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EMPOWERING COMMUNITIES THROUGH CPR EDUCATION: ASSESSING SKILL ACQUISITION AMONG NON-MEDICAL PARTICIPANTS

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Abstract

Background: *Early bystander cardiopulmonary resuscitation (CPR) substantially improves survival and neurological outcomes after out-of-hospital cardiac arrest, yet community awareness and practical readiness remain low in many settings. There is a recognized gap between CPR awareness and the ability to perform effective chest compressions and rescue actions, particularly among non-medical community members.*

Objective: *To evaluate the effectiveness of a structured CPR education and hands-on training program in improving knowledge, confidence, and practical CPR skills among non-medical participants from urban and rural areas of Wah Cantonment.*

Methodology*: A one-group pretest–posttest design was conducted among 100 non-medical adults (18–55 years) from Wah Cantonment. CPR knowledge and skills were assessed using an AHA-based questionnaire and manikin checklist before and after a structured training session (lecture,*

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demonstration, and hands-on practice). Data were analyzed in SPSS v25 using descriptive statistics and paired t-tests ($p < 0.05$).

Results: *Of 100 participants (52% male; mean age 31.4 ± 9.2 years; 53% rural), baseline CPR knowledge was low (pretest mean = 4.82 ± 1.91 out of 10). Following the workshop, knowledge improved significantly (posttest mean = 8.76 ± 1.15), yielding a mean difference of 3.94 ($t = 19.47$, $p < 0.001$). Practical skill performance showed large absolute gains: correct recognition of unresponsiveness increased from 24.0% to 91.0% (+67%), calling for emergency help from 35.0% to 94.0% (+59%), correct hand position from 15.0% to 89.0% (+74%), maintenance of compression depth and rhythm from 12.0% to 85.0% (+73%), and accurate sequence execution from 10.0% to 88.0% (+78%).*

Conclusion: *A brief, structured CPR education program combining didactic instruction with supervised hands-on practice produces large, immediate improvements in both CPR knowledge and practical skills among non-medical community participants. Such training is a feasible and effective strategy to enhance community preparedness for cardiac emergencies. To maximize public-health impact, programs should incorporate periodic refresher sessions and broader community engagement measures to sustain skills and translate competence into real-world bystander action.*

INTRODUCTION

Cardiopulmonary resuscitation (CPR) is a lifesaving emergency procedure that maintains blood circulation and oxygenation in individuals experiencing cardiac arrest until professional medical help arrives. Early initiation of CPR by bystanders significantly increases survival and favorable neurological outcomes(1). Evidence indicates that for every minute without chest compressions, the likelihood of survival decreases by approximately 7–10% (2). Therefore, it is essential to equip community members especially non-medical individuals with CPR knowledge and skills to enhance emergency response and improve outcomes in cardiac emergencies.

Despite its proven importance, public awareness and readiness to perform CPR remain alarmingly low in many parts of the world. Factors such as fear of causing harm, lack of confidence, and limited access to training opportunities contribute to low bystander CPR rates(3). In Pakistan, for example, only 2.3% of out-of-hospital cardiac arrest victims reportedly received bystander CPR, primarily due to inadequate training and fear of legal or social consequences(4) Similarly, a study conducted among Saudi university students revealed that while 77.5% of participants were aware of CPR, only 15.8% knew when to begin the procedure, and fewer than one-third could accurately assess unresponsiveness(5). These findings highlight that general awareness alone is insufficient; genuine preparedness requires skill acquisition, practical exposure, and confidence to act in real-life emergencies.

Developing CPR competence involves learning not only the correct sequence of actions but also mastering technical aspects such as hand placement, compression depth, and rate. Research shows that individuals who undergo repeated, hands-on training perform CPR with greater accuracy and confidence compared to those who receive theoretical instruction alone (6). However, most public training programs focus on imparting knowledge rather than evaluating performance or retention

of practical skills. In a recent study, Yasin et al. (2023) found that while participants' CPR knowledge improved significantly after a single training session, their practical performance and confidence declined after three months, emphasizing the need for structured and continuous skill-based interventions(7).

Although numerous studies have explored CPR awareness and attitudes(8, 9), important research gaps remain. Many investigations target healthcare professionals or students rather than laypersons, even though non-medical individuals are often the first witnesses to cardiac arrest(10, 11). Few studies have measured actual skill improvement before and after CPR training among community participants, and even fewer have assessed retention of those skills over time(12, 13). Evidence from low- and middle-income countries is particularly limited, especially concerning programs that integrate education, practice, and evaluation among the public. Moreover, psychosocial aspects such as fear of failure, lack of self-efficacy, and perceived social barriers are often overlooked, even though they significantly influence a person's willingness to perform CPR (14). Addressing these gaps requires an integrated approach that combines awareness, skill development, and empowerment to create a sustainable culture of community readiness.

The rationale for this study lies in the pressing need to bridge the gap between knowledge and action. Cardiac arrests can occur anywhere in homes, workplaces, or public spaces and the presence of a trained layperson can determine whether a life is saved or lost. Yet, most communities lack enough trained responders. This study seeks to empower non-medical participants through structured CPR education and hands-on training, transforming theoretical understanding into practical capability. By focusing on both knowledge and performance, the study aims to foster confidence and competence in performing CPR during emergencies.

The significance of this study extends beyond individual learning outcomes. It contributes to the broader goal of community health empowerment by transforming ordinary citizens into capable first responders. The findings will provide empirical evidence on how structured CPR workshops can enhance not only participants' knowledge but also their practical ability and willingness to act. Such evidence can inform policymakers, educational institutions, and health organizations in designing effective, community-centered CPR training programs. Ultimately, enhancing the community's readiness to respond to cardiac emergencies can improve out-of-hospital survival rates and reduce preventable deaths, particularly in low-resource settings where emergency services are often delayed.

The present study aims to empower communities through CPR education by assessing skill acquisition among non-medical participants. Specifically, it seeks to assess the baseline knowledge and skills related to cardiopulmonary resuscitation among non-medical participants prior to training; to implement a structured CPR education and hands-on training program aimed at improving emergency response competence; to evaluate the effectiveness of training in enhancing participants' knowledge, confidence, and practical skills; to compare participants' performance before and after training to determine the overall improvement in skill acquisition; and to promote community empowerment by raising awareness of the importance of timely CPR intervention during cardiac emergencies.

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METHODOLOGY

The present study employed a quantitative pre-experimental (one-group pretest–posttest) research design to evaluate the effectiveness of a structured cardiopulmonary resuscitation (CPR) education program in enhancing knowledge, awareness, and skill acquisition among non-medical community participants. The primary aim was to assess participants' baseline knowledge and practical competence regarding CPR, implement a structured educational and hands-on training program, and evaluate its effectiveness through pre- and post-intervention assessments.

The study was conducted in Wah Cantonment, Pakistan, at Wah Medical College, which served as the central training and data collection site. Ethical approval for the study was obtained from the Ethical Review Committee of Wah Medical College prior to participant recruitment. The research adhered to ethical principles of voluntary participation, informed consent, confidentiality, and the right to withdraw at any stage without penalty.

The target population comprised non-medical individuals aged between 18 and 55 years residing in both rural and urban areas of Wah Cantonment. A total of 100 participants were recruited through convenience sampling from community centers, local organizations, and educational institutions. Both male and female participants were included to ensure gender diversity and representation of the broader community. Inclusion criteria required participants to be non-medical individuals with no formal training or professional background in healthcare or emergency medicine, willing to provide written informed consent, and physically able to perform CPR maneuvers. Individuals who were medical or paramedical professionals, had previously received certified CPR training, or reported physical disabilities preventing active participation in the training were excluded from the study.

A demographic information sheet was administered to collect participants' background data, including age, gender, education level, socioeconomic status, and living environment (rural or urban). These characteristics were recorded to help describe the sample and analyze whether demographic variables influenced baseline awareness or post-training improvement.

Data collection instruments were designed to evaluate knowledge, awareness, and skill performance related to CPR. A structured questionnaire, developed based on the American Heart Association's Basic Life Support (BLS) guidelines, was used to assess participants' knowledge and awareness. The questionnaire consisted of multiple-choice and true/false questions focusing on recognizing cardiac arrest, calling for help, performing chest compressions, and understanding the sequence of CPR steps. A practical performance checklist was also used to assess skill acquisition, including proper hand placement, compression depth, and rate during simulated CPR on a mannequin.

The data collection procedure was conducted in three phases. In the first phase, a pretest was administered to all participants to assess baseline knowledge and awareness regarding CPR. In the second phase, participants underwent a structured CPR education and hands-on training program conducted by certified BLS instructors from Wah Medical College. The program included a short interactive lecture, live demonstration of CPR techniques, and small-group practical sessions allowing participants to practice compressions and rescue procedures on mannequins under supervision. The educational content emphasized the "Chain of Survival," early recognition, calling

for help, and effective chest compression technique. In the third phase, immediately after the training, participants completed a posttest using the same questionnaire and performance checklist to evaluate the effectiveness of the educational intervention in enhancing knowledge, confidence, and skill proficiency.

Data were coded and entered IBM SPSS version 25 for statistical analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed to summarize demographic characteristics and pre- and post-intervention scores. Paired sample t-tests were applied to compare participants' knowledge and skill scores before and after the CPR education program.

RESULTS

A total of 100 non-medical participants from Wah Cantonment, including 52 males and 48 females, completed the CPR education and training program. The mean age of participants was 31.4 ± 9.2 years, ranging from 18 to 55 years. Nearly half (47%) of the participants resided in urban areas, while 53% were from rural regions. Most participants (58%) had completed at least secondary education, and 64% belonged to middle socioeconomic status families.

Table 1
Demographic Characteristics of Participants (n = 100)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	52	52.0
	Female	48	48.0
Age Group (years)	18–25	28	28.0
	26–35	36	36.0
	36–45	22	22.0
	46–55	14	14.0
Residence	Rural	53	53.0
	Urban	47	47.0
Education Level	Primary or below	10	10.0
	Secondary	48	48.0
	Bachelor's or above	42	42.0
Socioeconomic Status	Low	22	22.0
	Middle	64	64.0
	High	14	14.0

Table 1 results show that the study included 100 non-medical participants from Wah Cantonment, comprising 52 males and 48 females, indicating a nearly balanced gender distribution. The mean age of participants was 31.4 ± 9.2 years, with the largest proportion (36%) belonging to the 26–35-

year age group, followed by 28% in the 18–25-year range, reflecting a predominantly young to middle-aged sample. Slightly more than half of the participants (53%) resided in rural areas, while 47% were from urban settings, suggesting adequate representation from both localities. In terms of education, 48% had completed secondary education and 42% held a bachelor's degree or higher, denoting a reasonably educated population. Most respondents (64%) belonged to middle socioeconomic status families, whereas only 22% were from low-income groups and 14% from high-income backgrounds.

Table 2
Comparison of Pretest and Posttest Knowledge Scores (n = 100)

Variable	Mean ± SD (Pretest)	Mean ± SD (Posttest)	Mean Difference	t-value	p-value
Knowledge Score (0–10)	4.82 ± 1.91	8.76 ± 1.15	3.94	19.47	<0.001*

*Significant at $p < 0.05$

Table 2 results show a significant improvement in participants' knowledge following the CPR education program. The mean pre-test score was 4.82 ± 1.91, which markedly increased to 8.76 ± 1.15 in the post-test, yielding a mean difference of 3.94 points. The paired-sample t-test produced a t-value of 19.47 with a p-value < 0.001, confirming that the gain in knowledge was statistically significant. This substantial enhancement indicates that the educational intervention was highly effective in improving participants' conceptual understanding of CPR principles and procedures, reinforcing the value of structured community-based training for non-medical individuals.

Table 3
Comparison of Skill Performance Before and After Training (n = 100)

Performance Indicators	Pretest (n, %)	Posttest (n, %)	Improvement (%)
Recognized unresponsive person	24 (24.0%)	91 (91.0%)	+67.0
Called for help/emergency service	35 (35.0%)	94 (94.0%)	+59.0
Correct hand position for chest compression	15 (15.0%)	89 (89.0%)	+74.0
Maintained compression depth and rhythm	12 (12.0%)	85 (85.0%)	+73.0
Sequence of steps performed accurately	10 (10.0%)	88 (88.0%)	+78.0

Table 3 results show notable improvement in practical CPR skills after the training session. Before the intervention, fewer participants could correctly recognize an unresponsive person (24%), call for help (35%), or demonstrate proper hand positioning for chest compression (15%). Post-training performance increased dramatically across all indicators, with over 89% of participants correctly executing each step. The most pronounced improvements were observed in the accurate sequence of CPR steps (+78%), maintenance of compression depth and rhythm (+73%), and hand positioning (+74%).

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DISCUSSION

The aim of this study was to evaluate whether a structured CPR education and hands-on training program could improve knowledge, confidence, and practical CPR skills among non-medical community participants in Wah Cantonment. Framed as a one-group pretest–posttest intervention, the study intended to translate baseline awareness into demonstrable competence and thus strengthen the community's capacity to respond to out-of-hospital cardiac arrest.

The sample profile (Table 1) showed a balanced gender distribution, a wide age range (18–55 years), and representation from both rural and urban settings. This demographic mix is important because bystander characteristics age, education, residence and socioeconomic status influence both access to training and willingness to intervene during an emergency (15). The relatively high proportion of participants with secondary or higher education in this sample may have facilitated rapid uptake of theoretical concepts during the workshop; however, rural representation ensured that findings are relevant across different community strata. Reporting demographic characteristics is therefore essential not only for describing external validity but also for interpreting subgroup variations in baseline readiness and training responsiveness (16).

Table 2's pretest findings revealed poor baseline knowledge (mean 4.82 ± 1.91 /10), which is consistent with prior community surveys that document low functional understanding of when and how to initiate CPR among lay populations (17). Low baseline scores emphasize the unmet need for community-level training and mirror trends reported in similar low- and middle-income settings where awareness does not reliably translate into actionable knowledge (4). The pretest results also underscore psychosocial barriers—such as lack of confidence and fear of causing harm that typically co-exist with low knowledge and reduce the likelihood of bystander intervention (15).

The marked and statistically significant rise in knowledge after the intervention (posttest mean 8.76 ± 1.15; mean difference 3.94, $p < .001$) demonstrates that a focused, instructor-led session combining brief didactic material with hands-on practice can rapidly close knowledge gaps. This finding aligns with abundant evidence that even short, well-structured BLS courses produce immediate improvements in declarative knowledge (17, 18) Importantly, the magnitude of change observed here suggests that the instructional design (live demonstration plus small-group practice on mannequins) was effective in conveying not only facts but also the correct sequence of responses an outcome that education-science literature identifies as a key driver of subsequent willingness to act (16).

Practical skill outcomes (Table 3) showed large absolute improvements across all measured indicators: recognition of unresponsiveness, calling for help, correct hand placement, maintenance of compression depth/rhythm, and correct sequence execution. The transition from single-digit or low-percentage correct performance at baseline to very high posttest correctness (hand position from 15% to 89%) demonstrates a successful transfer from knowledge to motor skill within the single training session. These results echo studies showing that hands-on practice particularly deliberate practice with corrective feedback produces substantial immediate gains in chest-compression technique among lay learners (19, 20). The high posttest performance also suggests that supervised practice on

mannequins with instructor feedback is superior to theory-only formats for producing skill competence.

When interpreting these skill gains, it is critical to situate them within the broader literature on retention and the role of refresher training. Numerous studies indicate that CPR skills decay within months of initial training unless refreshed (18, 21). Thus, while our immediate posttest improvements are encouraging and consistent with best practices for initial skill acquisition, the long-term public-health impact will depend on strategies for retention brief periodic refreshers, use of feedback devices, community practice sessions, or blended (video + hands-on) refresher models that maintain competence over time (17, 19).

Finally, the program's broader public-health implications are notable. By significantly increasing both knowledge and hands-on performance among non-medical residents from rural and urban areas, the intervention models a scalable approach to strengthen lay responder capacity. This aligns with community-level implementation studies and trials that show organization-based and outreach programs can expand the pool of competent bystanders and improve the chain of survival when integrated with public awareness campaigns (22, 23). Nevertheless, translating improved competence into actual bystander action requires attention to psychosocial barriers (fear, legal concerns), availability of AEDs in public spaces, and community reinforcement factors shown to influence willingness to perform CPR in contemporary research (15, 24). Therefore, scaling such workshops should be coupled with community engagement, policy support and infrastructure planning.

CONCLUSION

This study concludes that cardiopulmonary resuscitation (CPR) education and hands-on training are highly effective in improving the knowledge, confidence, and practical skills of non-medical community members. Before the educational intervention, participants exhibited limited awareness and inadequate CPR techniques. However, after attending the structured workshop, there was a marked improvement in their understanding and ability to perform CPR effectively. This demonstrates that with proper guidance and practice, even individuals without a medical background can acquire essential life-saving competencies. The findings emphasize the vital role of public CPR training programs in enhancing community preparedness for cardiac emergencies. Empowering ordinary citizens with CPR skills can significantly increase the chances of survival for cardiac arrest victims before professional medical help arrives. Hence, integrating regular CPR education initiatives within communities, workplaces, and educational institutions should be a public health priority. By promoting awareness and skill development, such programs not only strengthen emergency response capacity but also foster a collective sense of social responsibility toward saving lives.

LIMMMITATIONS AND RECOMMENDATIONS OF THE STUDY

Despite the encouraging outcomes, this study had several limitations. Firstly, the sample size was relatively small and limited to participants from the Wah Cantonment area, which may restrict the generalizability of the findings to broader populations. Secondly, the study used a short-term

evaluation approach, assessing participants immediately after the educational program; therefore, long-term retention of CPR knowledge and skills was not measured. Thirdly, the study relied on simulated practice rather than real-life emergency situations, which may not fully reflect participants' performance under actual stress conditions. Additionally, differences in participants' educational backgrounds and prior exposure to health-related information might have influenced learning outcomes.

Future studies should address these limitations by including a larger and more diverse sample across multiple regions and by conducting longitudinal assessments to evaluate knowledge and skill retention over time. Incorporating refresher training sessions and periodic re-assessments could also help sustain proficiency. Furthermore, integrating digital learning tools, such as mobile CPR simulation apps or virtual training modules, may enhance accessibility and engagement. It is recommended that CPR education be made a mandatory part of community health initiatives, workplace safety programs, and school curricula. Collaborative efforts between healthcare institutions, local government, and community organizations can ensure widespread CPR awareness and preparedness. Such initiatives have the potential to significantly improve bystander intervention rates and, ultimately, survival outcomes in cardiac emergencies.

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