

# The Prevalence of Cardiopulmonary Resuscitation for Out-of-Hospital Cardiac Arrest in Melaka State, Malaysia

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## ABSTRACT

The prognosis following an out-of-hospital cardiac arrest (OHCA) is often very poor. The outcomes, as well as the essential needs of public area rescue workers will influence the effectiveness and possibly improve the survival rate. This is a retrospective study using representative data through screening of records at the Medical Emergency Coordination Centre (MECC), Hospital Melaka. Data were collected from MECC for all OHCA cases from the year 2018 and 2019 through monitoring by the Development Division of Ministry of Health, Putrajaya, Malaysia. There were 1141 total cases recorded in 2018 for various types of death related to cardiac arrest. The prevalence cases for cardiac arrest in January to December 2018 was reported between 12 to 17 cases every month which needed community/household involvement to performed CPR on the scene. On the other hand, total cases for January to December 2019 was reported as 1376 cases that happened between 20 to 40 cases every month. Data analysis for this period shows that, the successful rate of performing CPR by community/household was only 1%. Findings from this prevalence study revealed that the level for community/household in the state of Melaka performing CPR in OHCA is very low. Furthermore, this can affect the outcomes of survival rate among OHCA patients. Therefore, CPR training must be provided to community/household that can facilitate and to increase the confidence level of performing CPR.

**Keywords:** *out of hospital cardiac arrest (OHCA), knowledge, attitude, practice, cardiopulmonary resuscitation (CPR), community, household*

## 1. INTRODUCTION

In the past ten years, the global burden of non-communicable diseases (NCDs) has been high. In 2016, the NCD caused 41 million of the total 57 million worldwide deaths (71 per cent) and 15 millions of that were premature deaths (30–70 years) [1]. An increase was seen in the risk factors for these deaths, which include unhealthy diet and lifestyle habits, along with obesity, alcohol abuse, tobacco

use, and physical inactivity [1][2]. Therefore, maintaining a healthy lifestyle is very important for the community. High awareness can help reduce any risk factors, particularly cardiovascular disease (CVD), leading to NCD diseases. In addition, Malaysian National Health and Morbidity Survey has shown that 70 per cent of other CVD risks, including hypertension, excessive body mass index of 30 or over, high blood pressure, hyperglycaemia, tobacco use, uncontrolled stress and hypercholesterolemia,

leading to over 95 per cent of acute heart disease and CVD, have been affecting reversible risk factors [3]. In Malaysia, CVD-Acute Coronary Syndrome is a leading cause of death and morbidity. Furthermore, data from Malaysia's National Cardiovascular Disease Registry-Acute Coronary Syndrome revealed that people in Malaysia develop heart disease at a younger age than in neighbouring nations [4].

Globally, NCDs caused the highest number of deaths worldwide with CVD. CVD is the most prevalent cause of death, with approximately 17.9 million deaths occurring in 2016, representing 31 per cent of all global deaths [1]. These deaths were caused by heart disease and stroke [1][2]. CVD caused deaths of more than three-quarters of those who suffered from the disease in low and middle-income countries [2].

It was reported that over a quarter of all deaths in the UK (approximately 160,000 deaths per year) attributed to CVD [5]. More than 42,000 people under the age of 75 died from cardiovascular disease every year in the UK [5]. Aside from treating and preventing cardiovascular disease, cardiopulmonary resuscitation (CPR) is necessary for community management. Teaching CPR could improve the community's ability to perform CPR, reduce the death rate while also increase the life rate, if it can be done quickly. CPR education has moved from hospital-based training to community-based learning, with community participation. CPR knowledge of the general public can both benefit people suffering from heart attacks and aid the survival of heart attack victims by implementing CPR [6]. It is known that in developing countries, there are limited CPR data reports.

Sudden cardiac arrest (SCA) is an emergency in which the victim's heart suddenly stops pumping. This must be addressed immediately to avoid a possible heart attack resulting in death (7). SCA is a potentially fatal disease [8]. The key factor to determine if an individual had a successful outcome after an out-of-hospital cardiac arrest (OHCA) is the percentage of OHCA that occurred. These OHCA incidence statistics might be useful in determining the acceptable levels of prehospital service performance [9].

Patients generally recover after receiving treatment from the hospital. As the pain in the chest area may be overlooked, it could lead to symptoms including pain in the musculoskeletal or gastrointestinal systems. Severe chest pain is a hallmark symptom of acute heart attack syndrome [8]. The symptoms can be comprehended, but the

pain occurs sequentially and periodically, followed by a break [8]. Patients generally use excuses to avoid hospitalization. Consequently, for physicians, a detailed assessment of the patient's clinical history is highly recommended. For example, chest pain, especially in patients with risk factors, such as a family history of heart disease, high blood pressure, or smoking, necessitates hospital admission.

OHCA is the most common case received by the emergency department. The National Health Service (NHS) England claimed that 98 per cent of OHCA's are caused by cardiac arrest compared to incident of cardiac arrest in the hospitals [10][11]. Thus, in critical situations, CPR rescuers must be readily available in the event of an OHCA as prompt treatment is very crucial. Patients who have a heart attack will die if left untreated. It is critical that community CPR skills are made available to everyone. Early CPR assistance saves the victim while EMS arrives at the scene.

Additionally, NHS England reported that ambulance services in England strive to rescue approximately 28,000 public rescuers each year (approximately 1 per 2,000 population) [11],[12] This is because there will be numerous additional OHCA cases in the future. Without a doubt, it is impossible for the emergency medical services (EMS) team to get to the OHCA scene in time. Additionally, when the EMS team arrives, the victim's condition will be irreversible beyond saving.

It may be possible to forecast that the EMS team will arrive promptly and control a difficult situation; however, it may not always be the case. Nonetheless, every survival instance of a SCA for OHCA is associated with a myriad of contributing circumstances, including regional location, traffic congestion, ambulance travel, EMS manpower and the number of ambulances available [13],[14]. In order to overcome the challenges, it is necessary to make provisions for additional facilities and incorporate the latest technologies to handle various daily emergencies and emergency service improvements [13],[14].

Indeed, it should be stressed that OHCA is a significant global health problem associated with poor survival outcomes [15]. Numerous reports from both developing and developed countries made similar assertions that the condition is "vague" in relation to heart attack signs and symptoms that will result in a high rate of mortality and life-threatening conditions. For example, countries such as America and Europe reported a high death rate from heart

attacks each year, compared to the UK, which reported nearly 270,000 cases of OHCA [16].

A heart attack is a potentially fatal emergency medical illness in which the heart stops pumping blood throughout the body if not treated immediately. It can be fatal within minutes [7], and each year, OHCA records more than 30,000 heart attack cases [5]. Additionally, OHCA remains a major public health problem in Europe, accounting for a significant number of deaths [16]. However, this is a small number compared to Asia. Moreover, Asian countries such as Japan, Korea, Singapore, Thailand, and Malaysia also face similar difficulties. According to a study conducted by the Pan Asian Resuscitation Outcomes Study (PAROS), 66,780 cases of OHCA were recorded in seven countries in Asia [14]. This international network was formed in collaboration with emergency medical service agencies and academic institutions in Singapore, Japan, Malaysia, Taiwan, South Korea, Malaysia, United Arab Emirates, Taiwan, and Thailand. According to PAROS, 41,004 heart attack cases were identified as aetiologically connected and age of OHCA cases is typically somewhere between 49.7 and 71.7 years old [14].

In Malaysia, CVD is the most common cause of death with the incidence of CVD has increased steadily since the early 1980s. In the early 2000s, the National Burden of Disease study determined that coronary artery disease (CAD) and cerebrovascular disease (CVA) were the country's leading causes of death for men and women [4]. Since 2002, CVD-related fatalities have been reported in 16 per cent of cardiovascular disease cases in government hospitals [13]. Furthermore, multiple risk factors have increased the chances of developing CVD, causing suffering and death in Malaysia.

A rise in the prevalence of cardiovascular risk factors, namely hypertension, hypercholesterolemia, hyperglycaemia, overweight and tobacco use have shown an increasing trend in Malaysia [4]. This study also revealed an increasing trend of younger age Malaysians to get heart disease than what is observed in neighbouring countries [4]. Coronary heart disease is indeed the main killer in Malaysia, and a significant contributor to disease-related disabilities. For more than a decade, CVD surpassed all other causes of morbidity and mortality in Malaysia [4].

Therefore, the survival of a victim when assisted by a public CPR rescuer is crucial. Proper CPR treatment can be linked to the chain of survival (COS). Initiating the COS requires public CPR. It is thus imperative that we are prepared for an influx of CPR public rescuers. If the CPR public rescue facility readiness rate is low, it will remain an important contributor to the poor survival of OHCA victims [15]. COS is a series of interventions which, when completed, will help the chance of survival by as much as 10 per cent, and each instance of early CPR doubles a victim's chances of survival for a short period of time [5].

There are not enough CPR providers currently. To be totally ineffective is to delay CPR efforts for victims of OHCA [17]. The research strongly endorses an early and rapid CPR assistance for rescuers. CPR public rescuer increases the statistical survival rate significantly. [21] and [22] stated that CPR teaching centres have created systems to educate the public on CPR. Additionally, there are two significant issues that must be addressed immediately: bettering the CPR spectator community, and fast response time to the scene [9],[20]. This study aims to investigate the prevalence of CPR for OHCA.

## **2. METHOD**

This is a retrospective study of raw data materials screened at the Medical Emergency Coordination Centre (MECC) of Melaka Hospital. The data collection process included extracting data (pre-data records) from ED MECC for OHCA cases on SCA in 2018 and 2019, as well as collecting records (pre-data records) from ED MECC callers via monitoring by the development division of Ministry of Health, Putrajaya, Malaysia.

Retrospective data were collected and analysed throughout 2018 and 2019 to determine the number of CPR public rescuers who were involved in and performing CPR on OHCA victims. These data were extracted and filtered from raw material data records of emergency calls from the MECC, which recorded and collected detailed information about callers, particularly in the event of a heart attack and the need for CPR. These real data were derived from a presumed cardiac aetiology and were associated with CPR. General Hospital Melaka was the site of this prevalence study. Melaka is a Malaysian state located in the southern region and is the largest historical state in the country. Melaka was designated a UNESCO World Heritage Site in 2008.

The Malaysian National Medical Research Register (NMRR), Ministry of Health Malaysia (NMRR-42093), and the International Islamic University Malaysia Research Ethic Committee, Kulliyyah of Nursing, Kuantan Pahang (IIUM 2018–2019) International Islamic University Malaysia, all approved the research.

period were analysed. On average, about twenty (20.5) cases need CPR on the scene. However, only two (2) cases had performed CPR on SCA patients outside the hospital, by the community household in that year. This data revealed that a support to perform CPR outside the hospital was very low. The range of age for OHCA cases was between 48–68 years and about 57 per cent of the cases were males. The age and gender affected by SCA are shown in Table 1.

**3. RESULT**

A total of 246 OHCA for SCA cases in year 2018 at the ED Melaka from the record of the study

**Table 1:** The age and gender affected by sudden cardiac arrest in 2018

Age	Gender	
	Male	Female
20-29	3	1
30-39	10	2
40-49	17	7
50-59	35	15
60-69	33	29
70-80	29	35
81-100	13	17

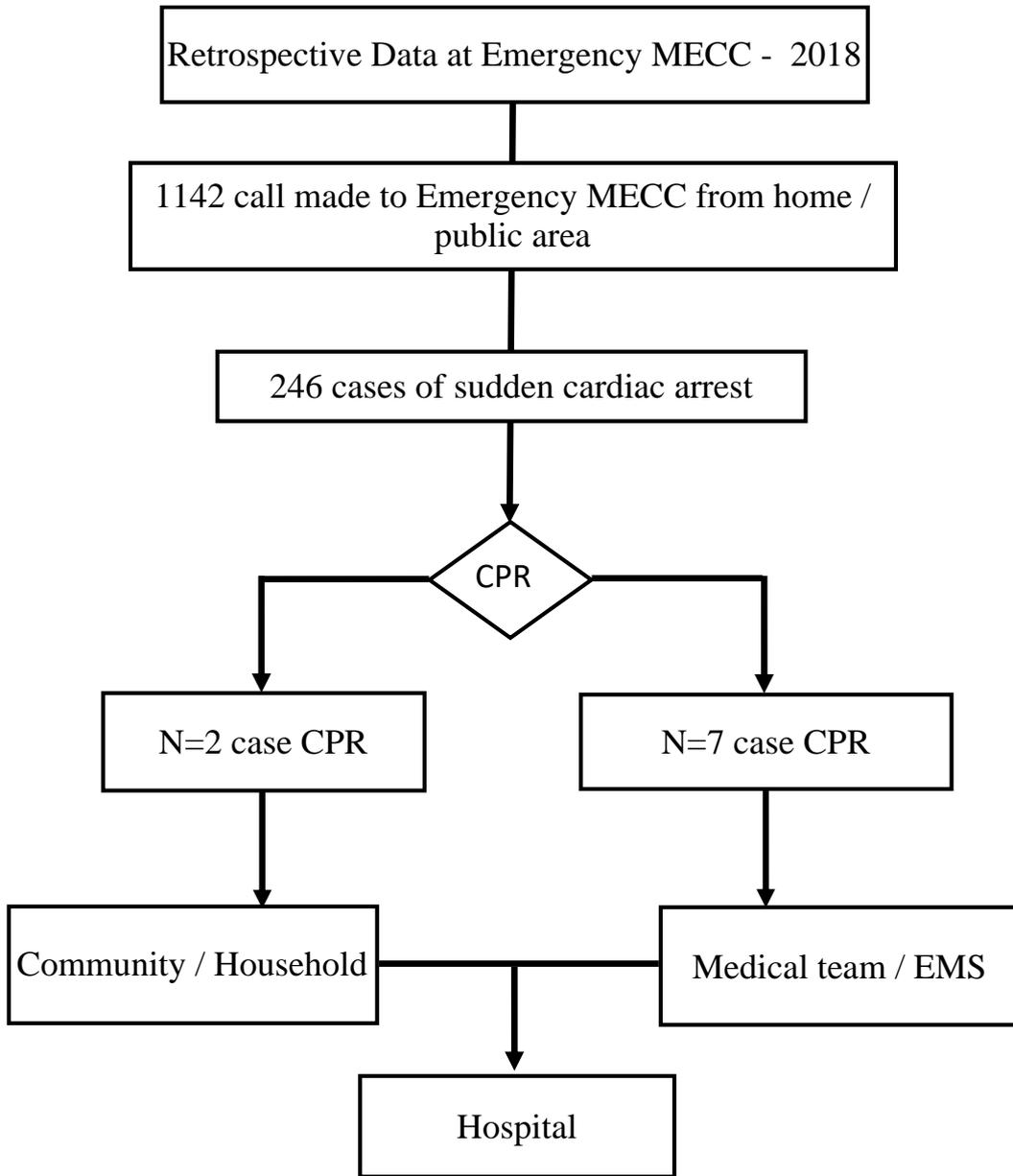
Cases were re-screened to obtain only those that were related to SCA. The total number of SCA cases from January to December 2018 was 246 cases for SCA and total cases a month was in the range of 12 to 25 cases. All the cases needed community households/public rescuers to perform CPR on the scene at the time.

member/community household in May and one (1) by public rescuers in November 2018. These two (2) incidences of cardiopulmonary resuscitation by family/community household members accounted for 0.76 percent of all cardiac arrests. Table 2 (CPR cases by months/year) provides full data for 2018. The total number of cases of sudden cardiac arrest treated successfully with CPR in 2018 is depicted in Figure1.

According to the comprehensive data for 2018, the medical team conducted CPR on just one (1) case every month, except in May and November, when one (1) CPR was performed by a family

**Table 2:** CPR performed based on cases of arrests with presumed cardiac aetiology per months recorded in 2018

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Total Call In	86	68	95	92	86	102	107	93	112	100	84	117
Cases need CPR	25	23	25	12	16	27	26	25	17	15	16	19
CPR Done	1	1	1	0	1	1	1	1	1	0	1	0
CPR Not Done	24	22	24	12	15	26	25	24	16	15	15	19
Performed by Medic	1	1	1	0	0	1	1	1	1	0	0	0
Performed by Family	0	0	0	0	1	0	0	0	0	0	0	0
Performed by Public	0	0	0	0	0	0	0	0	0	0	1	0



**Figure 1:** The total cases of cardiac arrest with CPR performed-2018

As for the number of cases recorded in January 2019 until December 2019, 19 was the lowest and 43 was the highest, which was in Dec 2019. The average cases of SCA in 2019 which needed CPR assistance were 25 cases per year. Overall, a total number of callers for SCA from January 2019 until December 2019 was 1780. The number of cases were between 19 and 43 cases a month and the total cases of SCA per year was 302.

The data from 2019 also shows that in each month, one (1) case is performed by the medical team, except in September for four (4) cases and October with only two (2) cases.

Whereas a total of four (4) cases had CPR performed by family members and two (2) done by public rescuers; thus, only six (6) cases of cardiac arrest (2

per cent) were treated with CPR by family members or public rescuers. The detailed number of cases for 2019 is presented in Table 4 (CPR cases by months/year).

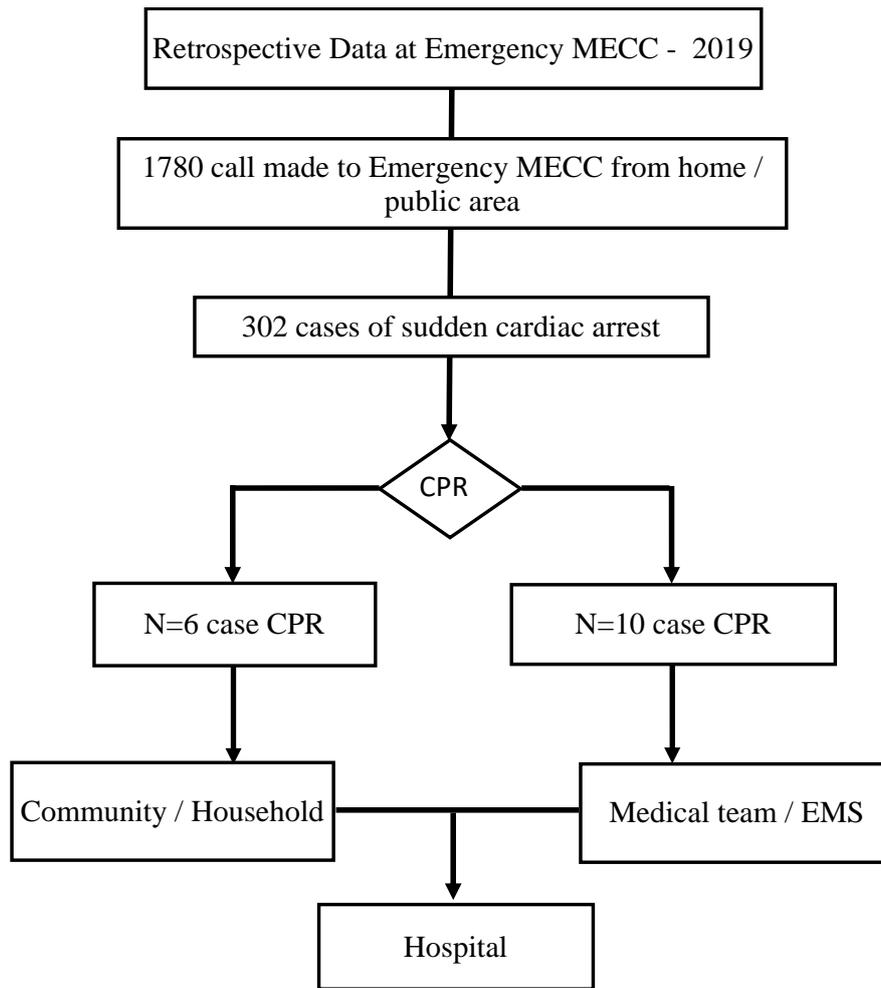
The detailed number of cases for 2019 is presented in Table 3 (CPR cases by months/year). The total number of cases of sudden cardiac arrest treated successfully with CPR in 2019 is depicted in Figure 2.

**Table 3:** Age and gender affected by sudden cardiac arrest in 2019

Age	Gender	
	Male	Female
20-29	5	1
30-39	19	3
40-49	29	13
50-59	47	23
60-69	39	35
70-80	29	37
81-100	9	13

**Table 4:** CPR performed based on cases of arrests with presumed cardiac aetiology per months recorded in 2019

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Total Call In	121	124	134	138	129	132	180	221	116	153	188	144
Cases need CPR	22	21	27	33	19	29	19	20	43	26	19	24
CPR Done	1	1	1	0	0	0	1	0	6	2	2	1
CPR Not Done	21	20	26	33	19	29	18	20	37	24	17	23
Performed by Medic	1	1	1	0	0	0	1	0	4	2	0	0
Performed by Family	0	0	0	0	0	0	0	0	1	0	2	1
Performed by Public	0	0	0	0	0	0	0	0	1	0	1	0



**Figure 2:** The total cases of cardiac arrest with CPR performed-2019

Overall, the successful rate of CPR performed by the public or family members was only below 2 per cent. From the findings of CPR data information, the rate of CPR assistance from the community household was very low. It was apparent that the number of community rescuers in CPR was at a low level. This can be explained by the fact that there was only one case per month involving the public rescuers and family members in providing emergency CPR treatment for OHCA.

**4. DISCUSSION**

The result of this prevalence study revealed that the CPR performed by community bystander for OHCA cases in Melaka is very low. This could be due to community bystanders' incapability and willingness to perform CPR on the victims.

Furthermore pre-hospital EMS personnel's competency is primarily focused on providing services in the hospital and OHCA setting, and the effectiveness of CPR performance greatly depends on the abilities of the personnel on the scene [17],[23]. The findings of this study show that for 2019, only 2 out of 1780 OCHA cases had CPR assistance by public rescuers. This percentage (0.11 %) was far behind compared to previous studies.

The percentage of public rescuers performing CPR in the Cheras community was reported to be 11 per cent (21) and 9 per cent (22) among the Kota Bharu community. This is because public health promotion in the previous settings applied the importance of CPR to the public [27][29].

In Europe and the United States, OHCA is also a public health problem [24][26] and various awareness activities have been carried out as one of the measures to raise public awareness. As an impact of the ongoing training and awareness activities, there has been an increase in public involvement in OHCA cases [30][32]. This also strengthens the opinion that further emphasis should be given on providing training for the public.

CPR training methods have different aspects and intensities in each country. In countries with different systems of education and training, the main reason for the difference in CPR training is due to the difference in training formats. However, the general public's greater desire to learn and use CPR, along with their willingness and higher self-efficacy, are also very important considerations [17]. Lots of barriers exist for people to learn and perform CPR, such as the lack of time, fear, legal responsibility and a lack of interest in CPR as well as other things [33]. OHCA victims will not be able to get assistance all the time. It is necessary to perform both the acts of CPR and the rescue of victims of OHCA at a fast pace.

Nevertheless, there has been a significant improvement on CPR performed by family members and public rescuers in 2019 compared to 2018 likely due to increased awareness and importance of CPR among them. Previous studies also admitted that family members tend to perform CPR compared to non-family or public because it stems from a sense of security and familial responsibility [34],[35].

Another important practical implication to achieve success in resuscitating victims is systemic coordination between the community and rescuers, particularly those who administer CPR to OHCA victims prior to the arrival of the EMS team. For instance, a report revealed that only 27.4 per cent of OHCA patients received CPR assistance prior to the arrival of the EMS team, despite the fact that these victims had a high rate of recovery [34]. This demonstrates the importance of speed and time factor in the survival and recovery of OHCA victims.

Obviously, the community assistance in CPR would increase the survival rate of OHCA victims [34].

Furthermore, a study found that people in several Asian countries had a higher number of bystanders providing CPR assistance before EMS arrival than in other countries [35]. Surprisingly, this prevalence study found that the number of cases in which CPR was used to assist in OHCA at Melaka state was fewer than 2 per cent. Though the findings

of this study revealed a very low participation in bystander CPR, it is possible that the community conditions are linked to related event such as panic, lack of knowledge, attitude, and poor practice.

## **5. FUTURE DIRECTION**

Due to the limited resource of data collection, the information obtained from various sources from 3 years ago provided complete prevalence of CPR for OHCA in Melaka State. Future research could be conducted in different settings to allow for more combinations and comparisons of findings for better understanding of CPR performed in OHCA. Much remains unknown about Malaysian perceptions to CPR for OHCA. More research is required to cover this issue, especially in multiracial country like Malaysia. Future studies should consider using more mixed method designs to offer in-depth analysis and detailed explanation on CPR practices for the public and family members.

## **6. LIMITATION**

This study was only applied in one health care centre. Multiple cases and raw materials were found in various locations because of an extended building, and then shifted to various locations to be stored. This includes data from the MECC on community readiness to perform CPR for OHCA cases. There are different elements and factors that may influence the willingness to perform CPR in other locations and states in Malaysia. Nevertheless, this study was able to show an important piece of information: community willingness to perform CPR for OHCA cases. From this data set, it can be estimated that the community willingness rate in Melaka is low. However, the opportunity to learn, change this situation, and practice CPR remains in Melaka's community, especially for emergency situations.

## **7. CONCLUSIONS**

Using the data, this study investigated the varying real-life situations regarding CPR awareness, particularly in Melaka, as well as give CPR to those in need. Research concluded that the community household and public CPR rescuers will need to be more aware, especially in giving response to victims, in order to give and begin an early emergency treatment CPR for OHCA. A clear path for further research is to be consistent in terms of assessment methodology while gathering a multitude of results, adding of more state in the study would be able to

give clearer picture of the public involvement in performing CPR for OHCA. CPR that can be performed on OHCA cases is essential for the Malaysian public to learn. Furthermore, the public must be educated about the importance and skills in performing CPR effectively.

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