RESEARCH ARTICLE

Student led outreach workshops to promote basic life support

Sadia Ahsin,[1] Madiha Imran,[2] Ammad Fahim,[3] Liaquat Hussain[4]

Abstract

Objectives: To provide basic life support training to the staff, students and faculty of higher educational institutions in urban areas through pre-trained medical students, and to record the qualitative impact of community training on student facilitators.

Methods: The mixed-method quasi-experimental study was conducted at the Foundation University, Islamabad, Pakistan, in collaboration with the Higher Education Commission of Pakistan from 2015 to 2018. Trained volunteer medical students were divided into teams to visit and provide hands-on basic life support training to 15 educational institutions in Rawalpindi and Islamabad with each batch having 45-50 participants. The participants completed pre- and post-training questionnaires, whereas the trainers went through post-training, semi-structured interviews. Quantitative analysis of pre and post-training responses was done using SPSS 21. Qualitative assessment of the impact of learning experience was done through constant comparative analysis of transcripts.

Results: There were 120 volunteers and 675 participants subjects. The participants' knowledge about basic life support showed significant improvement ($p<0.001$) post-training. There were two main recurring themes identified in the interviews; an opportunity to improve self-confidence, and technical skill.

Conclusion: Hands-on training sessions conducted by pre-trained medical students not only resulted in an improvement in Basic Life Support knowledge of the participants, but also had a substantial impact on student trainers' self-confidence and technical skills.

Keywords: Basic life support, Cardiopulmonary resuscitation, Community basic life support training.

(JPMA 71: 1761; 2021) **DOI: https://doi.org/10.47391/JPMA.1250**

Introduction

Cardiac arrest is a major public health issue and a cause of 15% mortality worldwide.[1] Sudden cardiac arrest (SCA) can happen anywhere and will almost always result in death if there is no intervention within minutes. Basic life support (BLS), including cardiopulmonary resuscitation (CPR) within 3-5 minutes and defibrillation with an automated external defibrillator (AED), provided by bystanders can increase the chance of survival in out-of-hospital SCA victims.[2] With simple skills, like recognising the SCA signs, stroke and foreign-body airway obstruction, and a BLS trained bystander can reduce the associated high mortality rate. Therefore, each individual in the community should have adequate knowledge and training in providing BLS to SCA victims.[3,4]

The American Heart Association (AHA) advocates CPR education as a required element of secondary and high school curricula.[5] CPR training not only increases the survival rate, but is also a way to increase the number of trained people in a community who could help in an emergency. People trained for CPR can also train other people and save lives.[6] However, literature shows that barriers, like lack of confidence, knowledge and training, prevent bystanders from providing efficient CPR.[7] Novel initiatives, such as public service messages, and corporate and institutional programmes, can help train the community and may overcome such barriers. The pressing need to increase the participation of the community in saving lives has to be coupled with an increase in the number of trained CPR providers. Therefore, the public should be continually encouraged to acquire CPR skills, thus increasing the number of trainers.[6]

Internationally, through a variety of programmes, the AHA is equipping communities to act in emergencies to ultimately save lives.[8] In Pakistan, only a few organisations are providing free online BLS training to the community because not many certified trainers or programmes are available to provide hands-on training to the public.[9]

BLS training sessions, especially at educational institutions, with a notion that these institutions will disseminate information to others, can play a significant role in community awareness. Yet, for the training of educational institutions, shortage of trainers can pose a challenge. Literature shows that trained medical students

[1,2,4]Department of Physiology, Foundation University Medical College, Foundation University, Islamabad, [3]Atta ur Rahman School of Applied Biosciences, National University of Sciences and Technology (NUST), Islamabad, Pakistan.

Correspondence: Sadia Ahsin. Email: ahsinsadia@hotmail.com

who became BLS instructors for secondary schools played a significant role in overcoming a shortage of trainers. Toner P et al. concluded in a study that primary school teachers, previously trained by medical students, taught BLS effectively to children aged 10-12 years using the 'ABC for life' programme.[10] Well-trained faculty and students of medical schools can also be a possible source of logically overcoming bystanders' inhibitions and increasing the number of trained people in the community.[11] The outcome can be better public health awareness and an increase in the number of trained people who could be a potential source of help should the need arise. Additionally, this practice can also help medical students to enhance their communication and teaching skills.[12]

The current study was planned to first provide BLS training to staff, students and faculty of higher educational institutions of urban centres through pre-trained medical students, and then to record the qualitative impact of community training on the facilitators themselves.

Subjects and Methods

The mixed-method quasi-experimental study was conducted at the Foundation University (FU), Islamabad, Pakistan, in collaboration with the Higher Education Commission of Pakistan from 2015 to 2018. After approval from the institutional ethics review committee, the project was conducted in three phases. The first phase was the self-preparation phase where FU volunteer medical students were recruited after an initial assessment of their BLS knowledge and skills by a qualified BLS trainer. They were divided into teams of 6 students each, including a team leader who was chosen by the group members. Team leaders were provided with a format of teaching in training workshops and their responsibilities. In this phase, training brochures and structured questionnaires to assess BLS knowledge of the participants were developed by adopting the AHA BLS protocol.[8] Also, BLS protocol brochures were prepared for community participants (Figure). Both the questionnaires and the brochures were also translated into local language through language experts. A list of non-medical higher educational institutions of Rawalpindi and Islamabad cities were collected and a sample of 20 institutions was randomly picked using the lottery method. On the basis of literature review, a sample size of 40-50 community participants per institution for 20 institutions over 3 years was estimated.[13-15] Each student team was allotted one institution where a workshop was to be conducted after thorough training under the supervision of researchers and anaesthesiologists at FU who were AHA-certified BLS trainers. The principals of educational institutions were contacted in person to create awareness for the need for BLS workshop and for coordination in the provision of appropriate time and space.

In the second phase, the students along with the researchers visited their allotted institutions. Since it was decided to provide hands-on training, therefore not more than 40-45 persons from each institution were enrolled for each workshop. Students set up six manikin stations along with teaching AED with about 6-8 participants per station. Student leaders had the responsibility of the equipment, their fellow student facilitators and the distribution of pre- and post-workshop questionnaires and brochures. The participants completed a pre-training questionnaire, which was followed by a half-an-hour interactive BLS tutorial conducted by the researchers. The students then took the role of facilitators and ensured hands-on training of each participant at their respective stations. The students were instructed not to use medical jargon, to clarify participants' fears and any misconceptions. Each participant showed how to provide chest compressions, rescue breaths and AED application. Later, workshop participants completed the questionnaire for the assessment of their post-training knowledge. At the end of the workshop, the participants were given brochures for onward dissemination.

The student leaders individually went through semi-structured interviews the next day upon their return. These were recorded, transcribed and validated by interviewees before content analysis.

In the third phase, a quantitative analysis of participants' pre- and post-workshop responses on questionnaires was done using SPSS 21.

The primary outcome was the improvement in BLS knowledge during post-training evaluation. The responses from the knowledge assessment questionnaires were converted to a percentage and were compared using McNemar's test. $P<0.05$ was considered statistically significant.

For qualitative assessment of the impact on students, the common and recurring themes which emerged from the transcripts and notes were identified and scrutinised through constant comparative analysis.

Results

Of the 20 institutions approached, 5(25%) were excluded due to incompatibility between the schedule provided by them and the academic calendar of the volunteers. There were 675 participants; 411(61%) students, 116(17%)

Table: Pre- and post-training responses of participants (n=675).

S. No	Questions	Response	Pre-training (Frequency) N(%)				Post-training (Frequency) N(%)				p-value
			Total 675	Student 410	Faculty 116	Staff 149	Total 675	Student 410	Faculty 116	Staff 149	McNemar's test
1.	Do you know what basic life support (BLS) stands for?	Yes	144 (21.3)	89 (21.7)	24 (20.6)	31 (20.8)	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	531 (78.7)	321(78.3)	92 (79.3)	118 (79.2)	2 (2.9)	2 (4.8)	0	0	
2.	Have you witnessed a person having Heart Attack?	Yes	183 (27.1)	114(27.8)	34 (29.3)	35 (23.4)	183 (27.1)	114 (27.8)	34 (29.3)	35 (23.4)	0.001*
		No	441 (65.3)	268(65.4)	70 (60.1)	103 (69.2)	441 (65.3)	268 (65.4)	70 (60.1)	103 (69.2)	
		Not sure	51 (7.6)	28 (6.8)	12 (10.3)	11 (7.4)	51 (7.6)	28 (6.8)	12 (10.3)	11 (7.0)	
3.	What was your response?	Called for help	555 (82.2)	340(82.2)	94 (81.0)	121 (81.2)	379 (56.1)	221 (53.9)	70 (60.3)	88 (59.0)	0.001*
		Started cardiopulmonary resuscitation (CPR) myself	96 (14.2)	59 (14.3)	18 (15.5)	19 (12.7)	296 (43.9)	189 (46.0)	46 (39.6)	61 (40.9)	
		Other	24 (3.6)	11 (2.6)	4 (3.4)	9 (6.0)		0	0	0	
4.	Can you assess whether victim requires BLS?	Yes	52 (7.7)	23 (7.2)	16 (13.7)	13 (8.7)	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	316 (46.8)	192(46.8)	53 (45.6)	71 (47.6)	2 (0.3)	2 (0.45)	0	0	
		Not sure	307 (45.5)	195(47.5)	47 (40.5)	65 (43.6)		0	0	0	
5.	Can you assess an Unresponsiveperson?	Yes	72 (10.7)	46 (11.2)	13 (11.2)	13 (8.7)	673 (99.7)	410 (100.0)	114 (98.3)	149 (100.0)	0.001*
		No	603 (89.3)	364(88.7)	103(88.7)	136 (91.2)	2 (0.3)	0	2 (1.7)	0	
6.	Do you know how to check carotid pulse?	Yes	73 (10.8)	47 (11.4)	17 (14.6)	9 (6.0)	673 (99.7)	410 (100.0)	114 (98.3)	149 (100.0)	0.001*
		No	547 (81.0)	336(81.9)	88 (75.8)	123 (82.5)	2 (0.3)	0	2 (1.7)	0	
		Not sure	55 (8.1)	27 (6.5)	11 (9.4)	17 (11.4)		0	0	0	
7.	Do you know how to assess breathing?	Yes	299 (44.3)	167(40.9)	58 (50.0)	74 (49.6)	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	162 (24.0)	108(26.3)	26 (22.4)	28 (18.8)	2 (0.3)	2 (0.45)	0	0	
		Not sure	214 (31.7)	135(32.9)	32 (27.5)	47 (31.5)		0	0	0	
8.	Do you know how to give rescue breaths?	Yes	131 (19.4)	87 (21.2)	23 (19.8)	21 (14.0)	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	541 (80.1)	323(78.7)	93 (80.1)	125 (83.8)	2 (0.3)	2 (0.45)	0	0	
		Not sure	3 (0.4)	0	0	3 (2.0)		0	0	0	
9.	Do you know how to do chest compression?	Yes	93 (13.8)	66 (16.0)	12 (10.1)	15 (10.0)	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	579 (85.8)	344(83.9)	104(89.6)	131 (87.9)	2 (0.3)	2 (0.45)	0	0	
		Not sure	3 (0.4)	0	0	3 (2.0)		0	0	0	
10.	Do you know the ventilation compression ratio?	Yes	88 (13.0)	50 (43.1)	12 (8.0)	26	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	587 (87.0)	360(87.8)	104(89.6)	123(82.5)	2 (0.3)	2 (0.45)	0	0	
11.	Do you know what automated external defibrillator (AED) stands for?	Yes	0	0	0	0	673 (99.7)	408 (99.5)	116 (100.0)	149 (100.0)	0.001*
		No	675 (100.0)	410 (100.0)	116 (100.0)	149 (100.0)	2 (0.3)	2 (0.45)	0	0	
12.	Do you know the local rescue number?	Yes	377 (55.9)	233(56.8)	70 (60.3)	74 (49.6)	592 (87.7)	364 (88.7)	91 (78.4)	137 (91.9)	0.02*
		No	156 (23.1)	90 (21.9)	24 (20.6)	42 (28.1)	83 (12.3)	46 (11.2)	25 (21.5)	12 (8.0)	
		Not sure	142 (21.0)	87 (21.2)	22 (18.6)	33 (22.1)		0	0	0	

faculty and 149(22%) staff members.

Before the training, 144(21.3%) participants had heard about BLS, and 623(92.3%) reported their inability to assess an unresponsive person. The participants' pre-training knowledge regarding checking carotid pulse, providing rescue breathing, chest compression and ventilation compression was 73(10.8%), 131(19.4%), 93(13.8%) and 88(13%) respectively, which improved to 673(99%) in all areas (p <0.001) post-training (Table).

Of the 120 trained student volunteers in 20 teams that were initially formed, 15 team leaders who got a chance to visit their designated institution were interviewed. The common and recurring themes which emerged from the transcripts and notes after constant comparative analysis were noted verbatim. 'Opportunity for improving self-confidence' was found to be the main and the foremost common opinion 13(86.6%). Few examples of responses includes: *"… this activity has made me confident to tackle emergency…"* and *"… I feel much more confident than before…."*; *"… now I can certainly teach my fellow students…"*; *"… "my self-confidence has been boosted…"*; and *"… role of the leader has raised my self-esteem…"*.

Another common theme identified was 'improvement in BLS technique' as interpreted from views like: *"rehearsals have polished my skill …"*; *"I am proficient in the BLS technique…"*; *"BLS steps are on my fingertips now…"*; and *"my knowledge is far better now"*.

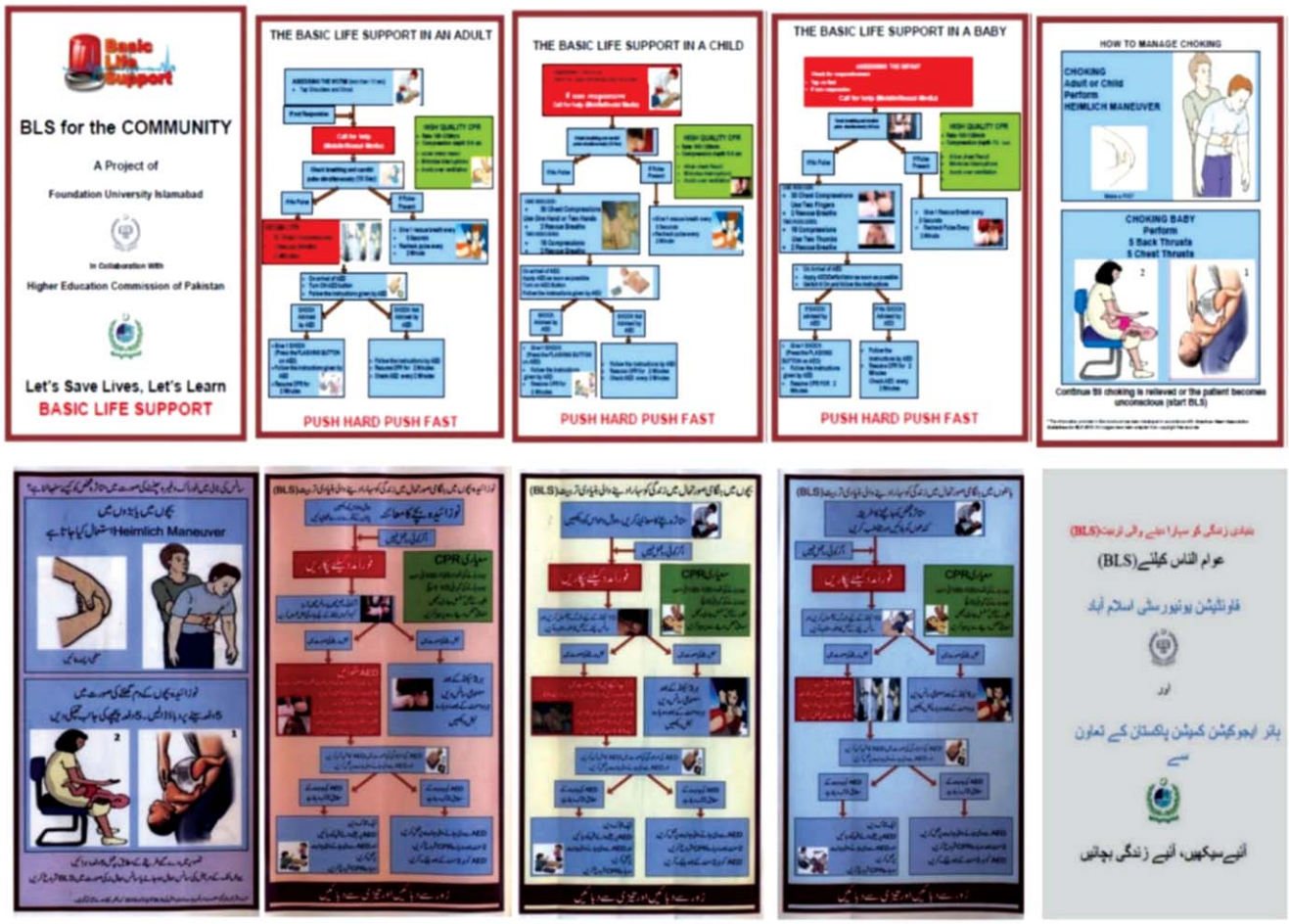

Figure: Basic life support (BLS) brochure, 'BLS for the community', designed and published for participants in English and Urdu languages.

Another theme identified was 'responsibility towards community' which was mentioned by 10(66.6%) team leaders: *"students should more often be involved in public health awareness activities…"*; *"we should not just study for exams…"*; *"such community visits should be part of our routine…"*; and *"we should be teaching about preventive diseases too…"*.

Another interesting and rather unexpected theme that appeared in the content analysis was of 'self-fulfillment' expressed by 8(53%) team leaders: *"I felt useful…"*; *"being part of this noble activity I feel so contented…"*; *"it gave me a feeling of self-satisfaction…"*; and *"it was pleasurable experience…"*.

Other less common themes identified by 2(13.3%) team leaders was 'essential training in schools' and 1(6.6%) leader talked of 'long-term results' and all three of them suggested that the workshops should be considered part of the curriculum in schools and colleges. Besides, 4(26.6%) team leaders said they wanted to revisit their allotted institutions and meet the participants to listen to their encounters with an unconscious victim, if any that they might have encountered, and the retention of BLS knowledge.

Discussion

SCA is an important acute emergency that can happen in and outside the hospital setup. It carries a high level of mortality risk.[16,17] The current findings revealed 99% improvement in the knowledge and skills of lay participants after BLS training.

The community members targeted for BLS training were from non-medical institutions where students, supporting staff and faculty members were given hands-on training in BLS. The idea was to first assess prior knowledge and then impart BLS training to the educated laypersons. It was assumed that pre-training evaluation would have a beneficial effect on the participant's BLS skill acquisition during the workshop as they would be aware of the important steps to remember in the chain of

survival. Pre- and post-event evaluation is valuable in gauging educational efficiency for rescue training and directly affect improvement outcomes.[18] Post-training assessment showed significant improvement in the current study. Literature also shows a similar trend.[19,20] In the current study, improvement can be due to hands-on training on manikins and the small group size for each workshop. The significant difference in pre- and post-training results can also be attributable to immediate post-workshop assessment. To our knowledge, there is no programme on BLS training in Pakistan for laypersons, and the current training raised awareness in this regard.

The current study depicted a severe deficiency of BLS knowledge before the training. This poor knowledge among students and supporting personnel is attributable to the absence of any training pertinent to basic life support at high school and university levels. Unfortunately, a similar pattern of deficient knowledge is exhibited by the medical students and doctors in various other studies across the globe.[21-25] The European Resuscitation Council recommends every community member to be trained in performing BLS.[26] Globally, awareness programmes have been organised to demonstrate BLS technique in schools so that even children can provide effective resuscitation if the need arises.[27] In Pakistan also, lack of resuscitation education is seen, and this may be causing adverse clinical outcomes and medico-legal complications.[28]

Around 80% participants in the current study were not even aware of what 'BLS' meant. This emphasises the need for the induction of BLS education in basic educational curriculum. Lessons can be learned from the experiences of implementation of BLS education in the school curriculum in Norwegian schools where it has been in effect for more than four decades. Norwegian children go through at least one BLS course during middle school.[29,30]

In the current study (92%) participants were not in a decision-making position on the basis of proper BLS need assessment. These numbers suggest a grave deficiency of education in our community since 29% of all the proportional mortality in Pakistan is due to cardiovascular diseases.[31] Moreover, 36,000 death estimates from Pakistan have been reported from road traffic accidents (RTAs) alone in 2018.[32] Such an alarming rate of mortality indirectly depicts a significant proportion of our population standing at the doorsteps of an eventual cardiac fatality, and this demands for equipping the general community with at least basic BLS skills which can significantly alter the potential outcomes in cases of emergency. The current study also found a large number of participants (79%) to be aware of the local rescue numbers. Although Pakistan harbours a limited number of government and non-governmental agencies to cater to the emergency needs of the community, their reflection on the media and penetration in the community for their acceptability in providing a positive outcome is significant. This suggests that BLS education can get a strong foothold, provided people are made to be aware that BLS education can save lives, especially in a bystander situation.

Given the cost viability barriers in imparting BLS training,[33] confident CPR trainers can play the role of rescuers in resource-restrained settings, like Pakistan. The current study was intended to employ medical students as BLS trainers after being trained and assessed by experienced physicians for their understanding and technique in imparting BLS training. The success of CRP in improving survival outcomes has been implicated in the rescuers skills and training.[34] Losert et al. has reported significantly improved CPR performance when mentored by specially-trained physicians.[35] Team leaders of our BLS-trained teams reported enhanced self-confidence and increase in understanding after rigorous BLS skills practice. The role of self-confidence in CPR performance has been proven crucial with favourable ventilation and compression capability.[36] Furthermore, this perceived self-confidence can increase rescuers' promptness to respond to life-threatening emergencies. In real-life settings, professional rescuers are exposed to distressing situations where the rescuers' self-confidence and self-esteem help them in coming up with active coping strategies, culminating into lifesaving outcomes.[37] The qualitative analysis depicted marked improvement in confidence, skills and knowledge of the team leaders.

The role of resuscitation instructors is substantial in enhancing the fallout of resuscitation efforts conducted by laypersons.[18] Literature revealed that hands-on practice and workshops enhance leadership and decision-making skills among medical students.[38] In our study, the roles were assigned to the medical students to boost their leadership and decision-making skills. Preparatory sessions were conducted to train them to deliver the best of their knowledge and to master resuscitation skills. The project also helped to develop a sense of responsibility in students towards their fellow citizens. This finding supports the recommendation of the Association of American Medical Colleges where medical schools were advised to take social responsibility for education and research in the organisation and delivery of health services.[12]

The current study has some inherent limitations. It would

have been ideal to assess the knowledge and skills of participants after a gap of a few months to assess the effectiveness of the imparted training by the facilitators. However, this was considered beyond the objectives of the current study, partly because it targeted higher educational institutions where the placement of such activities in academics are decided with at least a year of prior planning. Also, bringing the same participants back after six months for their assessment of knowledge and skills had feasibility limitations.

Conclusion

There was meagre knowledge related to BLS readiness in non-medical students, faculty and supporting staff of various educational institutions. Hands-on training sessions conducted by pre-trained medical students not only resulted in improvement in the BLS knowledge of the participants, but also had a substantial impact on medical students' self-confidence and technique.

Declaimer: None.

Conflict of Interest: None.

Source of Funding: The Higher Education Commission (HEC) of Pakistan.

References

1. Bogle BM, Ning H, Mehrotra S, Goldberger JJ, Lloyd-Jones DM. Lifetime Risk for Sudden Cardiac Death in the Community. J Am Heart Assoc. 2016; 5:e002398.
2. Berdowski J, Berg RA, Tijssen JG, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation. 2010; 81:1479-87.
3. Sasson C, Rogers MA, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes. 2010; 3:63-81.
4. Eisenburger P, Safar P. Life supporting first aid training of the public--review and recommendations. Resuscitation. 1999; 41:3-18.
5. CPR and First aid. Emergency cardiovascular care. [Online] [Cited 2019 July 27]. Available from: URL: https://cpr.heart.org/AHAECC/CPRAndECC/Programs/CPRIn-Schools/UCM_473194_CPR-In-Schools.jsp CistkAHAAf,
6. Leong BS. Bystander CPR and survival. Singapore Med J. 2011; 52:573-5.
7. Dobbie F, MacKintosh AM, Clegg G, Stirzaker R, Bauld L. Attitudes towards bystander cardiopulmonary resuscitation: Results from a cross-sectional general population survey. PLoS One. 2018; 13: e0193391.
8. CPR & First Aid training course. American Heart Association.[Online] [Cited 2019 February 15]. Availavle from: URL: https://www.heart.org/en/cpr.
9. Zaheer H, Haque Z. Awareness about BLS (CPR) among medical students: status and requirements. J Pak Med Assoc. 2009; 59:57-9.
10. Toner P, Connolly M, Laverty L, McGrath P, Connolly D, McCluskey DR. Teaching basic life support to school children using medical students and teachers in a 'peer-training' model--results of the 'ABC for life' programme. Resuscitation. 2007; 75:169-75.
11. Cho GC, Sohn YD, Kang KH, Lee WW, Lim KS , Kim W, et.al. The effect of basic life support education on laypersons' willingness in performing bystander hands only cardiopulmonary resuscitation. Resuscitation. 2010; 81:691-4.
12. Breckwoldt J, Beetz D, Schnitzer L, Waskow C, Arntz HR, Weimann J. Medical students teaching basic life support to school children as a required element of medical education: a randomised controlled study comparing three different approaches to fifth year medical training in emergency medicine. Resuscitation. 2007; 74:158-65.
13. Fraga GP, Carvalho RB, Hirano ES, Bollela VR. Basic life support: medical students learning by teaching. Med Educ. 2012; 46:1105.
14. Watanabe K, Lopez-Colon D, Shuster JJ, Philip J. Efficacy and retention of Basic Life Support education including Automated External Defibrillator usage during a physical education period. Prev Med Rep. 2017; 5: 263-7.
15. Meissner TM, Kloppe C, Hanefeld C. Basic life support skills of high school students before and after cardiopulmonary resuscitation training: a longitudinal investigation. Scan J Trauma Resusc Emerg Med. 2012; 20:31.
16. Holmberg M, Holmberg S, Herlitz J. Effect of bystander cardiopulmonary resuscitation in out-of-hospital cardiac arrest patients in Sweden. Resuscitation. 2000; 47: 59-70.
17. Herlitz J, Engdahl J, Svensson L, Angquist KA, Young M, Holmberg S. Factors associated with an increased chance of survival among patients suffering from an out-of-hospital cardiac arrest in a national perspective in Sweden. Am Heart J 2005; 149:61-6.
18. Cheng A, Nadkarni VM, Mancini MB, Hunt EA, Sinz EH, Merchant RM, et.al. Resuscitation Education Science: Educational Strategies to Improve Outcomes From Cardiac Arrest: A Scientific Statement From the American Heart Association. Circulation. 2018; 138:e82-e122.
19. Dwood SB, Al-Mosawi HS, S. Khudhair A, Al-Mussawi AA. Evaluate of Effectiveness of Planned Teaching Programmer Regarding Basic Life Support (BLS) among Nursing Staff in Basra General Hospital. Int J Nurs. 2014; 1:12-34.
20. Roshana S, Kh B, Rm P, Mw S. Basic life support: knowledge and attitude of medical/paramedical professionals. World J Emerg Med. 2012; 3: 141-5.
21. Chandrasekaran S, Kumar S, Bhat SA, Saravanakumar, Shabbir PM, Chandrasekaran V. Awareness of basic life support among medical, dental, nursing students and doctors. Indian J Anaesth. 2010; 54:121-6.
22. Olajumoke TO, Afolayan JM, Raji SA, Adekunle MA. Cardiopulmonary Resuscitation - Knowledge, Attitude & Practices in Osun State, Nigeria. J West Afr Coll Surg. 2012; 2:23-32.
23. Majid A, Jamali M, Ashrafi MM, Haq Z, lrfan R, Rehan A, et.al. Knowledge and Attitude Towards Cardiopulmonary Resuscitation Among Doctors of a Tertiary Care Hospital in Karachi. Cureus. 2019; 11:e4182.
24. Kaihula WT, Sawe HR, Runyon MS, Murray BL. Assessment of cardiopulmonary resuscitation knowledge and skills among healthcare providers at an urban tertiary referral hospital in Tanzania. BMC health Serv Res. 2018; 18:935.
25. Akpek EA, Kayhan Z. Knowledge of basic life support: a pilot study of the Turkish population by Baskent University in Ankara. Resuscitation. 2003; 58:187-92.
26. Greif R, Lockey AS, Conaghan P, Lippert A, De Vries W, Monsieurs KG. European Resuscitation Council Guidelines for Resuscitation 2015: Section 10. Education and implementation of resuscitation. Resuscitation. 2015; 95: 288-301.
27. Plant N, Taylor K. How best to teach CPR to schoolchildren: a systematic review. Resuscitation. 2013; 84:415-21.
28. Ram P, Menezes RG, Sirinvaravong N, Luis SA, Hussain SA, Madadin M, et.al. Breaking your heart-A review on CPR-related

injuries. Am J Emerg Med. 2018; 36:838-42.
29. Lind B, Stovner J. Mouth-to-Mouth Resuscitation in Norway. JAMA. 1963; 185:933-5.
30. Guidelines for basic life support. A statement by the Basic Life Support Working Party of the European Resuscitation Council, 1992. Resuscitation. 1992; 24:103-10.
31. Non Communicable Diseases Country Profile- Pakistan. World Health Organization. [Online] [Cited 2019 February 15]. Available from: URL: https://www.who.int/nmh/countries/pak_en.pdf?ua=1.
32. Road accidents in Pakistan claimed 36,000 lives last year.[Online] [Cited 2019 February 13]. Available from: URL: https://www.dawn.com/news/1463472
33. Sasson C, Haukoos JS, Bond C, Rabe M, Colbert SH, King R, et.al. Barriers and facilitators to learning and performing cardiopulmonary resuscitation in neighborhoods with low bystander cardiopulmonary resuscitation prevalence and high rates of cardiac arrest in Columbus, OH. Circ Cardiovasc Qual Outcomes. 2013; 6:550-8.
34. Hazinski MF, Nolan JP, Billi JE, Bottiger BW, Bossaert L, Caen AR, et.al. Part 1: Executive summary: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2010; 122: S250-75.
35. Losert H, Sterz F, Kohler K, Sodeck G, Fleischhackl R, Eisenburger P, et.al. Quality of cardiopulmonary resuscitation among highly trained staff in an emergency department setting. Arch Intern Med. 2006; 166:2375-80.
36. Verplancke T, De Paepe P, Calle PA, De Regge M, Van Maele G, Monsieurs KG. Determinants of the quality of basic life support by hospital nurses. Resuscitation. 2008; 77:75-80.
37. Popa GS, Podea DM. Stress-related Growth, Self-esteem and Perceived Self-efficacy among Professional Rescuers. Proc Soc Behav Sci. 2013; 89:720-4.
38. Gilfoyle E, Gottesman R, Razack S. Development of a leadership skills workshop in paediatric advanced resuscitation. Med Teach. 2007; 29:e276-83.