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Research Article

Cardiopulmonary Resuscitation - Knowledge and Attitude in a Tertiary Care Hospital in Karachi

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Abstract

Introduction: Cardiopulmonary resuscitation (CPR) is a combination of rescue breathing and chest compression, which is delivered to the victims who are thought to be in cardiac arrest. In developing countries like Pakistan, standardized resuscitation training is not yet a routine and there is no legislation of this sort. Our study aimed at explore the level of knowledge and attitude of health care professionals in a tertiary care hospital in CPR. The study also explored the value of life and the importance of communication and teamwork, as well as boost self-esteem and also the need for legislation for every healthcare professional to be certified before encountering any of the patients.

Methods: A cross-sectional study was conducted for three months at The Indus Hospital (TIH), Karachi, Pakistan. The final sample size was calculated to be 288. Only the staff members working in the clinical areas of the hospital were included in the study. The questionnaire was adapted from two studies conducted by Chandrasekaran., *et al*. and Annadurai K., *et al*.

Result: A total of 442 healthcare staff participated in this study. Out of which, overall median CPR knowledge score was found to be 7 with a minimum score of zero and a maximum 12. Majority of the participants had incorrect knowledge regarding the depth of compression in children and chest compression to ventilation ratio in newborn (18.1% and 11.1% respectively).

Conclusion: Our study revealed that most of the health care providers did not receive any training on CPR in the past. Moreover, attitudes varied among gender. Females were more confident in providing chest compression compared to males. Additionally, a significant proportion of male health care providers had a negative attitude towards providing chest compression to strangers.

Keywords: *Cardiopulmonary Resuscitation (CPR); Myocardial Ischemia (MI); Arrhythmias; Heart Blocks*

Introduction

Cardiopulmonary resuscitation (CPR) is an important medical procedure which is performed in an effort to manually preserve intact brain function until further measures are taken to restore normal spontaneous blood circulation and breathing in an individual. It is a combination of rescue breaths and chest compression, delivered to the victim who is suffering from cardiac arrest or when the pulse is present but the patient is not breathing [1,2]. CPR is also used when the heart rate is insufficient to provide blood circulation adequate enough to maintain systolic blood pressure above 90 mmHg especially when there are signs of end-organ hypoperfusion. Ischemic heart disease and stroke are among the most common causes of death and disability in the world. The Indian subcontinent (including India, Pakistan, Bangladesh, Sri Lanka, and Nepal) has among the highest rates of cardiovascular disease (CVD) globally [3]. Cardiopulmonary resuscitation is required in conditions like cardiac arrest secondary to Myocardial Ischemia (MI), arrhythmias, heart blocks, choking, drowning or near drowning, respiratory arrest, multiple metabolic conditions leading to pulseless electrical activity like tension pneumothorax, hyperkalemia, hypokalemia, hypercapnia, hypocalcaemia, etc. In addition to the number of lives lost, cardiac arrest has a considerable economic impact; measured in terms of productive years of life lost due to premature death or avoidable neurologic disability, it constitutes a societal burden equal to or greater than that of other leading causes of death in the nation [4].

Early and effective Cardiopulmonary Resuscitation (CPR) has been shown to improve survival after cardiopulmonary arrest [5]. In 1960, CPR was developed and the American Heart Association started a program to explain physicians about cardiac resuscitation and became the forerunner of CPR training for the general public. In 1963 cardiologist Leonard Scherlis started the American Heart Association's CPR Committee and the same year, the American Heart Association formally endorsed CPR [6]. Early intervention, the quality of CPR and time to defibrillation determines survival after cardiopulmonary arrest, survival is however very low [2].

Need for courses in CPR is increasing worldwide. However in developing countries like ours, standardized resuscitation training is not yet a routine and there is no legislation of this sort. Only a few reports from developing countries have addressed the level of awareness, knowledge and practice of health care professionals in the performance of CPR [7]. Early initiation of CPR can improve patient survival and neurologic outcome. Targeted education on Cardiopulmonary resuscitation for emergency care providers and the public has increased survival rate of the patients [8].

This study is aimed at exploring the level of knowledge and attitude of health care professionals in a tertiary care hospital in CPR. The study can also help to understand the importance of the need for legislation for every healthcare professional to be certified in CPR training before encountering any of the patients. No national guidelines have been developed regarding the compulsory training of health care professionals before coming in contact with patients. It is important to assess the basic knowledge and attitude of heath care professionals, to assess the need for implementing them. This study will help us provide a basic data for this purpose. There is need to emphasize on resuscitation training at institutional levels. Since, Emergency Response Committee at The Indus Hospital has started to provide these resuscitation trainings, and the goal is to train all health care providers, it is important to assess background knowledge and attitude of the working healthcare providers. Knowledge gaps have been assessed with this study and this can further help compare the knowledge and attitude of trained personnel with untrained health care workers to know how CPR training has an impact on covering the gaps.

Material and Methods

A cross-sectional study was conducted for three months, starting from April 2018 to June 2018, after obtaining the necessary institutional and ethical approvals from the Institutional Review Board (IRD_IRB_2018_04_006) and the Emergency Response Committee. The study was conducted at The Indus Hospital (TIH), Karachi, Pakistan.

Sample size was calculated using Open Epi Version 3.01. Based on findings from previous studies reporting 43.1% of the participants had good knowledge on ALS and 59.9% had positive attitude towards ALS [9] the minimum sample size was calculated to be 274 at 5% level of significance. Assuming non-response rate of 5% the final sample size was 288. A pilot study was conducted on 10% of the health care providers to assess validity and reliability of the questionnaire.

Only the staff members working in the clinical areas (out patient department, consultant clinics, medical and surgical wards, emergency unit) of the hospital were included in the study while healthcare workers who were not working in the clinical areas of the hospital were excluded from the study. Non-probability convenience sampling was used to collect the data. After being briefed about the study, verbal informed consent was taken from the healthcare providers (consultants, medical officers, residents, nurses and medical technicians) and the participants were requested to fill the questionnaire. Each participant was requested to give response to all questions and select one appropriate answer for each question.

The questionnaire was adapted from two studies conducted by Chandrasekaran., *et al*. [10] and Annadurai K., *et al* [11]. The questionnaire was divided into three sections. The first section asked about basic demographic information, followed by the next section regarding the knowledge of CPR based on American Heart Association Guidelines for Basic Life Support (BLS) and CPR 2015. The last section assessed the attitude of the participants towards CPR and was graded on a Likert scale from "Definitely to Don't know" (grade 1 to 5), so that lower the score more positive the attitude [11].

Data was entered and analyzed using SPSS version 21.0. Mean ± Standard Deviation (SD) and Median (Inter Quartile Range, IQR) were computed for all quantitative variables. All the categorical variables were presented as frequencies and percentages. Chi-square test was applied to assess association between various categorical variables. Mann-Whitney U test was applied to compare the means/median of two independent groups. One way ANOVA and Kruskal-Wallis tests was applied to assess any statistical differences in mean and median of three or more than three independent groups. P-value<0.05 was considered statistically significant.

Results

A total of 442 healthcare staff participated in this study. 144 (32.6%) participants had taken formal training for CPR while 298 (67.4%) did not receive any training. The majority (61.8%) of the participants belonged to the nursing profession, followed by technicians (15.4%), residents (10.2%), medical officers (6.8%), consultants (3.6%), other healthcare professions (1.4%) and only 0.9% of the participants had missing information.

The age of the participants ranged from 19 to 56 years (Median (IQR): 27 (25 - 30)) with equal distribution of both the gender, whereas 74 participants had missing information. However, male participants were older in comparison to females (Median: 28 vs 26 years). 31.9% of the participants were working in the ward followed by ER (24.9%) and critical care (19.2%), whereas 10.8% of the participants were on rotations (Table 1).

More than half of the participants (53.8%) reported active involvement in CPR training within last two years, whereas 26.7% and 15.2% reported occasional and no involvement in CPR training (Table 1). Two-third of the participants were aware of using Automatic External Defibrillators (AED) (Table 1).

	n (%)
Working area in hospital	423
ICU/CCU/HDU	80 (19.2)
OPD	17 (4.1)
ER	104 (24.9)
Ward/Daycare	133 (31.9)
OT	37 (8.9)
Rotated all areas	45 (10.8)
Other	7 (1.7)
Formal resuscitation training within last 2 years	
Active involvement	238 (53.8)
Rarely involvement	118 (26.7)
Never involved	67 (15.2)
Missing information	19 (4.3)
Participation in resuscitation of patients	
Active involvement	240 (54.3)
Rarely involvement	133 (30.1)
Never involved	44 (10)
Missing information	25 (5.7)
Knowledge about how to operate an AED device	
Yes	303 (68.6)
No	113 (25.6)
Missing information	26 (5.9)
Knowledge score	
Median (IQR)	7 (4-8)
Min-Max	0-12

Table1: *Demographic characteristics of participants.*

Moreover, overall median CPR knowledge score was found to be seven with a minimum score of zero and a maximum 12 (Table 1). Expectedly, participants who had taken formal CPR training, who were vigorously involved in training within two years and who had participated in resuscitation were significantly more knowledgeable than the other participants (Table 2 and 3). Furthermore, results showed that the majority of the participants had incorrect knowledge regarding the depth of compression in children and chest compression to ventilation ratio in newborn (18.1% and 11.1% respectively; Table 4). No significant differences was observed in knowledge between both the genders (Table 2 and 3) and no significant age difference was observed according to knowledge status (p = 0.474).

	Knowledge score of CPR				P-value
	n	Mean ± SD	Min-Max	Median (IQR)	
Gender					
Male	184	6.4 ± 2.6	0-12	6 (4-8)	0.314ǂ
Female	184	6.6 ± 2.5	0-12	7 (5-9)	
Training for CPR					
Trained	144	7.3 ± 2.1	2-12	7 (6-9)	0.000**ǂ
Non trained	298	6.0 ± 2.6	0-12	6 (4-8)	
Formal resuscitation training within last 2 years					
Active involvement [a]	238	6.9 ± 2.6	0-12	7 (5-9)[b,c]	0.000**ʅ
Rarely involvement [b]	118	6 ± 2.3	1-11	6 (4-8)	
Never involved [c]	67	5.6 ± 2.6	0-11	6 (4-7)	
Participation in resuscitation of patients					
Active involvement [a]	240	6.7 ± 2.5	0-12	7 (5-9)	0.007*⍰
Rarely involvement [b]	133	6.4 ± 2.3	0-11	6 (5-8)	
Never involved [c]	44	5.4 ± 2.7 [a,b]	0-11	5 (3.3-7)	
Knowledge about how to operate an AED device					
Yes	303	6.8 ± 2.4	1-12	7 (5-9)	0.008*ǂ
No	113	5.5 ± 2.6	0-10	6 (3-7)	

Table 2: *Comparison of the scores in relation to the different characteristics of the participants.*
**P-value < 0.05, **P-value < 0.0001, †: Independent sample t-test, ǂ: Mann Whitney U test, ʅ: Kruskal Wallis, ⍰: One-Way ANOVA. For each significant pair, the key of the category (a = active involvement, b = rare involvement, and c = no involvement) with the larger median appears under the category with the smaller median).*

	Knowledge regarding CPR			P value
	Yes n (%)	No n (%)	Total n (%)	
Gender				
Male	44 (48.4)	140 (50.5)	184 (50)	0.717
Female	47 (51.6)	137 (49.5)	184 (50)	
Total	91 (100)	277 (100)	368 (100)	
Formal resuscitation training within last 2 years				
Active involvement	71 (70.3)	167 (51.9)	238 (56.3)	0.005*
Rarely involvement	20 (19.8)	98 (30.4)	118 (27.9)	
Never involved	10 (9.9)	57 (17.7)	67 (15.8)	
Total	101 (100)	322 (100)	423 (100)	
Participation in resuscitation of patients				
Active involvement	63 (63)	177 (55.8)	240 (57.6)	0.301
Rarely involvement	30 (30)	103 (32.5)	133 (31.9)	
Never involved	7 (7)	37 (11.7)	44 (10.6)	
Total	100 (100)	317 (100)	417 (100)	
Knowledge about how to operate an AED device				
Yes	80 (82.5)	223 (69.9)	303 (72.8)	0.015*
No	17 (17.5)	96 (30.1)	113 (27.2)	
Total	97 (100)	319 (100)	416 (100)	
Training for CPR				
Trained	44 (30.6)	100 (69.4)	144 (100)	0.012*
Non trained	59 (19.8)	239 (80.2)	298 (100)	
Total	103 (23.3)	339 (76.7)	442 (100)	

Table 3: *Association between CPR knowledge with participants characteristics.*
**P-value < 0.05, **P-value < 0.0001, Pearson Chi Square test*

Questions	Correct answer n (%)	Incorrect answer n (%)
When you find someone unresponsive in the middle of the road, what will be your first response? (Note: You are alone there)	339 (76.7)	103 (23.3)
If you confirm somebody is not responding to you even after shaking and shouting at him, what will be your immediate action?	174 (39.4)	268 (60.6)
What is the location for chest compression?	233 (52.7)	209 (47.3)
What is the location for chest compression in infant? (Single rescuer)	194 (43.9)	248 (56.1)
Depth of compression in adults during CPR	227 (51.4)	215 (48.6)
Depth of compression in children during CPR	80 (18.1)	362 (81.9)
Ratio of CPR, single rescuer in adult is	296 (67)	146 (33)
In a new born the chest compression and ventilation ratio is	49 (11.1)	393 (88.9)
What does abbreviation AED stands for?	226 (54.1)	216 (48.9)
What is the rate of compression on an adult?	264 (59.7)	178 (40.3)
If you suspect that an unresponsive victim has head or neck trauma, what is the preferred method for opening the airway?	257 (58.1)	185 (41.9)
Which step is one of the universal steps for operating an AED?	273 (61.8)	169 (38.2)
Which action should you take when the AED is analyzing the heart rhythm?	219 (49.5)	223 (50.5)

Table 4: *Knowledge regarding CPR among the participants.*

Significantly higher proportion of participants who had attended the BLS course replied correctly to the majority of the CPR related knowledge questions, apart from location of chest compression, chest compression to ventilation ratio in new born and universal step for operating an AED for which the proportion of correct answer was approximately equal between both the groups (Table 5).

	Trained	Untrained	Total	P-value
	n (%)	n (%)	n (%)	
When you find someone unresponsive in the middle of the road, what will be your first response? (Note: You are alone there)	127 (88.2)	212 (71.1)	339 (76.7)	0.000**
If you confirm somebody is not responding to you even after shaking and shouting at him, what will be your immediate action?	75 (52.1)	99 (33.2)	174 (39.4)	0.000**
What is the location for chest compression?	78 (54.2)	155 (52)	233 (52.7)	0.671
What is the location for chest compression in infant? (Single rescuer)	52 (36.1)	142 (47.7)	194 (43.9)	0.022*
Depth of compression in adults during CPR	91 (63.2)	136 (45.6)	227 (51.4)	0.001*
Depth of compression in children during CPR	34 (23.6)	46 (15.4)	80 (18.1)	0.036*
Ratio of CPR, single rescuer in adult is	112 (77.8)	184 (61.7)	296 (67)	0.001*
In a new born the chest compression and ventilation ratio is	13 (9)	36 (12.1)	49 (11.1)	0.338
What does abbreviation AED stands for?	91 (63.2)	135 (45.3)	226 (51.1)	0.000**
What is the rate of compression on an adult?	102 (70.8)	162 (54.4)	264 (59.7)	0.001*
If you suspect that an unresponsive victim has head or neck trauma, what is the preferred method for opening the airway?	93 (64.6)	164 (55)	257 (58.1)	0.056
Which step is one of the universal steps for operating an AED?	94 (65.3)	179 (60.1)	273 (61.8)	0.291
Which action should you take when the AED is analyzing the heart rhythm?	93 (64.6)	126 (42.3)	219 (49.5)	0.000**

Table 5: *Distribution of correct responses of participants about CPR related questions according training status.*

**P-value < 0.05, p-value < 0.0001; Chi-square test.*

Furthermore, table 6 and 7 show the attitude of the participants towards CPR for a complete cohort and according to gender. It was observed that females were significantly more confident in providing chest compressions in comparison to males (96.1% vs 91.8%, p = 0.027). Moreover, it was found that 14.8% and 43.4% of the participants were either not willing or unsure about providing chest compressions and mouth-to-mouth ventilation to a stranger. Significantly higher proportion of males showed negative attitude towards providing chest compressions to a stranger in comparison to females (20.8% vs 8.7% p = 0.001).

Questions	Definitely n (%)	Likely n (%)	Unlikely n (%)	Definitely not n (%)	Do not know n (%)	Missing info. n (%)
Confidence of recognizing a person in need of basic life support	307 (69.5)	101 (22.9)	18 (4.1)	4 (0.9)	7 (1.6)	5 (1.1)
Confidence of providing chest compression	315 (71.3)	94 (21.3)	15 (3.4)	5 (1.1)	6 (1.4)	7 (1.6)
Confidence of providing mouth-mouth ventilation (MMV)	177 (40)	125 (28.3)	93 (21)	24 (5.4)	15 (3.4)	8 (1.8)
Willingness to provide chest compression to a stranger	273 (61.8)	103 (23.3)	30 (6.8)	8 (1.8)	23 (5.2)	5 (1.1)
Willingness to provide mouth-mouth ventilation to a stranger	125 (28.3)	130 (29.4)	101 (22.9)	50 (11.3)	30 (6.8)	6 (1.4)

Table 6: *Attitude of participants towards CPR.*

Confidence	Gender	Confident n (%)	Not confident n (%)	Unsure n (%)	Total n (%)	P-value
Confidence of recognizing a person in need of basic life support	Male	165 (90.7)	14 (7.7)	3 (1.6)	182 (100)	0.404†
	Female	172 (94)	8 (4.4)	3 (1.6)	183 (100)	
	Total	337 (92.3)	22 (6)	6 (1.6)	365 (100)	
Confidence of providing chest compression	Male	168 (91.8)	14 (7.7)	1 (0.5)	183 (100)	0.027*†
	Female	174 (96.1)	4 (2.2)	3 (1.7)	181 (100)	
	Total	342 (94)	18 (4.9)	4 (1.1)	364 (100)	
Confidence of providing mouth-mouth ventilation (MMV)	Male	131 (71.6)	49 (26.8)	3 (1.6)	183 (100)	0.129ǂ
	Female	122 (67)	50 (27.5)	10 (5.5)	182 (100)	
	Total	253 (69.3)	99 (27.1)	13 (3.6)	365 (100)	
Willingness	**Gender**	**Willing n (%)**	**Not willing n (%)**	**Unsure n (%)**	**Total n (%)**	**P-value**
Willingness to provide chest compression to a stranger	Male	145 (79.2)	21 (11.5)	17 (9.3)	183 (100)	0.001*ǂ
	Female	167 (91.3)	13 (7.1)	3 (1.6)	183 (100)	
	Total	312 (85.2)	34 (9.3)	20 (5.5)	366 (100)	
Willingness to provide mouth-mouth ventilation to a stranger	Male	113 (62.1)	56 (30.8)	13 (7.1)	182 (100)	0.107ǂ
	Female	93 (51.1)	72 (39.6)	17 (9.3)	182 (100)	
	Total	206 (56.6)	128 (35.2)	30 (8.2)	364 (100)	

Table 7: *Attitude towards CPR according to gender.*

**P-value < 0.05, †: Fisher-exact test, ǂ: Chi-square test.*

In univariate analysis, it was found that doctors and nurses had five and 4.3 times higher odds of having CPR knowledge respectively, as compared to technicians/technologists (p = 0.022 and 0.003 respectively, Table 8). Moreover, those who were actively involved in any formal resuscitation training within last two years had significantly (2.4 time) higher odds of having CPR knowledge then who were never involved in any formal resuscitation training within past two years (p = 0.017, Table 8). Whereas, who were rarely involved in any formal resuscitation training within past two years had 16% higher likelihood of having CPR knowledge as compared to those who were never involved in any formal resuscitation training within past two years, though the result was not statistically significant (p = 0.720, Table 8).

	Univariate logistic regression					Multivariable logistic regression				
	Coefficient	**S.E.**	**Unadjusted OR**	**95% C.I. for unadjusted OR**	**p-value**	**Coefficient**	**S.E.**	**Adjusted OR**	**95% C.I. for adjusted OR**	**p-value**
Age (years)	0.002	0.020	1.00	0.96, 1.04	0.902					
Gender										
Male	-0.088	0.242	0.92	0.57, 1.47	0.717					
Female	Ref									
Position										
Doctors	1.603	0.519	4.97	1.8, 13.73	0.002*	1.435	0.529	4.20	1.49, 11.8	0.007*
Nurse	1.456	0.485	4.29	1.66, 11.09	0.003*	1.313	0.496	3.72	1.41, 9.8	0.008*
Technician/ Technologist	Ref					Ref				
Any formal resuscitation training within last 2 years?										
Active involvement	0.885	0.371	2.42	1.17, 5.01	0.017*	0.957	0.395	2.60	1.2, 5.64	0.015*
Rarely involvement	0.151	0.422	1.16	0.51, 2.66	0.720	0.174	0.445	1.19	0.50, 2.85	0.696
Never involved	Ref					Ref				
Participation in resuscitation of patients										
Active involvement	0.632	0.438	1.88	0.8, 4.43	0.149					
Rarely involvement	0.431	0.461	1.54	0.62, 3.8	0.350					
Never involved	Ref									

Knowledge about how to operate an AED device										
Yes	0.578	0.232	1.78	1.13, 2.81	0.013*					
No	Ref									
Confident of recognizing a person in need of basic life support										
Confident	1.491	0.742	4.44	1.04, 19.01	0.044*	1.800	1.038	6.05	0.79, 46.3	0.083
Not confident	Ref					Ref				
Confident of providing chest compression										
Confident	0.895	0.625	2.45	0.72, 8.33	0.152					
Not confident	Ref									
Confident of providing mouth-mouth ventilation (MMV)										
Confident	0.268	0.253	1.31	0.8, 2.15	0.289					
Not confident	Ref									
Willing to provide chest compression to a stranger										
Willing	1.159	0.446	3.19	1.33, 7.64	0.009*					
Not willing	Ref									
Willing to provide mouth-mouth ventilation to a stranger										
Willing	0.040	0.229	1.04	0.66, 1.63	0.862					
Not willing	Ref									
Training status										
Trained	0.578	0.232	1.78	1.13, 2.81	0.013*					
Untrained	Ref									

Table 8: *Factors associated with CPR knowledge.*

Furthermore, participants who knew how to operate an AED had 1.8 times higher odds of having CPR knowledge as compared to others (p = 0.013), while those who were confident in recognizing a person who needed BLS had 2.4 times higher odds of having knowledge regarding CPR (p = 0.044). 3.2 times higher odds of CPR knowledge were seen in those participants who were willing to provide chest compression to a stranger (p = 0.009) and lastly those who had taken BLS course had 1.9 times higher odds of having CPR knowledge as compared to others (p = 0.013) as illustrated in table 8.

On the other hand multivariable analysis showed that if the participants had any formal resuscitation training within past two years, they were confident in recognizing a person who needed BLS. This was associated with knowledge of CPR (Table 8).

Discussion

Globally, millions of people die due to illnesses preceding cardiac shock and respiratory arrest [10]. BLS and CPR provided at the right time are most essential in saving lives during medical emergencies [12]. Updated knowledge and skills of health care workers regarding CPR are essential for dealing with medical emergencies. Lack of knowledge and incompetency in providing CPR can lead to tragic outcomes. Therefore, it is of paramount importance for all health care workers to be knowledgeable and competent in applying CPR during medical emergencies [10,13]. American Heart Association has been updating its guidelines for Advanced Cardiac Life Support (ACLS) every five years with making evidence-based changes in its guidelines. Certified training courses are conducted regularly for nurses and doctors worldwide to deal with medical emergencies.

Health care providers should have accurate knowledge and skills in CPR [12-14]. In our study 32.6 participants had taken formal training for CPR while 67.4% did not receive any training in the past, which contradicted with the study conducted by Dal and Sarpkaya, who recommended training should be ideally repeated every six months [15]. Our study revealed that the median knowledge score of participants regarding CPR is significantly higher among those who attended CPR training compared to those who did not attend any training on CPR. The low knowledge score among the participants who did not attend any training regarding CPR is undoubtedly due to the lack of training regarding CPR. These findings were consistent with the previous study, which reported that those participants who underwent BLS/ACLS training previously had significantly higher knowledge score than those who were untrained (9.5 ± 3.4 vs. 8.5 ± 3.5, P = 0.002). In contrast to our findings, this study reported that physicians had lesser knowledge score compared to nurses and supporting staff [16].

In another study, Pillai., *et al*. found a significant difference in mean knowledge score of health care providers before and after training on CPR i.e. mean score in pretest 7.4 ± 2.7 vs mean score 13.6 ± 2.8 post-test [17]. The present study found no significant difference in the median score of participants with different designations. Similar findings were also found by a previous study conducted in Karachi [18]. Majority of the health care providers in our study had incorrect knowledge of the depth of compression in children, and chest compression and ventilation ratio in newborns. Similar findings were highlighted by the previous study that 46% of the total participants identified correctly the ratio of chest compression in neonate and children CPR, 47% female, and 46% correctly answer [19]. We also found that majority of the health care providers had not received any CPR training. The lack of training on CPR among health care providers was reflected in many other CPR related studies. The lack of knowledge among health providers can lead to an inability to coping the emergencies resulting in loss of lives.

In our study, there was no significant difference in knowledge score between males and females. This was also supported by the previous study showing no difference in knowledge score between males and females [20]. Moreover, the present study found that participants who were formally trained, actively involved in CPR training within the last two years and had involved in resuscitation had significantly higher median CPR knowledge score in comparison to the rest of the participants. Similar findings were observed in a study by Dal and Sarpkaya that nurses who had undergone refresher courses within the past one year and who had involved in CPR training within the last six months reported higher knowledge scores indicating updated training is useful [15]. This indicates that a low level of knowledge on CPR among health care providers is due to lack of training. Survival rate can be improved by up to 75% by CPR together with early delivery of shock with AED [20]. However, 68.6% of the participants answered yes to the question "do you know how to operate an AED". In a similar study nearly similar proportion of the participants (76%) responded yes to the same question [21]. The attitude of health care providers plays an important role in delivering CPR. In our study, most of the participants had a positive attitude towards CPR. The present study showed 14.8% and 43.4% of the participants were either not willing or unsure about providing chest compression and mouth-to-mouth ventilation to a stranger. This confirmed the result of the earlier study where the majority of the participants felt confident to administer CPR; however, they preferred to use barrier while giving mouth to mouth ventilation [18].

Limitation of the Study

One limitation of the study is that the questionnaire measured only theoretical knowledge of the participants. Moreover, practical performance and hands-on skills were not evaluated in this study. Another limitation of this study is selection bias, due to a mixture of participants from nursing and medical fields. Reporting bias is another limitation, possibly due to over or under-reporting by the participants in response to some of the subjective questions related to knowledge and attitude. This way single hospital-based study, therefore findings cannot be generalized to all other hospitals in the country.

Conclusion

Our study revealed that the mean knowledge score on CPR among health care providers who had attended formal CPR training, who were vigorously involved in CPR training within the last two years and actively involved in resuscitation were more knowledgeable regarding CPR than rest of the participants. The study also showed that most of the health care providers in this study did not receive any training on CPR in the past. Attitudes varied among gender. Additionally, a significant proportion of male health care providers had a negative attitude towards providing chest compression to strangers.

Lastly, we believe that CPR training courses should be conducted regularly in all the major hospitals to train the health care providers in dealing with emergencies. Medical and nursing colleges should make CPR a part of the curriculum to train the students in the practical aspect of CPR. Newly appointed nurses and doctors should be tested on CPR before dealing with emergencies. Regular CPR training courses will enhance knowledge of health care providers on CPR, in turn, this would bring a positive attitude towards CPR and health care providers will be more confident in providing the skill. Refresher training at regular intervals should be incorporated to strengthen the CPR skills.

After thorough analysis of the study we recommended that formal resuscitation training should be conducted and the Emergency Response Committee of the Indus Hospital started CPR training sessions and currently all healthcare workers are formally trained with these essential skills.

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