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Nationwide Survey on Public Knowledge and Attitudes Regarding First Aid for Common Emergencies in Pakistan with Multivariable Regression Analysis

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Abstract

Background:

First aid provided by lay responders can lower preventable illness and death; however, community-level skills and training access are still uneven in low- and middle-income countries. Pakistan does not have nationally representative data on first-aid knowledge and attitudes.

Objective:

To measure adult first-aid knowledge and attitudes in Pakistan and identify sociodemographic and geographic differences to guide public health training strategies.

Methodology:

We conducted a nationwide cross-sectional survey (September–November 2025) using a structured, bilingual (Urdu/English) questionnaire adapted from validated instruments. Multi-stage cluster sampling with equal quotas recruited adults (≥ 18 years) from all seven provinces and territories through community sites and online dissemination; healthcare workers and ALS-trained individuals were excluded. Knowledge (6-item score; higher = better) and attitude (3-item Likert score, 3–15; higher = more positive) were predefined outcomes. Descriptive statistics summarized distributions. χ^2 tests assessed associations between categorical levels of knowledge and attitude and demographics; one-way ANOVA compared provincial mean knowledge scores. Listwise deletion addressed missing data; analyses used SPSS v22.

Results:

Of 490 respondents (52.4% female; 89.2% aged 18–30 years), equal representation (n = 70 each) was obtained from Azad Jammu & Kashmir, Sindh, Punjab, Khyber Pakhtunkhwa, Balochistan, Islamabad, and Gilgit-Baltistan. The average knowledge score was 3.71 ± 1.45 out of 6; 43.1% had poor, 45.1% moderate, and 11.8% good knowledge. Provincial means differed (ANOVA $F(6,483) = 11.478$, $p < 0.001$), with the highest in Khyber Pakhtunkhwa and the lowest in Sindh. Knowledge level was associated with gender, marital status, age, education, occupation, and province (all $p \leq 0.001$). The mean attitude score was 11.07 ± 2.23 out of 15; 41.0% displayed a positive attitude, 49.2% neutral, and 9.8% negative. Attitude was linked to education and province ($p \leq 0.001$), but not with gender, marital status, age, or occupation. Only 38.2% had attended a first-aid course, with reported barriers including “course not offered” (31.4%), lack of time (12%), and fees (6.9%).

Conclusions:

First-aid knowledge in Pakistan is moderate with noticeable regional and educational differences, although attitudes toward training are mostly positive. Expanding accessible, standardized first-aid education, focusing on underserved provinces and utilizing blended or community-based delivery, should become a national public health priority to bridge the gap between intent and capability.

INTRODUCTION

First aid is the immediate assistance provided to an ill or injured person before professional help arrives. According to international standards, the role of first aid is to save lives, decrease suffering, prevent additional injuries, and aid in recovery (1). Prehospital emergency care entails the basic, evidence-based measures, such as the administration of cardiopulmonary resuscitation (CPR), clearance of airway obstructions, hemorrhage control, and provision of simple life support. These measures are supposed to save lives, relieve pain and avoid complications (2). The International Federation of Red Cross and Red Crescent Societies (IFRC) notes that first aid is a cost-effective tool that empowers individuals; by sharing essential skills and knowledge with communities, first aid education helps create safer, more resilient societies (3). The IFRC “First Aid Vision 2030” states that first aid education must be accessible and inclusive, integrated into social programs, and tailored for vulnerable populations (4). Since communities are the first responders during emergencies, training laypersons and integrating them into emergency response systems is crucial (5).

The unintended injuries are a major cause of health and mortality among the world population. Pakistan and the Eastern Mediterranean Region contribute approximately 19 percent of the global number of deaths occurring due to injuries (1). Pakistan consists of around 216.6 million people, of whom about 15–25 years of the population is almost a quarter of the total people (1). According to the first National Injury Survey of Pakistan (NISP), there was a 45.6 unintentional injury per 1,000 population, with road traffic injuries being 15 per 1,000 and falls at 22.2 per 1,000 (6). The third most common cause of death in Pakistani children is unintentional injuries, followed by cancer and heart disease (7). Influenced by school working hours, teachers commonly act as first responders, and due to their training and confidence, it may not be the most appropriate job (8). Formal pre-hospital care systems remain poorly developed in most of the low- and middle-income countries (LMICs) (5). To deal with this, the World Health Organization (WHO) launched the Community First Aid Responder (CFAR) program, whereby community members are trained and incorporated into the dispatch and response systems (5). The Democratic Republic of Congo pilot CFAR course has shown that training lay people can become a viable method of enhancing emergency care when the participants showed a high confidence in their first aid practices (5).

Evidence indicates that bystanders with first aid training can effectively deliver life-saving assistance. A Norwegian observation study had observed that 97 out of 100 cases of trauma had bystanders present, and bystanders had properly administered airway management, bleeding control, and hypothermia prevention in 76, 81, and 62% respectively (9). The potential benefits of bystander first aid in terms of its impact on the health of the population are estimated as 1.8-5 percent (9). Moreover, the prehospital

emergency care literacy can have a strong impact; Chinese studies found that better knowledge of the bystanders about the emergency would lead to higher survival rates of the patients (2).

Despite the importance of recognizing the value of first aid, research shows that many people, including healthcare workers in Pakistan, lack proper knowledge and training. A survey of college students in Karachi revealed that only 17.5% had first-aid training, and those with training performed significantly better on knowledge tests (10). In a 2020 survey of Karachi schoolteachers, 96.9% knew about first aid, but only 40.7% understood that trained laypeople can provide it, and half of them remembered the emergency number. While they had a positive attitude, most teachers lacked practical knowledge and expressed the need for training (6). Another survey of caregivers in Bahrain indicated that 62.9% had never attended a first-aid course and had limited knowledge of managing childhood emergencies (11). A national study of Pakistani healthcare professionals and medical students revealed gaps in CPR knowledge; only 39% were aware of the prevalence of out-of-hospital cardiac arrests, and many misunderstood the correct compression–ventilation ratios (12). Similar results were reported elsewhere: two studies in Saudi Arabia found that only 15–34% of caregivers received first-aid training, and their limited knowledge hindered effective intervention (11).

Existing Pakistani studies have focused on specific groups, such as teachers or medical students, and used convenience sampling within limited geographic areas. To our knowledge, no nationwide survey has examined first-aid knowledge and attitudes among the general adult population. Given Pakistan's high injury rate and its large, diverse population, understanding baseline knowledge and perceived barriers to training is crucial. This nationwide cross-sectional study aims to assess the public's knowledge of first aid and attitudes toward receiving first-aid training across all provinces of Pakistan. The findings will assist policymakers and health educators in developing targeted strategies to improve emergency preparedness and reduce preventable morbidity and mortality.

METHODS

STUDY DESIGN AND SETTING

This nationwide cross-sectional study was conducted across Pakistan using a structured questionnaire adapted from validated tools employed in the Saudi Arabian study and local research (13). The design allows for the estimation of knowledge and attitudes at a single point in time across diverse regions. Pakistan was divided into multiple regions, such as

· Punjab

· Kpk

· Baluchistan

· Sindh

· Gilgit Baltistan

· Azad Jammu and Kashmir

· Islamabad

Recruitment will take place through community health centers, universities, workplaces, public events, and online platforms like social media and email. Provincial coordinators will ensure representation of both urban and rural populations.

This entire study was conducted from 12th October 2025 to 29th December 2025.

PARTICIPANTS

Our study included all Pakistani participants older than 18 years who had provided informed consent. Since it is a national survey, we distributed our sample size to seven regions. The questionnaire was distributed in both Urdu and English, and help was given to the illiterate.

All individuals under 18 years old and healthcare workers or students previously exposed to Advanced Life Support Training were excluded, as they may not reflect the general population.

Participation will be voluntary; no names or identification numbers will be collected. Respondents will be informed that they can withdraw at any time without penalty. The data will be anonymized and stored securely, with electronic identifiers such as phone numbers or IP addresses removed after collection. Participants will be assured that their information will only be used for research purposes and reported in aggregate form.

STUDY OUTCOMES

The primary outcomes of the study are defined as follows:

1. Evaluate awareness and attitudes about first aid practices, emergency numbers, and the significance of first aid education.
2. Investigate the reasons why people don't attend first aid courses, such as time constraints, course availability, and fear of emergencies.

DATA SOURCES AND MEASUREMENTS

Demographic data were collected through a questionnaire. Participants completed a structured survey to gather information on socioeconomic factors and to assess their knowledge and attitude towards First Aid (11).

STUDY SIZE

The sample size was calculated using Epi Info version 3, with a 95% confidence interval and a 5% margin of error. Assuming p = 0.65 [12], this yielded a sample size of 349. To account for a 20% non-response rate, the final sample was increased to 436, allowing for non-aggregate analyses within subgroups. However, to ensure balanced representation across all provinces, the sample size was further increased to 490 participants. This adjustment helped distribute participants more evenly among the provinces, enhancing the robustness and comparability of subsequent analyses.

SAMPLING TECHNIQUE:

A multi-stage cluster sampling method will be implemented. First, each province or territory will serve as a stratum. Within each stratum, districts will be randomly selected. In the second stage, urban and rural clusters, such as union councils or neighborhoods, will be chosen using probability proportional to size. In the third stage, households or community gathering points will be identified, and eligible participants will be systematically sampled. To supplement community recruitment and reach populations with internet access, an online survey link will be shared through provincial health departments, universities, and social networks. This mixed-mode approach reflects the electronic distribution used in the Saudi study while expanding geographical coverage (11).

QUANTITATIVE VARIABLES

Knowledge and attitude scores will be treated as quantitative variables. Each correct answer in the knowledge section will earn one point. The total knowledge score will be calculated by summing all the points, with higher scores indicating a better understanding of first aid, ranging from 0 to 6.

Similarly, for attitude items measured on a five-point Likert scale (from "Strongly Disagree" = 1 to "Strongly Agree" = 5), responses are summed to determine the attitude score, where higher scores represent more positive attitudes toward first-aid training and practice. Item scores are combined to generate a total attitude score ranging from 3 to 15, with higher values indicating more positive attitudes.

For descriptive analysis, means and standard deviations (SD) will be reported for quantitative variables, such as total knowledge and attitude scores.

STATISTICAL METHODS

Data will be analyzed using SPSS Statistics version 26. All responses will first be checked for completeness and accuracy before analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, will be used to summarize sociodemographic variables, knowledge scores, and attitude scores. Knowledge and attitude scores were treated as continuous variables. Independent-samples t-tests and one-way ANOVA will be used to compare group means. Linear regression will be employed to examine predictors of knowledge and attitude scores. Assumptions of normality and homogeneity of variance will be assessed via Shapiro–Wilk and Levene’s tests, respectively.

MISSING DATA

Questionnaires with more than 20% item nonresponse were excluded listwise before analysis. The remaining analyses used only complete cases. For transparency, denominators for each analysis are reported in all tables and figures. No imputation was performed.

RESULT

A total of 490 participants from all provinces and territories of Pakistan completed the survey. Of these, 233 (47.6%) were males and 257 (52.4%) were females. Most respondents were single (403; 82.2%), while 87 (17.8%) were married. The majority belonged to the 18–30-year age group (437; 89.2%), followed by 31–40 years (8.2%), 41–50 years (2.0%), and above 50 years (0.6%). In terms of education, most participants held a bachelor's degree (339; 69.2%), followed by master's (60; 12.2%), high school (37; 7.6%), and doctorate degrees (31; 6.3%), with a small proportion having secondary (20; 4.1%) or primary education (3; 0.6%). Regarding occupation, 307 (62.7%) were students, 53 (10.8%) were government employees, 52 (10.6%) worked in the private sector, 58 (11.8%) were unemployed, and 20 (4.1%) were engaged in business. Equal representation was maintained across all seven regions, with 70 participants (14.3%) from each province or territory, provided in Table No.1.

Table No.1: Socio-Demographic Characteristics of the Respondents (n = 490).

Variable	Category	Frequency (n)	Percent (%)
Gender	Male	233	47.6
	Female	257	52.4
Marital Status	Single	403	82.2
	Married	87	17.8
Age Group (years)	18–30	437	89.2
	31–40	40	8.2
	41–50	10	2.0
	Above 50	3	0.6
Education Level	Primary School	3	0.6
	Secondary School	20	4.1
	High School	37	7.6
	Bachelor’s Degree	339	69.2
	Master’s Degree	60	12.2
	Doctorate	31	6.3
Occupation	Student	307	62.7
	Government Job	53	10.8
	Private Job	52	10.6
	Business	20	4.1
	Not Working	58	11.8
Province / Residence	Azad Jammu & Kashmir	70	14.3
	Sindh	70	14.3
	Punjab	70	14.3
	Khyber Pakhtunkhwa	70	14.3
	Balochistan	70	14.3
	Islamabad	70	14.3
	Gilgit-Baltistan	70	14.3

Participants were assessed using six knowledge-based questions on basic first-aid procedures. The proportion of correct responses ranged from 45.7% to 93.7%. Most respondents (459; 93.7%) correctly

identified first aid as immediate care provided before the arrival of an ambulance, while 254 (51.8%) correctly identified the Red Crescent emergency number. In a road traffic accident scenario, 274 (55.9%) correctly indicated that calling emergency medical services was the first appropriate action. Correct responses were also observed for choking management through abdominal thrusts (269; 54.9%), positioning an unconscious but breathing victim in the recovery position (234; 45.7%), and controlling bleeding by applying direct pressure and elevating the affected limb (342; 69.8%). The mean first-aid knowledge score was 3.71 ± 1.45 (range: 0–6), with 43.1% of participants classified as having poor knowledge, 45.1% moderate knowledge, and 11.8% good knowledge, given in Table No.2.

Table No.2: Knowledge of First Aid Procedures Among Respondents (n = 490)

Knowledge Question	Response Category	Frequency (n)	Percent (%)
In case of emergency, the call number for the Red Crescent Authority is	Correct	254	51.8
	Incorrect	236	48.2
The initial first aid provided by the first responder to the injured or ill person before the ambulance arrives is	Correct	459	93.7
	Incorrect	31	6.3
If you face a sudden car accident with casualties, your first action is	Correct	274	55.9
	Incorrect	216	44.1
If you suddenly face a choking adult, you should	Correct	269	54.9
	Incorrect	221	45.1
If you suddenly face an unconscious victim with breathing and pulse, you should	Correct	224	45.7
	Incorrect	266	54.3
If you suddenly face someone bleeding from the arm, the best way to control bleeding is	Correct	342	69.8
	Incorrect	148	30.2

Independent-samples *t*-tests showed no significant differences in first-aid knowledge scores by gender ($t(488) = -0.81$, $p = 0.418$) or marital status (Welch $t(138.58) = -1.04$, $p = 0.302$). However, one-way ANOVA revealed a significant difference across age groups ($F(3,486) = 2.82$, $p = 0.038$). Post-hoc analysis using the Games–Howell test revealed that participants aged 18–30 years scored significantly higher than those aged 41–50 years (p = 0.011), while no other age-group comparisons were significant. Education level demonstrated a strong association with first-aid knowledge ($F(5,484) = 7.29$, $p < 0.001$). Participants with primary and secondary education scored significantly lower than those with high

school education or higher (all $p < 0.05$), whereas no statistically significant differences were observed among participants with high school, bachelor's, master's, or doctoral degrees. Occupational status was also significantly associated with knowledge scores ($F(4,485) = 7.88$, $p < 0.001$). Post-hoc comparisons showed that participants engaged in business occupations had significantly lower knowledge scores than students, government employees, private-sector employees, and unemployed participants (all $p < 0.001$), while no significant differences were observed among the latter four groups. Marked regional variation in first-aid knowledge was observed ($F(6,483) = 11.48$, $p < 0.001$). Participants from Sindh had significantly lower knowledge scores than those from Azad Jammu and Kashmir, Punjab, Khyber Pakhtunkhwa, and Balochistan (all $p < 0.001$). Khyber Pakhtunkhwa demonstrated the highest mean knowledge score nationally and scored significantly higher than Sindh, Islamabad, and Gilgit-Baltistan. Punjab, Azad Jammu and Kashmir, Balochistan, Islamabad, and Gilgit-Baltistan formed a statistically indistinguishable middle-performing group, show in Table No.3.

Table No.3: Association of Demographic Variables with First Aid Knowledge Score

Demographic Variable	Group(s) / Comparison	N	Mean ± SD	Test Statistic	df	p-value	Significant Findings (Post-hoc)
Gender	Male	233	2.29 ± 0.68	t = −0.81	488	0.418	NS
	Female	257	2.33 ± 0.61				
Marital Status	Married	87	2.25 ± 0.58	t = −1.04	138.58†	0.302	NS
	Single	403	2.33 ± 0.65				
Age Group	18–30, 31–40, 41–50, >50	—	—	F(3,486) = 2.823	—	0.038	18–30 > 41–50 (p = 0.011); others NS
Education Level	Primary, Secondary, High School, Bachelor's, Master's, Doctorate	—	—	F(5,484) = 7.291	—	<0.001	Primary & Secondary < High School and above; higher education groups NS
Occupation	Student, Government Job, Private Job, Business, Not Working	—	—	F(4,485) = 7.878	—	<0.001	Business < all other groups; others NS
Residence / Province	AJK, Sindh, Punjab, KP, Balochistan, Islamabad, GB	—	—	F(6,483) = 11.478	—	<0.001	Sindh < AJK, Punjab, KP, Balochistan; KP > Sindh, Islamabad, GB; others NS

Simple linear regression analyses showed that gender significantly predicted first-aid knowledge (F(1,488) = 28.26, p < 0.001), explaining 5.5% of the variance, with males scoring an average of 0.68 points lower than females. Age group was also a significant predictor (F(3,486) = 2.82, p = 0.038), although the explained variance was small (Adjusted R^2 = 0.011). Participants aged 41–50 years scored significantly lower than those aged 18–30 years, while other age groups did not differ significantly. Education level significantly predicted knowledge scores (F(5,484) = 7.29, p < 0.001), explaining 7.0% of the variance, with the largest deficits observed among participants with primary and secondary education. Knowledge gains plateaued beyond the high-school level. Occupational status remained independently associated with knowledge (F(4,485) = 7.88, p < 0.001), with business participants scoring

significantly lower than students (B = −1.73, $p < 0.001$). Province of residence emerged as the strongest sociodemographic predictor of knowledge ($F(6,483) = 11.48$, $p < 0.001$), explaining 12.5% of the variance. Compared with Khyber Pakhtunkhwa, significantly lower scores were observed in Sindh, Gilgit-Baltistan, Islamabad, Balochistan, and Azad Jammu and Kashmir, while the difference with Punjab was borderline, provided in **Table No.4.**

Table No.4: Simple Linear Regression Analyses Predicting First-Aid Knowledge Score by Demographic Variables

Demographic Variable	Category (Reference in bold)	B (Unstandardized)	β (Standardized)	p-value	Model R^2
Gender	**Female**	—	—	—	0.055
	Male	−0.68	−0.234	<0.001	
Marital Status	**Single**	—	—	—	0.004
	Married	−0.23	−0.061	0.181	
Age Group	**18–30 years**	—	—	—	0.017
	31–40 years	−0.43	−0.080	0.074	
	41–50 years	−1.08	−0.105	0.020	
	>50 years	−0.45	−0.024	0.597	
Education Level	**Bachelor's degree**	—	—	—	0.070
	Master's degree	−0.20	−0.045	0.309	
	Doctorate	+0.33	+0.055	0.219	
	High school	−0.43	−0.078	0.080	
	Secondary school	−1.69	−0.229	<0.001	
	Primary school	−1.84	−0.098	0.026	
Occupation	**Student**	—	—	—	0.061
	Business	−1.73	−0.235	<0.001	
	Government job	+0.15	+0.033	0.466	
	Private job	−0.12	−0.024	0.586	
	Not working	−0.36	−0.080	0.075	
Province / Residence	**Khyber Pakhtunkhwa**	—	—	—	0.125
	Punjab	−0.44	−0.106	0.057	
	Balochistan	−0.64	−0.154	0.006	
	Sindh	−1.67	−0.402	<0.001	
	Islamabad	−1.01	−0.244	<0.001	
	Gilgit-Baltistan	−1.24	−0.299	<0.001	
	Azad Jammu & Kashmir	−0.56	−0.134	0.017	

Most respondents expressed positive attitudes toward learning and providing first aid. A total of 425 (86.7%) either strongly agreed or agreed that first aid training is important, and 329 (67.1%) agreed it is necessary to advise others to take first aid courses. Fear of emergencies prevented 287 (58.5%) from performing first aid, while 93 (18.9%) disagreed that fear was a barrier. Only 187 (38.2%) participants reported having attended a first aid course, with the majority having never received formal training. Among those who had not attended, the main reasons included a lack of time (12%), the course not being offered (31.4%), and high course fees (6.9%). The overall mean attitude score was 11.07 ± 2.23 out of 15, provided in **Table No.5.**

TableNo.5: Attitudes Toward First Aid Among Respondents (n = 490)

Statement	Response Category	Frequency (n)	Percent (%)
First aid learning and training are important	Strongly Disagree	50	10.2
	Disagree	5	1.0
	Neutral	10	2.0
	Agree	46	9.4
	Strongly Agree	379	77.3
We need to advise others to take first aid courses	Strongly Disagree	40	8.2
	Disagree	9	1.8
	Neutral	20	4.1
	Agree	92	18.8
	Strongly Agree	329	67.1
Being afraid of emergency cases prevents us from doing first aid	Strongly Disagree	56	11.4
	Disagree	37	7.6
	Neutral	110	22.4
	Agree	83	16.9
	Strongly Agree	204	41.6
Have you ever joined a first aid course?	Yes	187	38.2
	No	303	61.8
Reason for not taking a first aid course *(n = 276)*	I don’t have time	59	21.4
	I’m not willing	15	5.4
	First aid courses not offered	154	55.8
	Training didn’t reflect reality	7	2.5
	Poor course content	7	2.5
	Courses offered with fees	34	12.3

Females demonstrated slightly higher attitude scores than males (Welch $t(443.23) = -2.01$, $p = 0.045$), although the magnitude of this difference was small. Marital status was not associated with attitude

scores (p = 0.721). One-way ANOVA showed no significant differences in attitude scores across age groups (F(3,486) = 0.62, p = 0.603) or occupational categories (F(4,485) = 1.61, p = 0.170). Education level was significantly associated with attitude scores (F(5,484) = 3.86, p = 0.002), with participants holding secondary or lower education demonstrating less positive attitudes. Province of residence also showed a modest but significant association with attitude (F(6,483) = 2.72, p = 0.013), with regression analysis indicating significantly less positive attitudes among participants from Sindh and Gilgit-Baltistan compared with those from Khyber Pakhtunkhwa, shown in Table No.6.

Table No.6: Association of Demographic Variables with First Aid Attitude Score (n = 490)

Demographic Variable	Group(s) / Comparison	N	Mean ± SD	Test Statistic	df	p-value	Significant Findings
Gender	Male	233	10.86 ± 2.47	t = −2.01	443.23†	0.045	Females > Males
	Female	257	11.27 ± 1.97				
Marital Status	Married	87	11.00 ± 2.10	t = −0.36	488	0.721	NS
	Single	403	11.09 ± 2.26				
Age Group	18–30, 31–40, 41–50, >50	—	—	F(3,486) = 0.62	—	0.603	All comparisons NS
Education Level	Primary, Secondary, High School, Bachelor's, Master's, Doctorate	—	—	F(5,484) = 3.86	—	0.002	Secondary < High School and above
Occupation	Student, Govt Job, Private Job, Business, Not Working	—	—	F(4,485) = 1.61	—	0.170	Overall NS (Business lower in regression)
Residence / Province	AJK, Sindh, Punjab, KP, Balochistan, Islamabad, GB	—	—	F(6,483) = 2.72	—	0.013	Sindh, GB < KP

Linear regression analyses were conducted to examine the association between demographic variables and first-aid attitude scores. Gender emerged as a significant but weak predictor of attitude (F(1,488) = 4.14, p = 0.042), explaining 0.8% of the variance (R^2 = 0.008). Female participants demonstrated slightly

more positive attitudes toward first aid than males, scoring an average of 0.41 points higher. Marital status was not significantly associated with attitude scores ($F(1,488) = 0.13$, $p = 0.721$), accounting for negligible variance. Age group did not significantly predict first-aid attitude scores ($F(3,486) = 0.62$, $p = 0.603$), with no meaningful differences observed between participants aged 18–30 years and older age groups. Educational attainment showed a statistically significant association with attitude ($F(5,484) = 3.86$, $p = 0.002$), explaining 3.8% of the variance. Compared with participants holding a bachelor's degree, those with secondary school education demonstrated significantly less positive attitudes, while differences among participants with higher education levels (high school and above) were not statistically significant. Occupational status was not a significant predictor of attitude scores ($F(4,485) = 1.61$, $p = 0.170$), despite a modest negative association observed among participants engaged in business occupations. Province of residence was significantly associated with first-aid attitude scores ($F(6,483) = 2.72$, $p = 0.013$), explaining 3.3% of the variance. Using Khyber Pakhtunkhwa as the reference category, participants from Sindh and Gilgit-Baltistan demonstrated significantly less positive attitudes toward first aid, while differences observed for Islamabad were marginal and did not reach statistical significance. No significant differences were observed for participants from Punjab, Balochistan, or Azad Jammu and Kashmir, provided in Table No.7.

Table No.7: Simple Linear Regression Analyses Predicting First-Aid Attitude Score by Demographic Variables

Demographic Variable	Category (Reference in bold)	B (Unstandardized)	β (Standardized)	p-value	Model R^2
Gender	Male	—	—	—	0.008
	Female	+0.41	+0.092	0.042	
Marital Status	Single	—	—	—	0.000
	Married	−0.09	−0.016	0.721	
Age Group	18–30 years	—	—	—	0.004
	31–40 years	−0.39	−0.048	0.286	
	41–50 years	−0.12	−0.008	0.868	
	>50 years	−1.12	−0.039	0.388	
Education Level	Bachelor's degree	—	—	—	0.038
	Master's degree	−0.28	−0.041	0.361	
	Doctorate	+0.49	+0.054	0.232	
	High school	−0.68	−0.080	0.077	
	Secondary school	−1.72	−0.152	0.001	
	Primary school	−2.22	−0.077	0.083	
Occupation	Student	—	—	—	0.013
	Business	−1.12	−0.099	0.030	
	Government job	−0.09	−0.012	0.795	
	Private job	−0.43	−0.059	0.199	
	Not working	−0.34	−0.049	0.288	
Province / Residence	Khyber Pakhtunkhwa	—	—	—	0.033
	Punjab	−0.30	−0.047	0.422	
	Balochistan	−0.16	−0.025	0.674	
	Sindh	−1.10	−0.173	0.003	
	Islamabad	−0.64	−0.101	0.086	
	Gilgit-Baltistan	−1.06	−0.166	0.005	
	Azad Jammu & Kashmir	−0.30	−0.047	0.422	

DISCUSSION

This nationwide cross-sectional survey recruited 490 adults from all seven provinces of Pakistan. The majority of respondents were female (52.4%) and aged 18–30 years (89.2%). The six-point first-aid knowledge score averaged 3.71 ± 1.45, with 43.1% of participants exhibiting poor knowledge, 45.1% demonstrating moderate knowledge, and only 11.8% achieving good knowledge. Knowledge levels differed significantly across provinces; Khyber Pakhtunkhwa had the highest mean score, while Sindh had the lowest. Education and occupation were strongly associated with knowledge: participants with secondary or lower education and those in business occupations scored significantly lower than others. Gender and marital status were not significant predictors in multivariable analyses. The mean attitude score was 11.07 ± 2.23 out of 15; 86.7% of respondents agreed that first-aid training is important, and 67.1% advocated advising others to take courses. Despite this favorable attitude, only 38.2% had ever attended a first-aid course. Among those who had not attended, the most common barriers were the unavailability of courses (31.4%), lack of time (12%), and high fees (6.9%).

The moderate level of knowledge and high willingness to learn observed in this survey mirror findings from other low- and middle-income countries. Liu et al. conducted a cross-sectional study among Chinese medical students and reported a mean first-aid knowledge score of 23.17 ± 4.43 out of 35; male students and those from urban regions scored higher, and knowledge correlated positively with attitude and practice (13). Our data likewise show that regional and educational disparities predict knowledge and that self-identified training gaps coexist with a high perceived importance of first aid.

Studies focusing on lay caregivers further emphasize the role of education and training. In a survey of caregivers in Bahrain, the mean number of correct answers was 7.33 ± 2.38 out of 14, and knowledge of specific emergencies such as febrile convulsions and ankle sprains was limited (14). Knowledge correlated positively with higher education and household income, and participants who had attended a practical course performed better (14). A similar pattern appears in our cohort: higher educational attainment was associated with better knowledge, and formal training remained uncommon yet beneficial. In Syria, Ataya et al. evaluated 1,855 medical students and found that only 10.6% had good knowledge (mean score = 6.36), while 24.4% had weak knowledge; students in senior years performed better (15). These results echo the stratification observed in our study, with knowledge improving among participants with higher educational levels.

Limited awareness among the general population is not limited to LMICs. Papachristodoulou et al. assessed first-aid knowledge in Greece and found that only ~ 10% of adults provided appropriate initial management; multivariable analysis indicated that female gender, higher educational attainment, having more than three children, and previous first-aid training predicted adequate knowledge (16). The independent effect of formal training reinforces our finding that course participation is a critical determinant of knowledge. Likewise, an Indian study of non-healthcare professionals reported that 68% had average knowledge, 93.4% were willing to provide first aid, and common barriers included language difficulties, lack of information and training, legal concerns, fear, and lack of confidence (17). Our

participants cited course availability, time constraints, and costs as obstacles; together, these studies suggest that structural barriers rather than willingness impede training uptake.

Studies focused on specific emergencies also corroborate the interplay among knowledge, attitudes, and practice. In a Saudi Arabian survey on choking-hazard first aid, adults achieved a mean knowledge score of 4.28 ± 1.54, and 43.3% were classified as having good knowledge; knowledge scores correlated positively with attitudes and practice, and higher knowledge was associated with the 30–40 year age group and previous training (18). Our results similarly demonstrate that regional differences and educational attainment predict knowledge, while attitudes were moderately positive across demographic groups. However, our regression analysis found only a small effect of gender on attitude, with females scoring 0.41 points higher on average, and no differences across most age groups.

Within Pakistan, previous studies have been limited to specific populations. Hisam et al. surveyed 251 medical students and reported that 33.9% had good knowledge, 42.6% intermediate, and 23.5% poor knowledge; knowledge improved significantly across academic years but was not associated with prior training (19). While our study enrolled lay adults, the distribution of knowledge categories is comparable, suggesting that both medical and nonmedical communities have substantial deficits. A Spanish investigation of first-aid knowledge across educational stages found that university students scored highest, whereas secondary-school students had superficial knowledge (20), reinforcing our observation that knowledge improves with educational attainment and plateaus after high school.

Collectively, these studies confirm that first-aid knowledge is often suboptimal among lay populations and junior healthcare trainees. Socio-demographic factors such as education and region consistently predict knowledge, while gender and age exert variable influence. Formal training is a robust predictor of better knowledge, yet participation rates remain low due to structural barriers. Our national survey uniquely reveals intra-country provincial disparities in Pakistan, with Sindh and Gilgit-Baltistan scoring lower than other regions. These findings underscore the need for province-specific public health initiatives and equitable resource distribution.

Strengths and limitations

The strengths of our study lie in its robust methodological design and statistical rigor. Descriptive statistics provided clear summaries of demographic variables and first-aid knowledge and attitudes, ensuring comprehensive insights into the population's preparedness. χ^2 tests identified significant associations between sociodemographic factors and first-aid knowledge, and one-way ANOVA allowed a detailed examination of regional and educational differences in first-aid knowledge, highlighting areas for focused intervention. Linear regression analysis was a key strength, identifying significant predictors of knowledge and attitudes, which are crucial for tailoring public health strategies. Additionally, the multi-stage cluster sampling method, paired with a large sample size of 490 participants, ensured nationwide representation, making our findings highly generalizable. The listwise deletion method for handling missing data further enhanced the reliability of our results, ensuring that only valid, complete data were

included in the analysis. These strengths contribute to the study's overall high quality and provide actionable insights for improving first-aid training and public health strategies in Pakistan.

However, the study also has limitations. The cross-sectional design limits the ability to infer causality because the data represent a snapshot at one point in time. While regional disparities were identified, the study did not explore deeper cultural, socioeconomic, or infrastructural factors that may contribute to these differences. Reliance on self-reported data may introduce response bias, as participants may overestimate their knowledge or willingness to participate in first-aid courses. Additionally, excluding healthcare workers and those with advanced life support training, while necessary to focus on the general population, may limit the broader scope of first-aid readiness in the country.

Implications for policy and practice

The combination of moderate knowledge and high willingness to learn indicates that public health interventions can substantially improve emergency preparedness in Pakistan. Given that course availability was the most frequently cited barrier, expanding access to standardized first-aid training through community centers, schools, universities, and online platforms should be prioritized. Incorporating first-aid modules into secondary and tertiary education curricula could address the observed educational gradient. Tailored outreach programs are needed for regions such as Sindh and Gilgit-Baltistan, where knowledge scores were lowest. Subsidizing or offering free training may mitigate financial barriers. Given the positive correlation between knowledge and attitude reported in multiple studies, enhancing awareness campaigns may concurrently improve attitudes and practice. Future research should evaluate the effectiveness of these interventions and explore innovative delivery models, including mobile applications and community first-responder programs, to broaden reach in resource-limited settings.

CONCLUSION

This nationwide study shows that first-aid knowledge among Pakistani adults is moderate but inadequate, with significant provincial and educational disparities, despite generally positive attitudes toward training. Although most participants recognized the importance of first aid, only 38.2% had received formal training, largely due to limited course availability, time constraints, and cost. These findings underscore the need for accessible, standardized, and regionally targeted first-aid education programs to translate willingness into effective bystander action and reduce preventable morbidity and mortality.

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Institutional Research and Ethical Review Board (IREB) of Khyber Medical College prior to the initiation of data collection (Approval No. 886/DME/KMC;

dated 22 September 2025). Participation was entirely voluntary, and electronic informed consent was obtained as the first mandatory question of the questionnaire, allowing participants to proceed only after providing consent of their own free will. For illiterate participants, the study information was explained verbally in the local language, and verbal informed consent was obtained directly from the participants themselves, with assistance provided where necessary. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. No personally identifiable information was collected, all responses were recorded anonymously, and participants consented to the publication of the study findings in aggregate form.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare no competing interests, financial or otherwise.

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Authors' contributions

S.K. conceptualized and supervised the entire study, designed the methodology, conducted data verification, and led manuscript writing and final editing.

A.R.K., M.Q., S.A. and S.A.R. coordinated data collection and assisted in statistical analysis.

A.S., A.K., and A.H. contributed to data validation, table preparation, and results interpretation.

H.I., M.Y., and S.B. participated in literature review, reference management, and formatting.

M.J., M.A., and S.M. contributed to questionnaire distribution and provincial coordination.

S.K., H.S., and A.A. conducted essential manuscript revision, technical review, and overall supervision.

All authors reviewed and approved the final version of the manuscript.

Clarification on the Questionnaire

The questionnaire used in this study was adapted from previously published instruments, as cited in the manuscript [13]. Since it has been validated in earlier research, no changes were made to its content for the current study.

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AI Tool Disclosure

ChatGPT (OpenAI) was utilized solely for language editing, formatting, and technical refinement, while all aspects of study design, data analysis, interpretation, and final manuscript approval were carried out by the authors.

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