

ORIGINAL ARTICLE

Community's Knowledge, Perception, and Attitude Towards Cardiopulmonary Resuscitation in Ipoh, Perak, Malaysia: A Cross-sectional Study

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ABSTRACT

Introduction: Cardiopulmonary resuscitation (CPR) is a life-saving emergency that must be addressed immediately in cases of cardiac arrest to increase survival rates. Bystander CPR is critical for maximising the chances of survival before qualified medical personnel arrive. This study aims to identify the community's knowledge, perception, and attitude towards cardiopulmonary resuscitation (CPR) in Ipoh, Perak, Malaysia. **Materials and methods:** A cross-sectional quantitative survey was conducted among the population of Ipoh, Perak. This study included a non-medical background group of people aged 18 and above. Data were reported in frequency and percentage for descriptive analysis, and the inferential statistic was analysed using Chi-square and Mann-Whitney U tests. **Results:** A total of 380 people completed the survey. Most responders, 54.7% (n=208), have inadequate knowledge of CPR. Even though 63.4% of respondents were not confident in performing CPR, 88.7% consented to participate in CPR training. Most respondents (n=261, 69%) had no formal Basic life support (BLS) training, and 79.7% (n=208) needed help knowing where to get training in cardiopulmonary resuscitation (CPR). Worrying about being sued (n=333, 87.6%) and injuring the sufferer (n=313, 82.4%) are also barriers to commencing CPR. The majority of respondents (n=307, 208.8%) are willing to conduct CPR on members of their immediate relatives. With a P value of 0.05, only knowledge of CPR was related to demographic data (age). **Conclusion:** In this study, the population of Ipoh, Perak demonstrated insufficient awareness and a reasonable opinion and attitude towards CPR practice. Therefore, increasing BLS training should be considered in all organisations.

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INTRODUCTION

Cardiopulmonary resuscitation (CPR) is a well-known medical therapy that involves chest compression and artificial respiration for patients suffering from cardiac or respiratory arrest to restore heart function by ensuring adequate blood supply to the brain and vital organs. A cardiac event is a medical emergency that necessitates immediate intervention to save a person's life. Without treatment, after 3 minutes, global cerebral oedema caused by a lack of blood supply to the brain would develop, resulting in neurological symptoms. Without cerebral blood flow for 8 minutes, irreversible brain injury is likely. Approximately 80% of patients admitted to an intensive care unit are unconscious, and roughly 70% die once life support is stopped owing

to hypoxic-ischemic brain injury (1). This distinction is critical because the chain of survival, a sequence of progressively linked measures, must be initiated as soon as possible following an out-of-hospital cardiac arrest to have a chance of survival. People should learn how to perform bystander CPR in certain instances while waiting for an ambulance.

Globally, the overall survival rate for out-of-hospital cardiac arrest patients ranges from 0.8% to 31% (2). Knowledge is essential, particularly when starting the CPR process. Although students were enthusiastic about CPR, additional information and training were required (3). According to research conducted in Saudi Arabia's Northern Region by Owaid Alsharari, Alduraywish, Ali Al-Zarea, Ibrahim Salmon, and Ali Sheikh (4), 72% of students had prior knowledge of CPR, and 67% believed it should be improved. When students were tested, 51% correctly answered the emergency medical service (Red Crescent), 59% did not know what to do first when confronted with a situation requiring CPR,

and 59% incorrectly wrote the steps of CPR in the correct sequence. Mansour, Alsager, Alasqah, Altamimi, Alsuhaibani, Aljabr, and AlDughaim (5) conducted a study to assess the level of knowledge, attitude, and practice regarding CPR among Qassim University students and discovered that only 40.8% of students have insufficient knowledge regarding the proper chest compression depth in CPR and 24.2% of students have inadequate knowledge relating to the chest compression rate for adults and children due to a lack of exposure. 24.2% of the pupils wrongly stated the adult chest compression rate. This demonstrates that, while they can do CPR in an emergency, a lack of expertise and inappropriate approaches can still endanger a precious life. Each life can only be saved if proper knowledge and techniques are applied, and the survivor can have a better-quality life. Mansour et al. (5) also discovered that most students (66.9% and 24.9%, respectively) strongly agree and believe that Basic life support (BLS) training courses enhance public lifesaving. However, most students (77.5%) did not have a CPR training course, although most (82.5%) wanted to learn CPR. According to a study conducted by Hung et al. (3) among Hong Kong tertiary students on knowledge and attitude towards bystander cardiopulmonary resuscitation (CPR), 79.2% of bystanders are willing to perform CPR because they believe it will increase survival rate before an emergency medical service provider arrives, and 49.3% believe life is valuable. The study also showed that 300 respondents (85.5%) would attempt CPR for anyone in need, and 217 (61.8%), 212 (60.4%), and 175 (49.8%) would attempt CPR for family members, friends, and pedestrians, respectively.

Chen, Wang, Li, Hou, Wang, Liu, and Han (6) discovered in a quantitative analysis that 66.1% of laypeople believed they could learn and do CPR, and 79.1% believed a dying person without a heartbeat or breath could be revived. Although layperson basic life support (BLS) training and bystander CPR rates in China remain lower than in other developed nations, people have a good attitude towards CPR practice. According to quantitative research conducted by Owaid Alsharari et al. (4) among university students in Saudi Arabia's Northern region, while 80.8% of females and 86.5% of males were utterly unaware of CPR, 88.7% of all participants were willing to attend CPR training in the future. A previous study by Al-Mohaissen (7) found similar results across Saudi women's universities, with 32.5% of students having never had BLS training. However, attitudes towards BLS were favorable; most participants (77.0%) sought more excellent training and assistance (78.5%). Developing an individual mindset may take a long time and much effort. This demonstrates that Saudi university students need more CPR understanding, as evidenced by poor BLS awareness but positive attitudes towards BLS training.

According to Birkun and Kosova's (8) research on social

attitudes and willingness to attend cardiopulmonary resuscitation training and perform resuscitation in the Crimea, the most common reasons for not getting CPR training were that the respondents had never considered the necessity for it (51%) or that they did not know where to go for it (28%). This indicates a need for Basic life support (BLS) training and retraining and increased community awareness and motivation to learn CPR, focusing on the least trained group. Mao, Chen, Xing, Zhou, Jia, and Zhang (9) studied Chinese college students to assess their understanding of cardiopulmonary resuscitation (CPR), attitudes towards BLS training, and readiness to provide bystander CPR. According to the data, less than half of those polled were willing to aid with simple tasks such as checking for consciousness and breathing and calling 120. Only 34.1% of those surveyed were ready to perform CPR on strangers. In contrast, Birkun and Kosova's (8) findings in Crimea, 79% of respondents would administer bystander CPR on a stranger, whereas 91% would do CPR on a friend or relative. Moreover, a study by Yasin S. et al. (10) has revealed that the level of CPR performance by the community in Melaka for out-of-hospital cardiac arrest is very low, indicating a significant issue in CPR readiness and response. Therefore, this study aims to identify the community's knowledge, perception, and attitude towards cardiopulmonary resuscitation (CPR) in Ipoh, Perak, Malaysia. The study focuses on the Ipoh community, offering insights into the knowledge, perception, and attitudes of CPR that are particular to this area. The study may explore community preferences for CPR, imparting knowledge and implementation, and attitudes and barriers around the practice.

MATERIALS AND METHODS

Research Design

A quantitative study employed a nonexperimental descriptive design methodology. This study identified the community's current knowledge, perception, and attitude regarding cardiopulmonary resuscitation (CPR) during an emergency. The setting chosen to answer the questions posed in this research was the community that lived in Ipoh, Perak. Ipoh is the capital city of Perak, the fourth largest city in the country in the central part of Peninsular Malaysia.

Participant and Data Collection

This survey comprised respondents who were the public from Ipoh, Perak. The study excluded healthcare workers such as doctors and paramedics. This study's inclusion criteria were non-medical background respondents aged 18 and above. The Raosoft sample size calculator was used to determine the sample size. and the sample size calculator suggested a minimum sample size of 377 participants. A convenient sampling was applied to get the sample respondents. The survey was distributed online using Google Forms among the community in Ipoh, Perak using social media platforms

such as WhatsApp, Facebook, Telegram, Instagram, and Twitter. Before responding to the questionnaire, the respondents received information on the study's objective and purpose at the beginning of the Google forms. A statement to obtain the respondent's consent was written below the information. Those in the community willing to participate can mark the consent column and answer the questionnaire.

Research Instruments

The well-validated questionnaire was adapted from previous studies by Ojifinni et al. (11) and modified to suit the researcher's research criteria. The structured questionnaire consisted of 5 sections with 20 items, including individual information, medical emergency cases seen before, knowledge about cardiopulmonary resuscitation (CPR), and perception and attitude towards CPR. Section A consists of questions on demographic data regarding age, gender, and highest education level. Section B consists of one question related to a medical emergency witnessed with a "Yes" or "No" answer choice. Section C consists of eight multiple-choice questions to identify the community's level of knowledge regarding cardiac and pulmonary resuscitation. Each correctly answered question is given a "1" mark, while the wrong answer is a "0" mark. The total marks for the section were summed up and labelled as total knowledge of scores. The percentage of the score is obtained to identify the level of knowledge. The knowledge level was categorised as poor knowledge (score less than 50%), moderate knowledge (score 50%-74.9%), and good knowledge (score more than 75%). Section D consists of five questions to identify the community's perception of cardiopulmonary resuscitation (CPR). The respondents were given the choice of "Yes" or "No" for each question. Section E consists of three questions on the community's perception of cardiopulmonary resuscitation (CPR). The respondents were given the choice of "Yes" or "No" for each question. An expert in the field of medicine and a personal expert in CPR knowledge established the content validity of the questionnaire tool. The questionnaire was pilot tested for readability and unambiguity. This study's reliability test Cronbach's alpha value obtained for the items was 0.766, considering good internal consistency. The questionnaires have undergone minor changes to be customised to the organisation's needs. The data was analysed using IBM SPSS Statistics 26 software, where the findings were presented using tables. The descriptive and inferential statistical analyses were processed, and non-continuous data were analysed using Chi-square analysis.

Ethical Consideration

The institution's ethical review board granted its approval. The permission number for the researcher's ethical review was (UniKL RCMP/MREC/2021-2022/BNSH-256). In addition, the respondent's participation is voluntary, and consent is obtained. Furthermore, there are no negative implications for participants who leave

the study at any time. Finally, to protect the participants' privacy, the questionnaire, dataset, and files are coded and do not contain any information that may be used to identify them.

RESULTS

A total of 397 people agreed to participate part in the study. However, 17 responses have been eliminated due to their medical background. As a result, 380 respondents were studied. According to the data collected, 161 (42.4%) of the respondents were between the ages of 21 and 23. The range was followed by 18-20 years old 114 (30.0%). Around 79 (20.8%) respondents were between the ages of 24 and 26, with 26 (6.8%) respondents over 27. There were more female respondents than male responders in this study. Females comprised 264 (69.7%) of the responders, while males comprised 115 (30.3%). Most of the respondents were from tertiary level education, with a bachelor's degree as the highest education level, which was 220 (57.9%), followed by Diploma 98 (25.8%) respondents, and Foundation 21 (5.5%) respondents. At the same time, secondary-level education is represented by 41 (10.8%) of the 380 respondents. The respondents had witnessed the medical emergency cases were mostly breathing difficulties, with 176 (46.3%) findings, whereas 175 (46.1%) respondents witnessed medical emergency allergic reactions. 157 (41.3%) respondents witnessed unconsciously the field play, followed by witnessed severe bleeding incidents, with findings of 148 (38.9%) respondents, 121 (31.8%) respondents witnessed airway obstruction incidents, 103 (27.1%) respondents witnessed drowning incidents, 101 (26.6%) witnessed broken limb incident and the least witnessed was deep laceration incident which data showed 65 (17.1%) respondents (Table I).

Table I: Summary of demographic characteristics of the participant

Demographic data	N	%
Gender		
Female	264	69.7
Male	115	30.3
Age		
18-20	114	30.0
21-23	161	42.4
24-26	79	20.8
>27	26	6.8
Educational background		
Bachelor's degree	220	57.9
Diploma	98	25.8
Foundation	21	5.5
Secondary education	41	10.8
Medical emergency witnessed		
Breathing difficulties	176	46.3
Allergic reactions	175	46.1
Unconsciously the field play	157	41.3
Bleeding incidents	148	38.9
Airway obstruction	121	31.8
Drowning	103	27.1
Broken limb	101	26.6
Deep laceration	65	17.1

Knowledge level of CPR was categorised as poor knowledge (score less than 50%), moderate knowledge (score 50%-74.9%), and good knowledge (score more than 75%). The knowledge of respondents was descriptively tabulated as presented in Table II. The findings show that 103 (27.1%) participants knew what the first thing to look out for during a medical emergency, 127 (33.4%) participants acknowledged the ratio of compression to breath for one rescuer in child CPR, 137 (36.1%) participants knew the ratio of compression to breath for two-rescuer in child CPR, 167 (43.9%) knew how often should rescuers switch roles when performing two-rescuer CPR, 123 (32.4%) knew the characteristic of high-quality CPR, 175 (46.1%) participants knew the current American Heart Association (AHA) recommended Basic Life Support (BLS) sequence of steps, 230 (60.5%) participants knew the sign of airway obstruction, and most 329 (86.6%) participants knew the Emergency Medical Service contact number in Malaysia. Two hundred-eight respondents (54.7%) demonstrated poor knowledge scores. On average half of the respondents, 104 (27.4%), scored moderate knowledge, and 68 (17.9%) scored good knowledge.

Table II: Frequency of Knowledge on Cardiopulmonary Resuscitation

Knowledge of CPR	N (380)	
	n (Correct)	%
What is the first thing to look out for during a medical emergency	103	27.1
The ratio of compression to breath for one rescuer in child CPR	127	33.4
The ratio of compression to breath for two rescuers in child CPR	137	36.1
How often should rescuers switch roles when performing two-rescuer CPR?	167	43.9
Which is NOT a characteristic of high-quality CPR	123	32.4
The current American Heart Association (AHA) recommended Basic Life Support (BLS) sequence of steps are:	175	46.1
Which of these are signs of airway obstruction?	230	60.5
What is the Emergency Medical Service contact number in Malaysia	329	86.6
Knowledge level score	n	%
Poor knowledge	208	54.7
Moderate knowledge	104	27.4
Good knowledge	68	17.9

Data on public perceptions of cardiopulmonary resuscitation (CPR) are presented in Table III. Data indicated that most participants, which was 337 (88.7%), were interested in being trained in CPR. Although findings found that 241 (63.4%) of the respondents did not feel confident about handling an emergency in public, the majority 337 (88.7%) participants thought that CPR training should be mandatory for everyone, and 216 (56.8%) respondents did not consider CPR

training as extra work and demand. Figure 1 shows the barrier to not attending CPR training. Most respondents, 333 (87.6%), fear being sued if it goes wrong, and 313 (82.4%) fear injury to the victim. It was followed by 256 (67.4%) respondents afraid of contracting disease from the victim, and 247 (65.0%) did not provide CPR because of the presence of blood or vomit. The least respondents, around 213 (56.1%), believe someone else will do it. Most respondents are willing to perform CPR on an immediate family member, with a finding of 352 (92.6%) respondents and 307 (80.8%) respondents on co-workers or friends. Most respondents are willing to perform CPR on a stranger that is a child more than a stranger who is an adult, with data 214 (56.3%) and 171 (45.0%) (Table IV). Table V shows that the relationship between knowledge of CPR and the demographic data was determined through statistical tests. The result indicated that findings for the relationship between knowledge and age were statistically significant ($P < 0.05$); however, other demographic data, such as gender and educational background, were not statistically significant.

Table III: Frequency and percentage of perception towards CPR practice among the community

Perception towards CPR practice	N (360)	
	Yes n (%)	No n (%)
Would you like to have a CPR training	337 (88.7)	43 (88.7)
Do you feel confident to handle an emergency in public?	139 (36.6)	241 (63.4)
Should BLS CPR training be mandatory for everyone	337 (88.7)	43 (11.3%)
Do you consider CPR training an extra work and extra demand for you	164 (43.2)	216 (56.8)

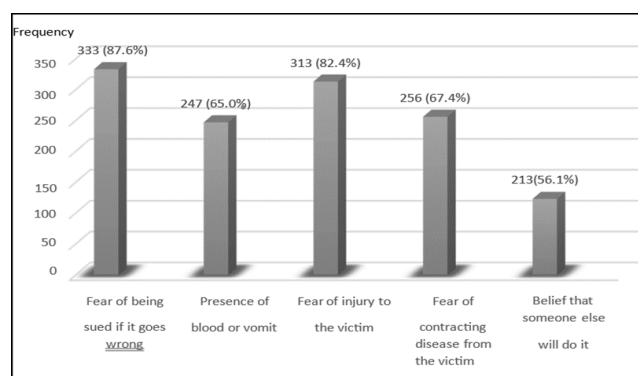


Figure 1: Barrier for not attending CPR training.

Table IV: Willingness of respondents to provide CPR in various categories of victims

Provide CPR	N (360)	
	Yes n (%)	No n (%)
Co-workers or friends	307 (80.8%)	73 (19.2%)
Immediate family member	352 (92.6%)	28 (7.4%)
Stranger that is adult	171 (45.0%)	209 (55.0%)
Stranger that is a child	214 (56.3%)	166 (43.0%)

Table V: Relationship between level of knowledge and demographic data

Variables	Level of Knowledge			P
	Poor	Moderate	Good	
	n (%)	n (%)	n (%)	
Gender				
Male	72 (62.6)	26(22.6)	17(14.8)	0.127
Female	136(51.5)	78(29.5)	51(19.3)	
Respondent's educational background				
Bachelor's degree	114 (54.81%)	56 (53.85%)	50 (73.53%)	0.265
Diploma	58 (27.88%)	28 (26.91%)	12 (17.65%)	
Foundation	12 (5.77%)	6 (5.77%)	3(4.41%)	
Secondary education	24 (11.54%)	14 (13.46%)	3 (4.41%)	
Age				
18-20	68(59.6)	40(35.1)	6(5.0)	0.002*
21-23	87(54.0)	47(29.1)	27(16.8)	
24-26	40 (50.6)	11(13.9)	28 (35.4)	
>27	13 (50.0)	6 (23.1)	7(26.9)	

Note: *p-value significant if p-value <0.05

DISCUSSION

This research finding is strongly supported by Ojifinni et al. (11), who also suggested that most respondents did not feel confident performing CPR but were willing to join the BLS training. The findings of willingness to join CPR training among respondents are similar to the study conducted by Jargon et al. (12) among non-medical staff in South Africa and Mansour et al. (5) among Qassim University students, which indicated that almost all participants would like to be trained in CPR if they have been given a chance. Liaw, Chew, Zulkarnain, Wong, Singmamae, Kaushal and Chan (13) research findings also showed low confidence in performing CPR before training and slightly increased post-training. However, some researchers have suggested that gaining understanding and skills can help bystanders feel more confident. According to the study by Bogle, Mehrotra, Chiampas and Aldeen (14), American university students who had recently received CPR training felt more confident performing CPR. Another study also found that knowing cardiopulmonary resuscitation promotes confidence in one's ability to perform bystander cardiopulmonary resuscitation and raises awareness of the obligation to assist others. We can conclude that youngsters must receive early cardiopulmonary resuscitation training (15).

Additionally, Jarghon et al. (12) found in research among non-medical staff that almost most agreed that this CPR knowledge practice is mandatory for those who work at medical school. Similar findings from research done in 2018 showed that approximately all the participants agreed that CPR knowledge should be mandatory as an admission criterion by the universities (4). This research

found that most respondents did not provide CPR because of fear of being sued if the CPR goes wrong and fear of injury to the patient. Many research findings were found to have "afraid of causing injury to the victim" as one of the most significant barriers to providing CPR with another different barrier. Research published in 2020 among the public in West Africa found that lack of skills and fear of causing harm were the most common barriers noted by respondents for not administering CPR (16). This recent cross-sectional study also found a need for more confidence among respondents when performing bystander CPR. The majority answered uncertainty about their first aid skills as a barrier to participation and expressed concern about harming the injured individual Mao et al. (9). Comparatively, a study by Hung et al. (3) among college students in 2017 showed that most respondents answered they would not perform CPR because they were worried about making mistakes while performing CPR that would hurt the victim. Lack of confidence was a significant obstacle for nearly half of them. Hence, worldwide, most respondents were chosen not to perform CPR because they feared they might hurt the victim. This might be because they need more confidence to handle and perform CPR in an emergency and choose to do nothing.

Attitude is crucial, particularly when it comes to beginning the CPR process. The attitude of CPR training is also affected by the willingness of the respondents to perform CPR, depending on the victim. According to Ojifinni et al. (11), who conducted research among teachers in training and Anto-Ocrah et al. (16) among the public in Ghana, West Africa, most respondents said they would be willing to give CPR to a close family member. There was no age-related difference in participants' desire to do CPR on a loved one. Moving onto the discussion on significant relationships between the knowledge and age of respondents, the findings found by Alkandari, Alyahya, & Abdulwahab (17) in Kuwait supported these research findings in which there was a significant decline trend in CPR knowledge with the respondents' age. Consistent findings were found by Pivač et al. (15) conducted among schoolchildren, which also suggested a significant relationship between knowledge of CPR and age. From the research findings, all age groups had higher knowledge levels following the implementation of CPR training. Continuing the discussion on the relationship between knowledge of CPR the gender, the result supported the research carried out by Mansour et al. (5), where their study concluded that there was no significant relationship between the males and females in CPR knowledge level. However, this differs from the findings found by Alkandari et al. (17) among general dentists in Kuwait, where there was a significant relationship between knowledge and gender. The findings showed that male respondents had significantly lower knowledge scores than female respondents. The relationship between knowledge and educational background different findings found

by Son, Ryoo, Moon, Kim, Ahn et al. (18) and Birkun and Kosova's (8), which found there was a significant relationship between educational background with the willingness of respondents to perform CPR rather than education background. According to Son et al. (18), who conducted a metropolitan citywide survey, the higher educational level has been linked to willingness to perform CPR; college graduate respondents had more desire to perform CPR. According to the findings found by Birkun and Kosova's (8), they found there was a significant relationship between educational background and the willingness to perform CPR. Increased levels of education are linked to increased CPR training rates and a greater willingness to learn CPR.

CONCLUSION

In conclusion, the results indicated that the community in Ipoh, Perak, needs more knowledge of CPR, with the majority needing better knowledge. This aligns with similar studies conducted in South Africa and China, which also showed low CPR knowledge among participants. The research also reveals that while respondents expressed willingness to join CPR training, many needed more information on where to access such training. Government and social organisations collaborate to create a strategy plan to enhance bystander CPR performance by organising CPR Education Programs. People of all ages and backgrounds should be able to access these programs and be available in areas like healthcare facilities, businesses, community centres, and schools. We can raise awareness levels and equip people to perform CPR successfully during cardiac emergencies by holding frequent CPR training sessions, workshops, and awareness campaigns. CPR Training should be included in the secondary education curriculum. Introducing this curriculum could benefit from early CPR intervention. Early CPR instruction and awareness can help create a culture of readiness and equip future generations with life-saving knowledge.

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REFERENCES

- Sandroni C, D'Arrigo S, Nolan JP. Prognostication after cardiac arrest. *Crit Care*. 2018 Dec;22(1):150. doi.org/10.1186/s13054-018-2060-7.
- Gabr AK. The Importance of Nontechnical Skills in Leading Cardiopulmonary Resuscitation Teams. *Journal of the Royal College of Physicians of Edinburgh*. 2019 Jun;49(2):112–6. doi: 10.4997/JRCPE.2019.205.
- Hung MSY, Chow MCM, Chu TTW, Wong PP, Nam WY, Chan VLK, et al. College students' knowledge and attitudes toward bystander cardiopulmonary resuscitation: A cross-sectional survey. *Lee A, editor. Cogent Medicine*. 2017 Jan 1;4(1):1334408. doi.org/10.1080/2331205X.2017.1334408.
- Owaid Alsharari A, Alduraywish A, Ali Al-Zarea E, Ibrahim Salmon N, Ali Sheikh MS. Current Status of Knowledge about Cardiopulmonary Resuscitation among the University Students in the Northern Region of Saudi Arabia. *Cardiology Research and Practice*. 2018 Jun 10;2018:1–9. doi.org/10.1155/2018/3687472.
- Mansour A, Alsager AH, Alasqah A, Altamimi AS, Alsuhaibani A, Aljabr AA, et al. Student's Knowledge, Attitudes, and Practices Related to Cardiopulmonary Resuscitation at Qassim University, Saudi Arabia. *Cureus [Internet]*. 2019 Nov 16 [cited 2023 Oct 17]; Available from: <https://www.cureus.com/articles/24130-students-knowledge-attitudes-and-practices-related-to-cardiopulmonary-resuscitation-at-qassim-university-saudi-arabia>. doi.org/10.7759/cureus.6169.
- Chen M, Wang Y, Li X, Hou L, Wang Y, Liu J, et al. Public Knowledge and Attitudes towards Bystander Cardiopulmonary Resuscitation in China. *BioMed Research International*. 2017:1–7. doi.org/10.1155/2017/3250485.
- Al-Mohaissen MA. Knowledge and Attitudes Towards Basic Life Support Among Health Students at a Saudi Women's University. *Sultan Qaboos Univ Med J*. 2017 Feb;17(1):e59–65. doi.org/10.18295/squmj.2016.17.01.011.
- Birkun A, Kosova Y. Social attitude and willingness to attend cardiopulmonary resuscitation training and perform resuscitation in the Crimea. *World J Emerg Med*. 2018;9(4):237–48. doi:10.5847/wjem.j.1920-8642.2018.04.001.
- Mao J, Chen F, Xing D, Zhou H, Jia L, Zhang Y. Knowledge, training and willingness to perform bystander cardiopulmonary resuscitation among university students in Chongqing, China: a cross-sectional study. *BMJ Open*. 2021 Jun;11(6):e046694. doi: 10.1136/bmjopen-2020-046694.
- Yasin S, Nurumal MS, Isa ML, Arif KA, Omar AAM, Kiat TS, et al. The Prevalence of Cardiopulmonary Resuscitation for Out-of-Hospital Cardiac Arrest in Melaka State, Malaysia. 39.
- Ojifinni K, Motara F, Laher AE. Knowledge, Attitudes and Perceptions Regarding Basic Life Support Among Teachers in Training. *Cureus [Internet]*. 2019 Dec 6 [cited 2023 Oct 17]; Available from: <https://www.cureus.com/articles/25582-knowledge-attitudes-and-perceptions-regarding-basic-life-support-among-teachers-in-training>. doi: 10.7759/cureus.6302.

12. Jarghon S, Molokoane K, Laher AE, Motara F. Knowledge, Attitudes, and Perceptions Regarding CPR Among Non-medical Staff at a Medical School in South Africa. *Cureus* [Internet]. 2023 Jan 8 [cited 2023 Oct 17]; Available from: <https://www.cureus.com/articles/131586-knowledge-attitudes-and-perceptions-regarding-cpr-among-non-medical-staff-at-a-medical-school-in-south-africa>. doi: 10.7759/cureus.33506.
13. Liaw SY, Chew KS, Zulkarnain A, Wong SSL, Singmamae N, Kaushal DN, et al. Improving perception and confidence towards bystander cardiopulmonary resuscitation and public access automated external defibrillator program: how does training program help? *Int J Emerg Med*. 2020 Dec;13(1):13. doi.org/10.1186/s12245-020-00271-3.
14. Bogle B, Mehrotra S, Chiampas G, Aldeen AZ. Assessment of knowledge and attitudes regarding automated external defibrillators and cardiopulmonary resuscitation among American University students. *Emerg Med J*. 2013 Oct;30(10):837–41. doi:10.5847/wjem.j.1920-8642.2018.04.001.
15. Pivač S, Gradišek P, Skela-Savič B. The impact of cardiopulmonary resuscitation (CPR) training on schoolchildren and their CPR knowledge, attitudes toward CPR, and willingness to help others and to perform CPR: mixed methods research design. *BMC Public Health*. 2020 Dec;20(1):915. doi.org/10.1186/s12889-020-09072-y.
16. Anto-Ocrah M, Maxwell N, Cushman J, Acheampong E, Kodam RS, Homan C, et al. Public knowledge and attitudes towards bystander cardiopulmonary resuscitation (CPR) in Ghana, West Africa. *Int J Emerg Med*. 2020 Dec;13(1):29. doi.org/10.1186/s12245-020-00286-w.
17. Alkandari SA, Alyahya L, Abdulwahab M. Cardiopulmonary resuscitation knowledge and attitude among general dentists in Kuwait. *World J Emerg Med*. 2017;8(1):19–24. doi.org/10.5847/wjem.j.1920-8642.2017.01.003.
18. Son JW, Ryoo HW, Moon S, Kim J yeon, Ahn JY, Park JB, et al. Association between public cardiopulmonary resuscitation education and the willingness to perform bystander cardiopulmonary resuscitation: a metropolitan citywide survey. *Clin Exp Emerg Med*. 2017 Jun 30;4(2):80–7. doi: 10.15441/ceem.16.160.