

Knowledge, Attitude and Practices of Rescue 1122 Personnel Regarding
Pre-Hospital Infection Control and Handling of AIDS and Hepatitis Patients
in District Kohat, Bannu, and Lakki Marwat, Pakistan

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Abstract

Background: Emergency medical rescue personnel are among the healthcare workers most frequently exposed to blood-borne pathogens such as the Human Immunodeficiency Virus (HIV) and the Hepatitis B and C viruses, largely because of their close, often unplanned, contact with body fluids in uncontrolled pre-hospital settings. Adequate knowledge, a positive attitude, and

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consistent infection-control practice among rescue squad personnel are essential to protect both the workforce and the patients they serve. **Objectives:** Rescue personnel are exposed to blood-borne pathogens in uncontrolled pre-hospital settings. We assessed the knowledge, attitude, and practices (KAP) of Rescue 1122 personnel regarding pre-hospital infection control strategies and the handling of AIDS and hepatitis patients in Kohat, Bannu, and Lakki Marwat, Khyber Pakhtunkhwa, Pakistan. **Methods:** A descriptive, cross-sectional study used a structured, self-administered questionnaire with seven sections (knowledge, health and safety, training and confidence, cleaning practices, equipment and ambulance design, barriers, and suggestions). We enrolled 100 personnel using convenience sampling (Kohat n = 42, Bannu n = 30, Lakki Marwat n = 28). We calculated frequencies and percentages by district and overall. Domain scores were classified as Good ($\geq 75\%$), Moderate (50–74%), or Poor ($< 50\%$). **Results:** Most respondents (73.0%) had transported a patient with AIDS or hepatitis, and 72.0% rated their occupational risk of hepatitis as high or very high. Personal protective equipment (PPE) was always used during cleaning by 81.0% overall (100% in Bannu and Lakki Marwat, 54.8% in Kohat). Full training in ambulance disinfection was reported by 74.0% (Kohat 40.5%, with 19.0% untrained), and 77.0% wanted more training or guidelines. Lack of time between calls was the main barrier (80.0%). Pooled scores were Poor for knowledge (43.3%) and practice (44.1%) and Moderate for attitude (55.3%). Kohat scored Poor in all three domains; the only Good score was Bannu's attitude (75.0%). **Conclusions:** Rescue 1122 personnel held generally favourable attitudes, but knowledge and practice were inconsistent across districts. Standardised training with annual refreshers, reliable supplies of PPE and disinfectants, modern disinfection equipment, and protected cleaning time between calls are needed. **Keywords:** Knowledge, attitude, practice; AIDS; HIV; hepatitis; infection control; rescue squad; emergency medical technician; ambulance disinfection; Khyber Pakhtunkhwa

INTRODUCTION

Healthcare workers and emergency rescue personnel face continuous occupational exposure to blood, body fluids, and contaminated equipment. The most important blood-borne infections are the human immunodeficiency virus (HIV/AIDS) and hepatitis B and C (HBV, HCV), which cause long-term illness and death when prevention fails

(Lemessa & Solomon, 2021) Rescue personnel work at road-crash scenes, in homes and in moving ambulances, where they manage bleeding patients, perform invasive procedures and handle sharps, all of which raise the risk of exposure (Sahebi et al., 2025) Occupational transmission of HIV is uncommon, yet needle-stick injury and contact of mucous membranes or broken skin with infected blood remain recognised routes, and HBV, which can survive outside the body for days, is considerably more infectious (Nicolle, 1991).

Standard precautions, namely hand hygiene, appropriate personal protective equipment (PPE), safe sharps handling, environmental decontamination and reporting of exposures, are recommended for every patient regardless of known infection status, because infection status is usually unknown at the point of care (Brown et al., 2019). Whether these measures are applied depends on the knowledge, attitudes and practices (KAP) of the workforce. Knowledge alone does not guarantee safe behaviour: perceived risk, stigma, confidence, time pressure and supply availability mediate whether knowledge becomes practice (Liu et al., 2024). Hospital-based studies show that training and access to written guidelines improve knowledge and compliance (Bunting & de Klerk, 2022), Yet in a large Bangladeshi study fewer than one in six workers held a favourable attitude despite adequate knowledge in most (Saha et al., 2022).

Evidence from emergency medical services (EMS) points the same way. Scoping reviews find that paramedics comply poorly with infection prevention and control recommendations, with hand hygiene a persistent weak point, and that heavy workload, limited time between calls and inconsistent PPE supply are the main barriers (Taylor et al., 2024). Needle-stick injuries and blood exposures are well documented among paramedics in the United States and South Africa (Chetty et al., 2022) and urban–rural differences in experience, certification and organisational factors influence both injury rates and adherence to standard precautions (Bang et al., 2019). Compliance with published recommendations and hand-washing practice among EMS providers has been reported as suboptimal (Vikke et al., 2019).

Pakistan has one of the highest burdens of hepatitis C worldwide, and hepatitis B remains common (Ali et al., 2009). Rescue 1122, established in Punjab in 2004 and later extended to Khyber Pakhtunkhwa and other provinces, is the principal government pre-

hospital service (Waseem et al., 2011). Published KAP research involving it is very limited and largely confined to Lahore (Siddiqui et al., 2024). To our knowledge, none has covered Kohat, Bannu or Lakki Marwat. This study therefore aimed to assess the knowledge, attitude and practices of Rescue 1122 personnel in these three districts regarding infection control strategies and the handling of AIDS and hepatitis patients, and to identify barriers to safe practice.

METHODS

Study Design and Setting

We conducted a descriptive, cross-sectional, questionnaire-based study among personnel of the Rescue 1122 emergency ambulance service in Districts Kohat, Bannu and Lakki Marwat, Khyber Pakhtunkhwa. The districts have active Rescue 1122 stations and span urban and predominantly rural catchment areas. The approved project lasted six months, covering questionnaire finalization, field data collection, data entry, analysis and reporting.

Participants and Sampling

The study population comprised serving emergency medical technicians (EMTs), paramedics and ambulance drivers who were available and willing to participate. A total of 100 personnel were enrolled by non-probability convenience sampling: 42 from Kohat, 30 from Bannu and 28 from Lakki Marwat. All eligible on-duty staff at each station were approached until the planned district quotas were reached. Eligible participants were currently serving with Rescue 1122 in one of the three districts, gave informed verbal or written consent, and were present at the station during data collection. We excluded administrative or non-clinical staff without patient-care or cleaning duties, personnel on leave, and incompletely filled questionnaires that could not be reliably tallied.

Instrument and Data Collection

Data were collected with a structured, self-administered questionnaire of 19 items in seven sections: (1) knowledge, (2) health and safety, (3) training and confidence, (4) general cleaning practices, (5) equipment and ambulance design, (6) challenges and barriers, and (7) suggestions and final thoughts. Item 14 allowed multiple responses, and Item 19 was open-ended. The supervisor reviewed the questionnaire for content

and face validity. At each station, the purpose, voluntary nature, and confidentiality of the study were explained; participants completed the form independently; the researcher was available to clarify items; and forms were checked for completeness on site.

Data Analysis

Responses were analysed in SPSS. Frequencies and percentages were calculated for every response option, first by district and then pooled (N = 100); percentages used the district sample size as the denominator. Composite knowledge, attitude and practice scores were calculated for each district as the percentage of favourable responses on the relevant items and classified as Good ($\geq 75\%$), Moderate (50–74%) or Poor ($< 50\%$), following the cut-offs of the approved research proposal. Open-ended comments were grouped into recurring themes. Analysis was descriptive; no inferential tests were performed, so differences between-district differences are reported as observed.

Ethical Considerations

The study was approved by the Department of Emergency Care Technology, Kohat University of Science and Technology, and permission was obtained from the Rescue 1122 district administrations. Participation was voluntary; participants could skip items or withdraw without any effect on their employment. No personal identifiers were recorded, and forms were kept confidential and used only for academic purposes. Verbal or written informed consent was obtained from every respondent.

RESULTS

Respondent Characteristics

Of the 100 respondents, 42 (42.0%) were from Kohat, 30 (30.0%) from Bannu, and 28 (28.0%) from Lakki Marwat (Table 1, Figure

1). Among those who reported their designation, EMTs made up 28.0%, paramedics 24.0%, and drivers 14.0%. Most respondents (80.0%) reported 1–10 years of service, and 75.0% worked in government service. Non-response to these optional items was concentrated in Bannu, where 17 of 30 respondents (56.7%) left them blank.

Table 1. *Characteristics of the respondents (N = 100), n (%).*

Response	Bannu (n=30)	Lakki (n=28)	Marwat	Kohat (n=42)	Overall (N=100)
District / Respondents	30 (100.0)	28 (100.0)		42 (100.0)	100 (100.0)
Designation — EMT	0 (0.0)	14 (50.0)		14 (33.3)	28 (28.0)
Paramedic	0 (0.0)	9 (32.1)		15 (35.7)	24 (24.0)
Driver	0 (0.0)	1 (3.6)		13 (31.0)	14 (14.0)
Other	13 (43.3)	4 (14.3)		0 (0.0)	17 (17.0)
Not specified	17 (56.7)	0 (0.0)		0 (0.0)	17 (17.0)
Years of service — <1 year	0 (0.0)	1 (3.6)		6 (14.3)	7 (7.0)
1–5 years	0 (0.0)	10 (35.7)		29 (69.0)	39 (39.0)
Response	Bannu (n=30)	Lakki (n=28)	Marwat	Kohat (n=42)	Overall (N=100)
5–10 years	13 (43.3)	16 (57.1)		12 (28.6)	41 (41.0)
>10 years	0 (0.0)	1 (3.6)		4 (9.5)	5 (5.0)
Not specified	17 (56.7)	0 (0.0)		0 (0.0)	17 (17.0)
Type of service —	13 (43.3)	27 (96.4)		35 (83.3)	75 (75.0)
Government					
Private	0 (0.0)	0 (0.0)		6 (14.3)	6 (6.0)
Hospital-based	0 (0.0)	1 (3.6)		1 (2.4)	2 (2.0)
Not specified	17 (56.7)	0 (0.0)		0 (0.0)	17 (17.0)

Designation, years of service, and type of service were optional items; 17 Bannu respondents (56.7%) left them blank. Kohat counts for years of service, as tallied, sum to more than 42 and should be verified against the original forms before submission.

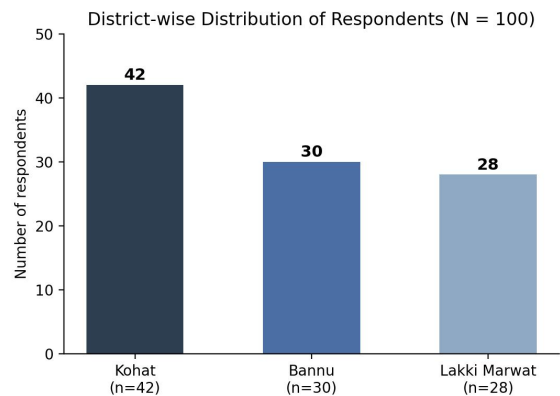


Figure 1. Profile of respondents. (A) Number of respondents by district (N = 100). (B) Designation, years of service and type of service by district (optional items).

Knowledge, Risk Perception And Vaccination

Comfort in discussing HIV prevention with peers differed sharply by district (Table 2): 37.0% overall were very comfortable and 52.0% neutral, and all Bannu respondents chose neutral. Knowledge of the differences between hepatitis B and C transmission was good in 43.0% overall, but only 10.7% of Lakki Marwat respondents knew them well, and half knew very little (Figure 2A). Most respondents recognised occupational risk, rating hepatitis risk at work as high (62.0%) or very high (10.0%). Vaccination practice was inconsistent: 46.0% always ensured vaccination and 25.0% never did; the latter was reported by 71.4% in Lakki Marwat.

Table 2: Knowledge, risk perception and vaccination practice (Items 1–4), n (%).

Response	Bannu (n=30)	Lakki (n=28)	Marwat Kohat (n=42)	Overall (N=100)
Item 1. Very comfortable	0 (0.0)	27 (96.4)	10 (23.8)	37 (37.0)
Somewhat comfortable	0 (0.0)	0 (0.0)	8 (19.0)	8 (8.0)
Neutral	30 (100.0)	1 (3.6)	21 (50.0)	52 (52.0)
Somewhat uncomfortable	0 (0.0)	0 (0.0)	3 (7.1)	3 (3.0)
Item 2. Know differences well	30 (100.0)	3 (10.7)	10 (23.8)	43 (43.0)
Know a few differences	0 (0.0)	6 (21.4)	22 (52.4)	28 (28.0)

Know very little	0 (0.0)	14 (50.0)	5 (11.9)	19 (19.0)
Do not know them	0 (0.0)	5 (17.9)	5 (11.9)	10 (10.0)
Item 3. Very high risk	0 (0.0)	1 (3.6)	9 (21.4)	10 (10.0)
High risk	30 (100.0)	12 (42.9)	20 (47.6)	62 (62.0)
Moderate risk	0 (0.0)	9 (32.1)	6 (14.3)	15 (15.0)
Low risk	0 (0.0)	2 (7.1)	6 (14.3)	8 (8.0)
Very low risk	0 (0.0)	4 (14.3)	1 (2.4)	5 (5.0)
Item 4. Always ensure vaccination	30 (100.0)	8 (28.6)	8 (19.0)	46 (46.0)
Often	0 (0.0)	0 (0.0)	4 (9.5)	4 (4.0)
Sometimes	0 (0.0)	0 (0.0)	14 (33.3)	14 (14.0)
Rarely	0 (0.0)	0 (0.0)	12 (28.6)	12 (12.0)
Never	0 (0.0)	20 (71.4)	5 (11.9)	25 (25.0)

Percentages use the district sample size as the denominator; column totals for some items deviate by one respondent because of item non-response or tallying.

Practice, Training And Confidence

PPE was always used during cleaning by 81.0% of respondents, with full compliance in Bannu and Lakki Marwat but only 54.8% in Kohat, where 7.1% rarely or never used it (Table 3, Figure 3A). Overall, 42.0% suspected having fallen ill because of an unclean ambulance. Full training in ambulance disinfection was reported by 74.0%, a further 17.0% had brief training and 8.0% none; Kohat lagged, with 40.5% fully trained and 19.0% untrained (Figure 2B). Three-quarters (76.0%) were very confident that their cleaning prevented infection, but 21.4% of Kohat respondents were not very or not at all confident. A large majority (77.0%) wanted more training or better guidelines. Full cleaning after every patient was reported by 76.0% overall and by 54.8% in Kohat (Figure 3B).

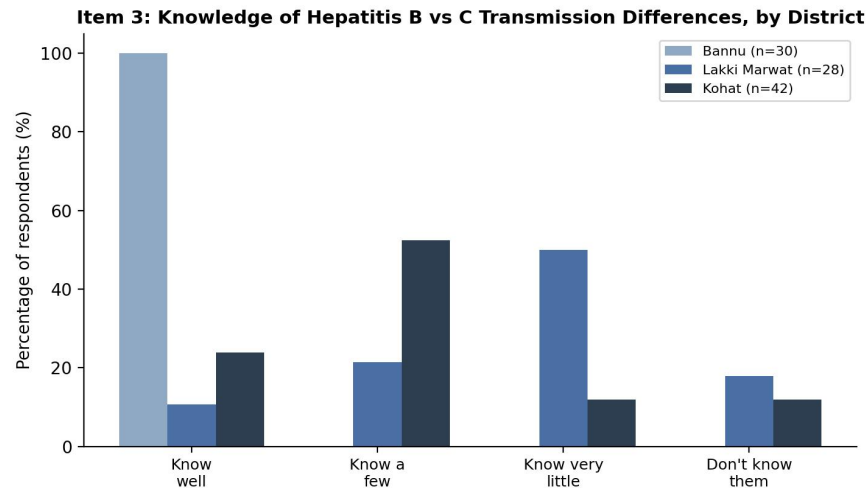


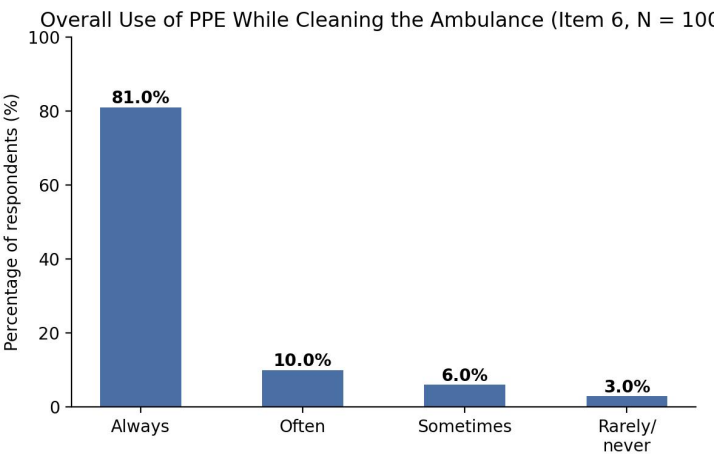
Figure 2. Knowledge and training by district. (A) Knowledge of the differences between hepatitis B and C transmission (Item 2). (B) Formal training received in ambulance disinfection (Item 7). Bars show % of district respondents.

Table 3: Practice, training and confidence in ambulance cleaning (Items 5–10), n (%).

Response	Bannu (n=30)	Lakki Marwat (n=28)	Kohat (n=42)	Overall (N=100)
Item 5. Always use PPE	30 (100.0)	28 (100.0)	23 (54.8)	81 (81.0)
Often	0 (0.0)	0 (0.0)	10 (23.8)	10 (10.0)
Sometimes	0 (0.0)	0 (0.0)	6 (14.3)	6 (6.0)
Rarely or never	0 (0.0)	0 (0.0)	3 (7.1)	3 (3.0)
Item 6. Yes, became ill/suspected unclean ambulance	30 (100.0)	1 (3.6)	11 (26.2)	42 (42.0)
No	0 (0.0)	19 (67.9)	25 (59.5)	44 (44.0)
Maybe / do not know	0 (0.0)	8 (28.6)	6 (14.3)	14 (14.0)
Item 7. Yes, full training	29 (96.7)	28 (100.0)	17 (40.5)	74 (74.0)
Yes, brief training	0 (0.0)	0 (0.0)	17 (40.5)	17 (17.0)
No formal training	0 (0.0)	0 (0.0)	8 (19.0)	8 (8.0)
Item 8. Very confident	29 (96.7)	25 (89.3)	22 (52.4)	76 (76.0)

Somewhat confident	0 (0.0)	3 (10.7)	12 (28.6)	15 (15.0)
Not very confident	0 (0.0)	0 (0.0)	6 (14.3)	6 (6.0)
Not confident at all	0 (0.0)	0 (0.0)	3 (7.1)	3 (3.0)
Item 9. Yes, definitely wants more training	29 (96.7)	15 (53.6)	33 (78.6)	77 (77.0)
Maybe	0 (0.0)	5 (17.9)	5 (11.9)	10 (10.0)
No, training sufficient	0 (0.0)	6 (21.4)	4 (9.5)	10 (10.0)
Do not know	0 (0.0)	2 (7.1)	0 (0.0)	2 (2.0)
Item 10. After every patient	29 (96.7)	24 (85.7)	23 (54.8)	76 (76.0)
Once per shift	0 (0.0)	4 (14.3)	10 (23.8)	14 (14.0)
Only when visibly dirty	0 (0.0)	0 (0.0)	6 (14.3)	6 (6.0)
Every morning	0 (0.0)	0 (0.0)	3 (7.1)	3 (3.0)

Figure 3. Cleaning practices. (A) Overall use of personal protective equipment while cleaning the ambulance (Item 5, N = 100). (B) Frequency of full ambulance cleaning and disinfection by district (Item 10).



Time, Equipment And Barriers

Most respondents (69.0%) had 5–15 minutes between calls for cleaning, and 42.9% in Lakki Marwat had less than five minutes (Table 4). Sixty percent found the ambulance very easy to clean, but only 14.3% in Kohat did, where 33.3% found cleaning difficult or

very difficult. Fully functional specialised equipment (spray devices, UV or ozone units) was reported by 29.0%; 54.0% had only some of it, and 7.0% had equipment that was not working properly. Lack of time between calls was by far the leading barrier (80.0%; 100% in Bannu), well ahead of lack of supplies (9.0%), complex procedures (7.0%), and lack of training (4.0%) (Figure 4A). Cleaning became at least slightly more difficult during major emergencies for 93.0%, and much more difficult for 78.6% in Lakki Marwat.

Exposure, post-transport instructions and suggestions

Nearly three-quarters (73.0%) had transported a patient with AIDS or hepatitis (54.0% "sometimes", 19.0% "yes"), while 57.1% of Lakki Marwat respondents had not (Table 5). Special cleaning instructions or equipment afterwards were provided consistently to only 28.0%; 43.0% received them sometimes and 28.0% not at all, with 71.4% of Lakki Marwat respondents receiving none (Figure 4B). Better disinfectants (55.0%) and more time between calls (30.0%) were the most requested improvements; more time was requested by 78.6% in Lakki Marwat.

Table 4: *Time, equipment and barriers to ambulance cleaning (Items 11–15), n (%).*

Response	Bannu (n=30)	Lakki Marwat (n=28)	Kohat (n=42)	Overall (N=100)
Item 11. <5 minutes	0 (0.0)	12 (42.9)	8 (19.0)	20 (20.0)
5–15 minutes	29 (96.7)	14 (50.0)	26 (61.9)	69 (69.0)
15–30 minutes	0 (0.0)	2 (7.1)	8 (19.0)	10 (10.0)
>30 minutes	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Item 12. Very easy to clean	29 (96.7)	25 (89.3)	6 (14.3)	60 (60.0)
Fairly easy	0 (0.0)	2 (7.1)	22 (52.4)	24 (24.0)
Difficult	0 (0.0)	1 (3.6)	11 (26.2)	12 (12.0)
Very difficult	0 (0.0)	0 (0.0)	3 (7.1)	3 (3.0)
Item 13. Yes, specialised equipment	0 (0.0)	18 (64.3)	11 (26.2)	29 (29.0)
Yes, but not working properly	0 (0.0)	0 (0.0)	7 (16.7)	7 (7.0)

No	0 (0.0)	2 (7.1)	7 (16.7)	9 (9.0)
Some of them	29 (96.7)	8 (28.6)	17 (40.5)	54 (54.0)
Item 14. Lack of time between calls	30 (100.0)	24 (85.7)	26 (61.9)	80 (80.0)
Lack of cleaning supplies	0 (0.0)	3 (10.7)	6 (14.3)	9 (9.0)
Lack of training	0 (0.0)	0 (0.0)	4 (9.5)	4 (4.0)
Complex cleaning procedures	0 (0.0)	0 (0.0)	7 (16.7)	7 (7.0)
Item 15. Much more difficult	0 (0.0)	22 (78.6)	20 (47.6)	42 (42.0)
Slightly more difficult	30 (100.0)	5 (17.9)	16 (38.1)	51 (51.0)
No difference	0 (0.0)	1 (3.6)	5 (11.9)	6 (6.0)
Easier (more cautious)	0 (0.0)	0 (0.0)	1 (2.4)	1 (1.0)

Item 14 allowed multiple responses, so options do not sum to the district sample size.

Table 5: *Exposure to infectious patients, post-transport instructions and suggested improvements (Items 16–18), n (%).*

Response	Bannu (n=30)	Lakki (n=28)	Marwat (n=42)	Kohat (n=42)	Overall (N=100)
Item 16. Sometimes transported infectious patients	30 (100.0)	1 (3.6)		23 (54.8)	54 (54.0)
Yes	0 (0.0)	6 (21.4)		13 (31.0)	19 (19.0)

Item 15: Reported Challenges to Ambulance Cleaning
(Overall mentions, multi-select)

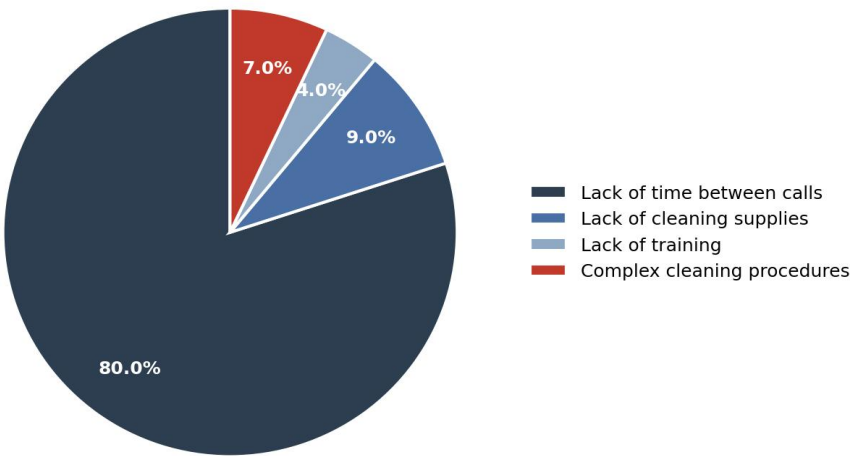


Figure 4. (A) Reported barriers to proper ambulance cleaning, overall mentions (Item 14, multiple responses). (B) Special cleaning instructions or equipment provided after transporting an infectious patient (Item 17, overall).

Open-Ended Comments

Forty-seven comments were recorded (Bannu 3, Lakki Marwat 15, Kohat 29; Table 6, Figure 5). Training and refresher courses were mentioned most often (13 mentions), followed by SOPs, supervision, and workflow between calls (9), and both PPE and cleaning supplies (8) and equipment and design (8). Kohat respondents asked for regular refresher training, orientation of new staff, inclusion of drivers in training, displayed SOPs, and enough time for cleaning. Lakki Marwat respondents asked mainly for advanced equipment such as UV sterilisation, more staff and more training, although one considered current training adequate.

Table 6: Themes in open-ended comments (Item 19), number of mentions.

Theme	Bannu	Lakki Marwat	Kohat	Total
Training and refresher courses	0	3	10	13
SOPs, supervision and workflow/time management	3	0	6	9
PPE and cleaning supplies/disinfectants	0	1	7	8

Ambulance equipment and design	0	5	3	8
Staffing and service infrastructure	0	3	3	6
Timely supply of medicine/consumables	0	2	0	2
Satisfied (current training/staffing adequate)	0	1	0	1
Total mentions	3	15	29	47

Counts are distinct comments assigned to a primary theme, not respondents. Only 3 of 30 Bannu respondents (10.0%) commented.

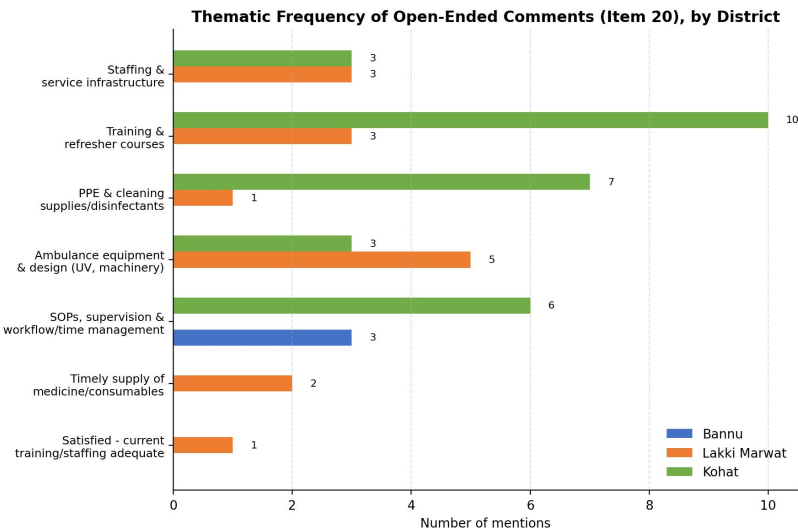


Figure 5. Themes in open-ended comments and suggestions by district (Item 19), number of mentions.

KAP Scores

Pooled scores were Poor for knowledge (43.3%) and practice (44.1%) and Moderate for attitude (55.3%) (Table 7, Figure 6). Bannu scored Moderate for knowledge (60.0%), Good for attitude (75.0%), and Poor for practice (37.5%). Lakki Marwat scored Poor for knowledge (36.4%) and Moderate for attitude (58.9%) and practice (58.2%). Kohat scored Poor on all three domains (36.1%, 39.6%, and 39.6%). Of the nine district-by-domain scores, one was Good, three Moderate, and five Poor.

Table 7: *Knowledge, attitude and practice domain scores (% favourable responses) and classification.*

Domain	Bannu (n=30)	Lakki Marwat (n=28)	Kohat (n=42)	Overall (N=100)
Knowledge	60.0 (Moderate)	36.4 (Poor)	36.1 (Poor)	43.3 (Poor)
Attitude	75.0 (Good)	58.9 (Moderate)	39.6 (Poor)	55.3 (Moderate)
Practice	37.5 (Poor)	58.2 (Moderate)	39.6 (Poor)	44.1 (Poor)

Good ≥75%; Moderate 50–74%; Poor <50%.

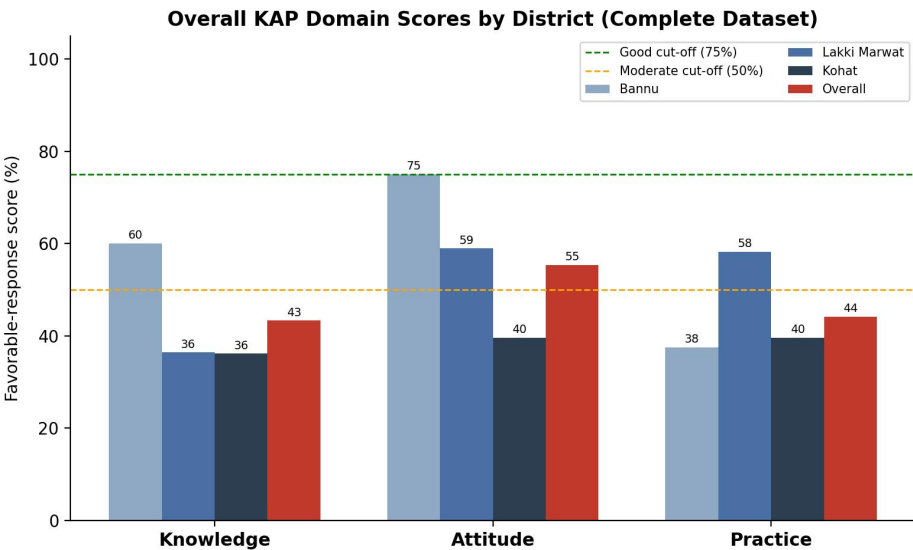


Figure 6. (A) Knowledge, attitude and practice scores by district, with the Good (75%) and Moderate (50%) cut-offs. (B) Classification of the nine district-by-domain scores.

DISCUSSION

This is, to our knowledge, the first KAP study of Rescue 1122 personnel in Kohat, Bannu and Lakki Marwat. Exposure to blood-borne infections was part of routine work for most personnel: 73.0% had transported a patient with AIDS or hepatitis, although only 25.0% of Lakki Marwat respondents had. This is consistent with reports of frequent blood exposure and needle-stick injury among paramedics in the United States and South Africa (Hamza & Sarwar, 2025) and underlines why standard precautions must be applied to every patient.

The central finding is that favourable attitudes did not translate into good knowledge or practice. Attitude was Moderate overall (55.3%), whereas knowledge (43.3%) and

practice (44.1%) were Poor. The same loose coupling of knowledge, attitude and practice has been described in hospital workers (Mazumdar et al., 2026) and among EMS providers, whose practice tends to lag behind their stated knowledge (Sah et al., 2025). Respondents also recognised their risk (72.0% high or very high) and asked for more training (77.0%), which suggests motivation rather than indifference.

Knowledge and practice varied by district. Knowledge of hepatitis B and C transmission was Poor in both Lakki Marwat (36.4%) and Kohat (36.1%) and Moderate in Bannu (60.0%); half of Lakki Marwat respondents knew very little about the transmission differences, and 71.4% there never ensured vaccination. Low hepatitis B vaccination coverage among health workers has been reported elsewhere [6]. Kohat had the weakest item-level cleaning practices: consistent PPE use (54.8%), full training (40.5%), being very confident (52.4%) and cleaning after every patient (54.8%) were all lower than in the other districts. Bannu’s composite practice score was nevertheless also Poor (37.5%) despite full PPE use and training, so the composite score should be read alongside the item-level results. Training and guideline access are the most consistent modifiable predictors of safer practice in earlier work (Shah et al., 2015), This fits the Kohat pattern. Imperfect PPE use is common even among trained staff (Rahman et al., 2025).

Structural constraints seem to matter more than skills. Lack of time between calls was reported by 80.0% and dwarfed lack of supplies (9.0%) and lack of training (4.0%), and 93.0% said cleaning becomes harder in major emergencies. Time pressure, workload and inconsistent supplies are the main barriers identified in EMS reviews and in urban–rural comparisons (Farahmandnia et al., 2025).

Equipment was unevenly distributed: only 29.0% had fully working specialised equipment, Lakki Marwat had the best availability (64.3%), and in Bannu 96.7% had only some of it. Post-transport instructions were inconsistent, with 28.0% always receiving them. Willingness to train is not sufficient without institutional support and effective exposure policies, so these gaps need organisational solutions.

Our results differ from the community KAP study of Ali in Rawalpindi and Islamabad, which found satisfactory awareness of

HIV/AIDS (79.2% knew modes of transmission and 85.8% preventive measures) but a positive attitude toward people living with HIV/AIDS in only 58.3% (Ali & Ahmad, 2015). The populations, objectives and instruments differ, so the studies are not directly comparable. Our respondents scored lower on knowledge and practice than the community scored on awareness, although they are routinely exposed. Our study also covered hepatitis B and C, PPE use, ambulance disinfection and operational barriers, which that study did not.

Strengths and Limitations

Strengths include a previously unstudied workforce, coverage of three districts with urban and rural catchments, and measurement of knowledge, attitude and practice as separate domains together with operational barriers. Limitations should be noted.

Convenience sampling and a sample confined to three districts limit representativeness and generalisability. Data were self-reported, and practices were not observed, so recall and social-desirability bias are possible. The cross-sectional design cannot establish causal links between, for example, training and practice, and the analysis was descriptive without inferential testing. Optional items had substantial non-response in Bannu, and Bannu respondents gave identical answers on many items; this may reflect genuine homogeneity, shared training, or response or recording effects, so district comparisons involving Bannu should be interpreted cautiously.

CONCLUSIONS

Rescue 1122 personnel in Kohat, Bannu and Lakki Marwat showed generally positive attitudes toward infection control, but knowledge and safe practice were inconsistent, with Kohat scoring Poor in all domains. Gaps in PPE use, disinfection training and post-transport instructions, together with too little time between calls, were the main challenges. Strengthening training, infection control resources and operational support would improve the safety of both rescue personnel and patients.

RECOMMENDATIONS

1. Provide regular, standardised training on HIV, hepatitis, infection control, safe patient handling and ambulance cleaning to all Rescue 1122 staff, especially where training is limited.

2. Ensure every ambulance carries enough PPE, disinfectants and cleaning equipment.
3. Allow enough time between calls to clean ambulances properly after transporting patients with infectious diseases.
4. Place a simple cleaning checklist in every ambulance.
5. Conduct annual refresher training.
6. Future studies should include more stations, use larger random samples, observe actual cleaning practice and evaluate the effect of training on knowledge and practice.

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