver are more enthusiast, energetic and ready to learn new knowledge in order to equip themselves in becoming a good HBCD caregiver. In addition, previous CPR training had a good impact on knowledge and attitude, which could also be a motivating agent.<sup>25</sup> Another local study from Universiti Sains Islam Malaysia showed the child care providers had moderate attitude on CPR.<sup>26</sup> On the other hand, our study found a majority of 40% of participants responded “unsure” in answering questions on attitude towards practicing CPR among their clients.

There were some limitations to this study. It was carried out in the Malaysian state of Kelantan, which may have limited data heterogeneity. Secondly, gender, race, education, and marital status all had remarkable differences in distribution. However, in the statistical analysis, these elements were not deemed important. Furthermore, subject reporting bias was a concern with self-administered questionnaires. It was possible that respondents won't take the time to provide an accurate and fair evaluation of their knowledge and attitudes. On the self-administered questionnaires, there were several eliminations done due to missing values or non-responses from respondents. Other than that, there was also an issue of possible language barrier since the questionnaire was written in standard Malay, instead of Kelantanese dialect. However, this risk was reduced by the presence of investigator team with the respondents during the data collection process to facilitate accordingly if needed. The respondents were also being explained on the CPR procedure to enlighten them further.

## CONCLUSION

This study revealed that HBCD caregivers in Kelantan had inadequate CPR knowledge, potentially increasing the risk of OHCA. Exposure to CPR was the associated factor that contributes to knowledge level among HBCD caregivers whereas years of experience as HBCD caregivers influence attitude towards CPR. Therefore, it is important for the necessary stakeholders and relevant authorities to have a dedicated and structured training for them. CPR training must be a prerequisite for HBCD caregivers as part of their required programmes.

## CONFLICT OF INTEREST

The authors declare they have no conflicts of interest.

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