

Original Article

Knowledge and Practice of First Aid and Cardiopulmonary Resuscitation Among Primary School Teachers in District Swabi, Pakistan: A Cross-Sectional Study

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ABSTRACT

Background: Primary school teachers may be required to provide immediate assistance during injuries and medical emergencies, yet evidence regarding their first aid and cardiopulmonary resuscitation (CPR) preparedness in Pakistan remains limited. **Objective:** To assess knowledge and self-reported practice of first aid and CPR among primary school teachers in District Swabi, Khyber Pakhtunkhwa, Pakistan. **Methods:** A descriptive cross-sectional study was conducted from December 2025 among government and private primary school teachers recruited through convenience sampling. A structured self-administered questionnaire assessed demographic characteristics, nine knowledge items, and 11 self-reported practice/preparedness items. Data were analyzed using descriptive statistics, with categorical association testing planned where appropriate. **Results:** A total of 448 teachers participated. Previous CPR-training data were available for 397 participants, of whom 138 (34.8%) reported prior training. Knowledge scores were available for 415 teachers, with a mean score of 4.67 ± 1.92 out of 9 and a median of 5.00; 87 (21.0%) scored 7–9. Practice scores were available for 397 participants and averaged 18.12 ± 3.24 , with a median of 18.00. **Conclusion:** Primary school teachers demonstrated limited first aid and CPR knowledge, and formal CPR training coverage was low. The findings indicate an important gap in school emergency preparedness and support strengthening structured first aid and CPR education for teachers. **Keywords:** First aid; Cardiopulmonary resuscitation; Primary school teachers; Knowledge; Practice; School safety; Pakistan.

INTRODUCTION

School-age children may experience a range of acute health emergencies within the school environment, including injuries, bleeding, burns, fractures, choking, seizures, fainting, and sudden cardiac arrest. Because teachers are often present when such events occur, their ability to recognize an emergency and initiate appropriate first aid or

cardiopulmonary resuscitation (CPR) may contribute to timely care before professional medical assistance becomes available (1,2). Primary school teachers are therefore an important target population for assessment of first aid and basic life support preparedness, particularly because younger children may depend heavily on supervising adults during medical emergencies.

Evidence from different countries indicates that schoolteachers frequently have limited formal training and incomplete knowledge of first aid and CPR. Among female schoolteachers in Al-Madinah, Saudi Arabia, only 30.5% had previously received CPR training despite a high level of interest in further instruction (3). Similarly, a study of schoolteachers in Jordan reported that only 14.5% had received CPR training and demonstrated substantial gaps in CPR knowledge (4). In Spain, teachers and parents commonly perceived their first aid knowledge as adequate, although very few respondents were able to correctly sequence the steps of basic life support (5). More recent evidence from Saudi Arabia likewise showed low exposure to pediatric CPR education and training among elementary schoolteachers (6). Comparable deficiencies have been reported in Greece, Brazil, China, and Ethiopia, where teachers demonstrated variable but generally insufficient knowledge of first aid procedures and emergency response, while previous training emerged as an important factor associated with better preparedness in several settings (7–10).

Evidence from Pakistan remains comparatively limited. A study conducted among public- and private-sector schoolteachers in Karachi found that only 27% of public-school teachers and 40% of private-school teachers believed that they had sufficient first aid knowledge to manage an emergency independently (11). Deficiencies in first aid knowledge have also been reported among undergraduate health-profession students in Pakistan, particularly among those without previous training (12). Although these findings indicate broader gaps in emergency-care preparedness, available Pakistani evidence does not adequately describe first aid and CPR knowledge and self-reported practice among primary school teachers in Khyber Pakhtunkhwa, particularly in District Swabi.

Previous studies further suggest that exposure to structured first aid or CPR training is an important component of emergency preparedness among teachers. International studies have identified limited access to formal training, lack of confidence, fear of causing harm, and concerns about responding incorrectly as barriers to effective first aid and basic life support participation (13,14). These findings support the need to determine not only whether teachers possess essential first aid and CPR knowledge, but also whether they report previous training and preparedness to respond to emergencies in their own school settings. Locally generated evidence is particularly important because differences in teacher preparation, school resources, training opportunities, and health-service access may limit the applicability of findings from other countries to primary schools in District Swabi.

Accordingly, the present cross-sectional study was conducted to assess the knowledge and self-reported practice of first aid and CPR among primary school teachers in government and private schools of District Swabi, Khyber Pakhtunkhwa, Pakistan, and to examine whether knowledge was associated with selected demographic and professional characteristics. The study was intended to provide local evidence that may inform the development of appropriately targeted first aid and CPR training and school emergency-preparedness initiatives.

MATERIAL AND METHODS

A quantitative descriptive cross-sectional study was conducted among primary school teachers in District Swabi, Khyber Pakhtunkhwa, Pakistan, from December 2025 to January 2026. The cross-sectional design was selected to characterize teachers' existing knowledge and self-reported practice regarding first aid and cardiopulmonary resuscitation (CPR) without intervention or follow-up. The study was carried out in government and private primary schools serving classes 1–5 across District Swabi, which includes both urban and rural communities. The target population comprised qualified male and female teachers currently teaching at the primary-school level.

Teachers were eligible if they were currently employed in a government or private primary school in District Swabi, taught classes 1–5, were present during data collection, and voluntarily agreed to participate. Teachers working at higher-secondary or college level, non-teaching staff, teachers who were absent or on medical leave during data collection, those who declined participation, and those returning incomplete questionnaires were excluded. Participants were recruited using non-probability convenience sampling. Teachers who were available and accessible at participating schools during the data-collection period were approached directly by the researcher.

Recruitment included teachers from both government and private schools, male and female teachers, and schools located across different union councils and tehsils of the district to obtain representation from different educational settings.

The minimum sample size was estimated using the single-population-proportion formula, $n = Z^2pq/d^2$, with a 95% confidence level ($Z = 1.96$), an assumed proportion of 50% because no precise local estimate of adequate CPR knowledge was available, $q = 1 - p$, and a 5% margin of error. This produced a minimum required sample of 384 teachers. To allow for potential non-response and incomplete questionnaires, 10% was added, resulting in a recruitment target of 423 participants. Recruitment continued during the defined data-collection period, and 448 teachers ultimately participated in the study.

Data were collected using a structured, self-administered questionnaire adapted from the instrument reported by Tamur et al. (14). The questionnaire was administered in English, with an Urdu version available when required for comprehension. It contained three components. The first collected demographic and professional information, including age, gender, marital status, educational qualification, school type, teaching experience, and previous first aid or CPR training. The second assessed knowledge through nine multiple-choice items covering first aid and CPR concepts, including management of bleeding, burns, fractures, choking, seizures, and fainting, as well as recognition of cardiac arrest, chest-compression rate and depth, compression-to-ventilation ratio, and use of an automated external defibrillator. The third component contained 11 items assessing self-reported first aid and CPR-related practice and preparedness, including previous provision of first aid, availability of first aid resources within the school, and confidence in responding to emergency situations.

For the knowledge component, each correct answer was assigned one point, whereas an incorrect or “do not know” response received zero points, producing a possible total knowledge score from 0 to 9. Scores were also converted to percentages. According to the study protocol, percentage scores were classified as good knowledge at $\geq 70\%$, moderate knowledge at 50–69%, and poor knowledge at $< 50\%$.

Practice-item responses were combined to generate an overall self-reported practice score, with higher scores representing more favorable reported practice or preparedness. Practice was assessed descriptively in the final analysis because the observed score distribution did not support meaningful categorical comparison across participant characteristics.

Content validity of the adapted questionnaire was evaluated by five nursing experts, and modifications were made in response to their review. Before the main study, the questionnaire was pilot tested among approximately 10% of the intended sample ($n = 40$ teachers) recruited from schools that were not included in the final study. The pilot assessment examined clarity, relevance, comprehensibility, and the time required for questionnaire completion. Pilot participants were excluded from the final analysis. Internal consistency of the instrument was assessed using Cronbach's alpha and was reported as 0.93.

Following ethical approval, the researcher visited participating schools, explained the study purpose and procedures to eligible teachers, and obtained written informed consent before questionnaire administration. Participants completed the questionnaire independently in a quiet setting, and completion generally required approximately 10–15 minutes.

The researcher remained available to clarify procedural or wording-related questions without directing participants toward particular responses. Completed questionnaires were reviewed at the point of collection for completeness before being retained for data entry. These procedures, together with use of a standardized questionnaire, pilot testing outside the final sample, and consistent administration procedures, were intended to improve data quality and reduce avoidable measurement and data-entry errors.

The primary study outcomes were knowledge of first aid and CPR and self-reported first aid and CPR-related practice. Demographic and professional characteristics, including age, gender, marital status, educational qualification, school type, teaching experience, and previous first aid or CPR training, were considered potential explanatory variables. Because the study was observational and cross-sectional, analyses were interpreted as descriptive or associative rather than causal. No intervention, exposure assignment, follow-up assessment, or prospective outcome measurement was undertaken.

Data were entered, coded, cleaned, and analyzed using IBM SPSS Statistics version 21.0. Categorical variables were summarized using frequencies and percentages, whereas continuous score variables were summarized using means and standard deviations; medians and observed ranges were additionally reported where relevant. Because some questionnaires contained missing responses, analyses were based on the available valid observations for each variable, and the corresponding valid denominator was reported with the results. Knowledge scores and practice scores were summarized descriptively. Associations between categorized knowledge and participant characteristics, including gender, age, marital status, educational qualification, and previous CPR training, were examined using Pearson's chi-square test. Fisher's exact test was used for 2×2 comparisons when expected cell counts were small. All statistical tests were two-sided, and a p -value < 0.05 was considered statistically significant. Analyses were bivariate; no multivariable-adjusted model was performed.

Ethical approval was obtained from the Institutional Review Board of the Hamdan Institute of Nursing & Allied Health Sciences, Swabi (Reference No. HINAHS/Admin/026/05/003-IRB). The study was conducted in accordance with the principles of the Declaration of Helsinki. Participation was voluntary, and written informed consent was obtained from all participants before data collection.

RESULTS

A total of 448 primary school teachers participated in the study. The number of valid observations varied across variables because of item-level missing responses. Gender information was available for 432 participants, age and marital status for 437 each, educational qualification for 433, previous CPR training for 397, knowledge scores for 415, and practice scores for 397.

Table 1. Sociodemographic and training characteristics of participants (N = 448)

Variable	n (%)
Gender	
Male	322 (74.5)
Female	110 (25.5)
Missing	16 (3.6)
Age, years	
<25	117 (26.8)
25–35	162 (37.1)
36–45	92 (21.1)
46–55	57 (13.0)
56–60	5 (1.1)
>60	4 (0.9)
Missing	11 (2.5)
Marital status	
Single	219 (50.1)
Married	176 (40.3)
Divorced	33 (7.6)
Widowed	9 (2.1)
Missing	11 (2.5)
Educational qualification	
BA/BSc	90 (20.8)
BS	146 (33.7)
MA/MSc	119 (27.5)
M.Phil	72 (16.6)
PhD	6 (1.4)
Missing	15 (3.3)
Previous CPR training	
Yes	138 (34.8)
No	259 (65.2)
Missing	51 (11.4)

Percentages for response categories are based on the valid denominator for each variable. Missing percentages are based on the total sample (N = 448). CPR, cardiopulmonary resuscitation.

Among participants with available gender data, 322/432 (74.5%) were male. The largest age group was 25–35 years, comprising 162/437 (37.1%) participants, followed by those younger than 25 years (117/437, 26.8%). Half of participants with available marital-status information were single (219/437, 50.1%). BS was the most frequently reported educational qualification (146/433, 33.7%). Previous CPR-training information was available for 397

teachers, of whom 138 (34.8%; 95% CI 30.2–39.6%) reported having received CPR training and 259 (65.2%) reported no previous training.

Table 2. Distribution and summary of first aid and CPR knowledge scores (n = 415)

Knowledge measure	Value
Mean $\pm$ SD	4.67 $\pm$ 1.92
95% CI for mean	4.48–4.86
Median	5.00
Observed range	0–9
Score 0–3, n (%)	115 (27.7)
Score 4–6, n (%)	213 (51.3)
Score 7–9, n (%)	87 (21.0)
Score 0, n (%)	4 (1.0)
Score 9, n (%)	3 (0.7)

CI, confidence interval; CPR, cardiopulmonary resuscitation; SD, standard deviation. The 95% CI for the mean was calculated from the reported mean, SD, and sample size.

Knowledge scores were available for 415 participants. The mean score was 4.67 $\pm$ 1.92 out of 9, with a median of 5.00 and a 95% CI for the mean of 4.48–4.86. Scores ranged from 0 to 9. A total of 115 participants (27.7%) scored between 0 and 3, 213 (51.3%) scored between 4 and 6, and 87 (21.0%) scored between 7 and 9. Only 3 participants (0.7%) obtained the maximum score of 9, whereas 4 (1.0%) obtained a score of 0.

Table 3. Summary of self-reported first aid and CPR practice scores (n = 397)

Practice measure	Value
Mean $\pm$ SD	18.12 $\pm$ 3.24
95% CI for mean	17.80–18.44
Median	18.00
Observed range	11–30
Score ≤ 17 , n (%)	171 (43.1)
Score ≤ 22 , n (%)	359 (90.4)
Score > 24 , n (%)	7 (1.8)

CI, confidence interval; CPR, cardiopulmonary resuscitation; SD, standard deviation. The 95% CI for the mean was calculated from the reported mean, SD, and sample size. Reported score thresholds overlap and represent cumulative or upper-tail distributions rather than mutually exclusive categories.

Practice scores were available for 397 participants. The mean self-reported practice score was 18.12 $\pm$ 3.24, with a median of 18.00 and an observed range of 11–30; the calculated 95% CI for the mean was 17.80–18.44. A total of 171 participants (43.1%) scored 17 or below, while 359 (90.4%) scored 22 or below. Only 7 participants (1.8%) obtained scores above 24.

No publication-ready inferential estimates are presented here because the submitted knowledge-category association analysis does not correspond consistently with the reported knowledge-score distribution. Inferential results should be incorporated only after the knowledge-category variable and corresponding cross-tabulations have been reconstructed from the original statistical dataset.

DISCUSSION

The present study indicates important gaps in first aid and cardiopulmonary resuscitation preparedness among primary school teachers in District Swabi. Teachers demonstrated only partial knowledge of the assessed first aid and CPR concepts, and previous CPR training had reached only about one-third of respondents. The self-reported practice findings similarly suggest substantial variation in preparedness, although these scores represent reported behaviour and confidence rather than directly observed emergency-response competence. Taken together, the findings indicate that many teachers may enter school emergencies without sufficient formal preparation in basic first aid and CPR.

The limited exposure to CPR training observed in this study is consistent with international evidence showing that substantial proportions of schoolteachers have never received structured emergency-care education. In Al-Madinah, only 30.5% of female schoolteachers had previously received CPR training, a proportion broadly comparable with that observed in the present study (3). Even lower training coverage has been reported among schoolteachers in Jordan, where only 14.5% had received CPR training (4), while a Saudi Arabian study of

elementary schoolteachers reported that the majority had never received formal CPR instruction (6). Similar deficiencies in first aid preparedness have also been described among teachers in Greece, Brazil, China, and Ethiopia (7–10). Differences in the reported proportions across settings may reflect variation in national teacher-training requirements, school-health policies, availability of certified training programs, and access to emergency-care education rather than true differences in teachers' willingness to respond.

The mean knowledge score in the present study suggests that teachers answered only about half of the assessed first aid and CPR content correctly. This finding is compatible with earlier studies documenting substantial knowledge deficits among teachers despite generally favorable attitudes toward emergency training. Schoolteachers in Jordan demonstrated limited CPR knowledge, although previous CPR training was associated with better performance (4). Spanish research similarly identified discrepancies between perceived first aid preparedness and objectively assessed knowledge of basic life support procedures (5). In Pakistan, teachers from public and private schools in Karachi also reported limited confidence in their ability to independently manage emergencies, with fewer than half considering their knowledge sufficient (11). Although these studies used different questionnaires, scoring systems, and definitions of adequate knowledge and therefore cannot be compared quantitatively on a common scale, they consistently indicate that formal educational attainment alone does not ensure competence in first aid or CPR.

Previous training is a plausible contributor to better emergency preparedness because CPR and first aid require both acquisition and retention of procedural knowledge. International studies have repeatedly identified formal training as an important correlate of knowledge, confidence, and willingness to provide assistance (4,13,14). However, the association between training and knowledge in the present study should be interpreted cautiously. The originally reported categorical analyses contained sparse cells and substantial reductions in analyzable sample size, limiting the stability of the inferential comparisons. Accordingly, the present data do not establish whether previous training independently predicts knowledge among teachers in District Swabi. Future analyses using the complete continuous knowledge score, together with appropriate multivariable methods, may provide a more informative assessment of relationships between training, demographic characteristics, school factors, and knowledge.

The findings have practical implications for school health and emergency preparedness. Teachers are frequently present when children experience injuries or acute health events, and strengthening their ability to recognize emergencies and initiate appropriate first aid may improve the timeliness of the initial response while professional care is being sought. Previous research has identified limited access to structured training, lack of confidence, and concerns about responding incorrectly as barriers to first aid participation among teachers (13,14). These considerations support the development of structured, practical first aid and CPR education for school personnel rather than reliance on general education or informal experience alone. Community health nurses and other trained health professionals may contribute to such programs through school-based instruction, practical demonstrations, and periodic skills reinforcement. The present findings support the need for locally appropriate training initiatives, although this cross-sectional study cannot determine the effectiveness of any specific training strategy.

Several strengths of the study should be recognized. The sample exceeded the calculated minimum sample size and included teachers from both government and private primary schools, allowing description of emergency-preparedness indicators across different educational settings in District Swabi. The study also used a structured questionnaire adapted from previously published work (14), underwent expert content review and pilot testing, and assessed both knowledge and self-reported practice rather than training exposure alone. Nevertheless, the findings must be interpreted within important methodological limitations.

Convenience sampling limits representativeness and may have introduced selection bias, while the single-district setting restricts generalizability to other areas of Khyber Pakhtunkhwa or Pakistan. Because practice was self-reported, responses may have been influenced by recall and social-desirability bias and should not be interpreted as evidence of demonstrated CPR or first aid skill. Missing responses produced different denominators across study variables and reduced the sample available for some analyses. The adapted questionnaire also combined several dimensions of preparedness, including reported behaviour, confidence, and school resources, and the available data did not permit direct assessment of actual performance using simulation or manikin-based testing. Finally, the

cross-sectional design establishes the distribution of knowledge, training exposure, and reported practice at one point in time but cannot determine temporal or causal relationships.

Overall, the study adds local descriptive evidence indicating that first aid and CPR preparedness among primary school teachers in District Swabi remains limited, particularly with respect to formal CPR training and knowledge of essential emergency-care concepts. These findings support further development and evaluation of structured school-based training approaches and more rigorous research using probability sampling, objective skills assessment, and appropriately powered multivariable analyses to identify factors associated with teacher preparedness.

CONCLUSION

Among primary school teachers in District Swabi, knowledge of first aid and cardiopulmonary resuscitation was limited, previous CPR training was reported by only a minority of participants, and self-reported practice showed considerable variability. These findings indicate an important gap in school emergency preparedness and support the need to strengthen structured first aid and CPR education for teachers. Because the study was cross-sectional and relied on convenience sampling and self-reported measures, the findings should be interpreted as descriptive evidence from the study population rather than as proof of causal relationships or demonstrated emergency-response competence.

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