

Original Research Article

Effectiveness and Knowledge Retention among the Community First Responders in Nepal

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Abstract: **Background:** Timely pre-hospital care is critical in rural Nepal where formal Emergency Medical Services are scarce. In 2018, a three-day Community First Responder (CFR) program was delivered to more than 200 community volunteers in Geruwa Rural Municipality, Bardiya, Nepal; however, long-term effectiveness and degree of skill decay remained unknown. **Purpose:** To quantify first-aid knowledge retention and on-scene application among CFRs five years after their initial training. **Method:** A mixed-methods follow-up study was conducted in 2024. Quantitatively, 25-item validated MCQ administered to all reachable CFRs (n = 112). Qualitatively, in-depth interviews with two active CFRs and one elected ward chairperson. Knowledge scores were categorized into quartiles (low, moderate, significant, higher retention). Self-reported emergency responses since training were enumerated and thematic analysis of barriers performed. **Results:** The response rate was 100 %. Median post-course score was 23/25; at five years 59 % of participants retained moderate knowledge, 36 % significant, 4 % higher and 2 % low. CFRs documented 510 real cases (trauma 35 %, burns 15 %, obstetrics 7 %, wildlife attacks 8 %). Complex skills showed the steepest decay: adult CPR ratio 4 % correct, snake-bite immobilization 5 %. Qualitative themes included language and literacy mismatches (Tharu vs. Nepali), transport delays, time-conflict with farming, demand for local refresher trainers. No serious adverse events were reported. **Conclusion:** Community-based CFR training yields measurable but partially decayed knowledge at five years, sustained by periodic field practice. Embedding language-appropriate refreshers, local trainers and transport solutions is essential to preserving life-saving competence in low-resource settings.

Keywords: Community First Responders, Prehospital Care, Training Effectiveness, Knowledge Retention, and First Aid.

BACKGROUND

A Community First Responder (CFR) is a trained volunteer who provides basic emergency care and assists during medical emergencies before an ambulance arrives [1]. Following the devastating 2015 earthquake, several non-governmental organizations (NGOs) expanded these efforts as part of disaster preparedness initiatives [2, 3]. The Global Burden of Diseases (2017) study estimated that injuries account for 9.2% of all deaths and 9.9% of total disability-adjusted

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life years in Nepal [4]. The goals of a first aid provider include preserving life, alleviating suffering, preventing further illness or injury, and promoting recovery [5]. Although the burden of injuries on global health is significant [WHO, 2016], simple first-aid actions can reduce pre-hospital deaths [6]. First response at the scene of an injury event is vital to improve health outcomes, particularly in settings where Emergency Medical Services (EMS) are absent or limited [7]. Improving access to high-quality first response care to victims of injury followed by good medical treatment has the potential to save lives, reduce injury severity and avert disability [8]. Millions of people are trained annually in First-Aid worldwide [9]. According to the Nepal Living Standards Survey 2010– 2011, only 61.8% of households in Nepal can reach the nearest health posts within 30 minutes with significant urban and rural variation [10]. Barriers to effective first response include insufficient training, lack of practice, poor skill retention, and low self-efficacy [11]. Research conducted in other LMICs has demonstrated that lay-people trained as first responders applying first aid skills at the scene can make a significant difference to outcomes [12].

Bardiya district is located in Lumbini Province, which borders India to the south, is among the more disadvantaged districts in Nepal. Bardiya district consists of six municipalities (Gulariya, Rajapur, Madhuwan, Thakurbaba, Banskadhi and Barbardiya) and two structured as rural municipalities (Badaiyatal and Geruwa). Among these, the training was conducted for the community people of Geruwa Rural Municipality. People in rural areas of Geruwa often depend on the sub-health post of their village and often do not have proper modes of transportation [13]. Geruwa Rural Municipality—part of Bardiya’s buffer zone with Bardiya National Park—faces compounded challenges such as poor infrastructure, human-wildlife conflict, flooding, and road accidents [12, 13]. Between 2020 and 2024, the region recorded 53 fatalities from wildlife encounters, including leopard, tiger, and elephant attacks [14, 15]. In such a setting, where formal emergency care is inaccessible or delayed, trained laypersons serve as a critical link in the chain of survival [16, 17].

Rationale

Access to timely emergency medical care in Nepal, particularly in rural and remote regions, remains a persistent challenge due to limited health infrastructure and prolonged transport times. CFRs—help bridge the critical gap between the onset of an emergency and the arrival of professional medical help [18]. Although their importance has been increasingly acknowledged, there is limited empirical evidence on their effectiveness and the extent to which they retain long-term life-saving knowledge and skills. Since the 2015 earthquake, there has been a notable rise in community-based emergency response initiatives, with several organizations implementing CFR and first aid training programs [19]. However, few studies have rigorously assessed the long-term impact and knowledge retention outcomes of these efforts. Existing literature suggests that while such training improves immediate competency, skills may deteriorate without periodic refreshers or real-life application [20, 21]. Moreover, disparities in training quality, the absence of standardized protocols, and inconsistent post-training support have hindered program sustainability and left stakeholders uncertain about their long-term value. To address these gaps, this study evaluates both the effectiveness of first aid interventions and knowledge retention among CFRs in Geruwa Rural Municipality of Bardiya District. The research aims to provide evidence-based insights for improving training approaches and guiding policy, thereby contributing to the institutionalization of CFR systems within Nepal’s federal health structure and ultimately improving overall patient outcomes.

Objective

The objective of this study is to evaluate the first aid training and the retention of knowledge among trained CFRs in Geruwa Rural Municipality. Specifically, the study aims to assess the overall impact of the initial training program and to determine the extent to which CFRs have retained first aid knowledge measured through structured questionnaires administered 5 years after the training.

METHODS

Quantitative

The study employed a mixed-methods approach, incorporating both quantitative and qualitative data collection techniques. A quantitative survey was conducted among the Community First Responders in the Bardiya district, utilizing 25 structured questionnaires, each containing four multiple-choice answers. Assessments were conducted after 5 years of the training using structured questionnaires.

Qualitative

The qualitative component was carried out with CFRs from Geruwa Rural Municipality. To assess skills acquired during training and their application in real-life situations, semi-structured questions explored training effectiveness, challenges encountered during emergency response, and suggestions for future training improvements. One-on-one in-depth interviews were conducted with three participants: an elected chairperson of Ward Number 2, a farmer, and a Female Community Health Volunteer (FCHV)

Study Population

We recruited 112 Community First Responders for the study. The demographic data collected in the study reveals a diverse participant profile. Of the respondents, 68 were female and 44 were male. In terms of age, 12 participants were aged 15-25, while 34 were in both the 26-35 and 36-45 age groups. Additionally, 20 respondents fell within the 46-55 age range, and another 12 were 56 years or older. Ethnically, the majority identified as Janajati (indigenous) (94), followed by Chhetri (12) and Brahmin (6). Regarding education, 32 participants were literate, 46 had completed basic education, and 34 attained high school level. Occupationally, 72 individuals were engaged in agriculture, 18 served as Female Community Health Volunteers (FCHVs), 2 were health workers, 6 were students, and 14 worked as teachers.

Data Collection Techniques and Tools

The study utilized two data collection techniques and tools, in-person surveys and in-depth interviews. Three in-depth interviews were conducted to gather qualitative data, while structured follow-up questionnaires served as the tools for collecting quantitative data.

Training for CFR

The Community First Responder (CFR) training was delivered as an intensive 24-hour programme spread over 3 days, designed to turn local residents into confident first-contact lifesavers. Starting with the principles and ethics of the CFR role, the course moved rapidly into systematic patient assessment and hands-on cardiopulmonary resuscitation (CPR). It then expanded to cover traumatic injuries, medical emergencies, burns, environmental hazards, childbirth, and safe evacuation techniques. Learning was reinforced through pre- and post-training knowledge tests, skills stations, and realistic scenarios. Detailed lesson plans, checklists, and trainer guides that shaped this curriculum are openly accessible in the *Rural First Responder Handbook* (Dhading EMS Project, 2026).

Validity and Reliability of Tool

The structured questionnaire had been validated five years earlier during a three-day CFR training programme, after which it was used unchanged to reassess knowledge retention. Given its prior psychometric testing and identical administration format, no additional piloting was required. Content validity was re-affirmed through an updated literature review and expert consultation immediately before the follow-up survey.

Composite Index Analysis of Knowledge Retention

To assess the extent of knowledge retention among respondents, a composite index was constructed utilizing responses to a set of 25 structured questions. Each question was scored dichotomously, with a value of 1 assigned for correct responses and 0 for incorrect ones, thereby facilitating a total possible score range of 0 to 25 for each participant. The cumulative scores were subsequently subjected to quartile-based categorization to delineate levels of knowledge retention, enabling relative comparisons among respondents based on score distribution. The classification of retention levels was: Low Level Retention (Q1: 0–25th percentile), encompassing respondents whose scores fell within the lowest quartile; Moderate Level Retention (Q2: 26th–50th percentile), for those scoring between the 25th and 50th percentiles; Significant Retention (Q3: 51st–75th percentile), applicable to respondents with scores between the 50th and 75th percentiles; and Higher Level Retention (Q4: 76th–100th percentile), which included those in the upper quartile of the distribution.

RESULTS

Pre-Test Knowledge Status

Before the three-day training began, knowledge assessment revealed that most participants operated at low or moderate levels of knowledge. Specifically, 20.9% of participants demonstrated low-level knowledge and 61.2% demonstrated only moderate-level knowledge, indicating that the majority were not fully equipped with the subject matter and that meaningful knowledge gaps existed prior to training. The full cohort of 201 participants underscores the relevance of these findings as a baseline.

Post-Test Knowledge Status

By the third day of training, knowledge levels had improved markedly. Following the training, 15.4% of participants attained significant knowledge and 84.6% achieved higher-level knowledge, demonstrating the program's effectiveness in enhancing participants' understanding and retention of the material. This substantial shift toward higher-level knowledge indicates that the training successfully addressed the gaps identified at baseline, equipping participants with a more comprehensive grasp of first-aid principles and procedures.

Practice – Historical Overview of First Response by Trained CFRs

Over the five years following the training, the survey indicates that a single Community First Responder (CFR) has 112 trained CFRs collectively documented 510 pre-hospital emergency encounters, demonstrating a broad scope of

practice. These cases encompassed a wide range of presentations: 110 cut injuries managed by 98 CFRs, 80 road traffic injuries attended by 71 CFRs, 76 burn injuries responded by 68 CFRs, 74 falls addressed by 66 CFRs, 50 incidents of domestic violence responded to by 45 CFRs, 40 animal- or insect-related injuries handled by 36 CFRs, 34 childbirth events responses by 30 CFRs, 18 poisonings exposures managed by 16 CFRs, 16 drowning incidents attended by 14 CFRs, 10 cases of gender-based violence addressed by 9 CFRs, and 2 suicide-related emergencies cared for by 2 CFRs. This historical overview illustrates the heterogeneous nature of first-contact care provided by CFRs and highlights their pivotal role in delivering timely interventions across traumatic and psychosocial domains before definitive treatment is reached.

Knowledge Retention Level

Cross-sectional assessment of 112 Community First Responders (CFRs) revealed heterogeneous occupational backgrounds—agriculture, Female Community Health Volunteers (FCHVs), healthcare workers, school students, and teachers—and a generally favourable knowledge-retention profile, with the majority sustaining moderate mastery of pre-hospital curricula. The key finds are presented below:

- Moderate retention: 58.9 % (66/112)
- Significant retention: 35.7 % (40/112)
- Higher-level retention: 3.6 % (4/112)
- Low-level retention: 1.8 % (2/112)

Retention of Knowledge – Overall

The analysis of the questionnaire responses reveals significant variability in knowledge regarding first aid procedures among participants. The highest accuracy rates were observed for questions related to drowning (96%) and seizure recognition (93%), suggesting a strong understanding of these critical emergencies. Conversely, questions on more nuanced topics, such as managing snake bites (34%) and identifying muscle injury symptoms (4%), demonstrated notably lower correct response rates. This disparity highlights areas where targeted educational interventions may be necessary to enhance overall first aid knowledge.

Furthermore, the lower accuracy rates for questions involving complex decision-making, such as the treatment of burns (46%) and appropriate actions for an unconscious patient (43%), underscore the need for comprehensive training that emphasizes not only theoretical knowledge but also the practical application of skills in emergency scenarios. These findings reflect an urgent need to strengthen first aid training programs to address knowledge gaps and improve response efficacy in real-life situations.

Table 1: Survey-based assessment of knowledge retention among CFRs

Post-test survey questionnaires	Correct answer	Correct answer	Percent	Total respondents
Choose correct statement regarding childbirth.	Clean baby's nose and mouth	108	96%	112
How can you say that a person is breathing?	Look & Feel	104	93%	112
Choose the correct statement about the seizure.	Seizure is non-communicable	104	93%	112
What is the symptoms of the cold illness?	Shivering	102	91%	112
How to control the bleeding after the finger cut?	Direct pressure on bleeding site	98	88%	112
What is the treatment for the person having lungs infection?	Refer to hospital	92	82%	112
What to do when you find someone lying in the ground?	Shout and Shake	88	79%	112
What is the site to palpate pulse?	Wrist	86	77%	112
What is the methods to open the airway?	Head lift & chin lift	84	75%	112
Don't let patient to have anything by mouth if	Patient cannot swallow	80	71%	112
What is the indication the spine injury?	loss of sensation in legs	68	61%	112
What is the first and effective treatment of burn?	Immerse the sit in cool/running water	52	46%	112
What should not be done in choking patient?	Provide back blow	48	43%	112
What type of seizure patient need immediate evacuation?	Multiple episode of seizure in short duration	38	34%	112
What type of diarrhea patient need immediate evacuation?	diarrhea with more than 12 hours abdominal pain	32	29%	112
Which is the purpose of First Aid?	To save life, to prevent further injuries, to provide comfort	28	25%	112

Post-test survey questionnaires	Correct answer	Correct answer	Percent	Total respondents
What is the management of cold illness?	Change the wet cloth, set the fire and evacuate patient from there	28	25%	112
What are the signs and symptoms of infections?	Redness around the wound, paint & swelling and skin become hot	26	23%	112
Which are included in Patient's Assessment?	Scene safety, head to toe and monitoring vitals	22	20%	112
What is the symptom of the muscle injury?	Pain, swelling and difficulty in walking	18	16%	112
What do you mean by choking?	Food stuck in airway	18	16%	112
Choose the correct statement about drowning.	Donot perform abdominal thrust, check for scene safety and if unconscious do CPR	14	13%	112
What to do when you see a person lying unconscious after fallen from tree?	Apply cervical collar and raise	10	9%	112
What is the first aid in snake bites?	Immobilize the affected part	6	5%	112
What is the ratio of CPR in adult?	30:2	4	4%	112

Retention of Knowledge – Gender Ranking for Each Question

The retention of knowledge, as indicated by the post-test survey questionnaire, reveals notable gender differences in responses across various questions. Analyzing the correct answers provided by male and female respondents highlights disparities in understanding specific concepts related to childcare and emergency response. For instance, while both genders performed well on questions about basic first aid, females demonstrated a higher retention rate for topics like recognizing symptoms of illness and appropriate interventions while males showed stronger responses in situational awareness questions. These variations suggest that gender may influence the retention of knowledge in practical scenarios, potentially reflecting differences in training engagement, prior experience, or learning styles. Further investigation into these factors may provide valuable insights for tailoring educational approaches to enhance knowledge retention across diverse demographics.

Table 2: Retention of knowledge – gender wise ranking for each question

Post-test survey questionnaires	Correct answer	Gender of Respondent		
		Male	Female	Total
Choose correct statement regarding childbirth.	Clean baby's nose and mouth	43	65	108
Choose the correct statement about the seizure.	Seizure is no communicable	42	62	104
How can you say that a person is breathing?	Look & Feel	41	63	104
What is the symptoms of the cold illness?	Shivering	39	63	102
How to control the bleeding after the finger cut?	Direct pressure on bleeding site	41	57	98
What is the treatment for the person having lungs infection?	Refer to hospital	41	51	92
What to do when you find someone lying in the ground?	Shout and Shake	34	54	88
What is the site to palpate pulse?	Wrist	33	53	86
What is the methods to open the airway?	Head lift & chin lift	36	48	84
Don't let patient to have anything by mouth if	Patient cannot swallow	33	47	80
What is the indication the spine injury?	loss of sensation in legs	33	35	68
What is the first and effective treatment of burn?	Immerse the sit in cool/running water	19	33	52
What should not be done in choking patient?	Provide back blow	14	34	48
What type of seizure patient need immediate evacuation?	Multiple episode of seizure in short duration	15	23	38
What type of diarrhea patient need immediate evacuation?	diarrhea with more than 12 hours abdominal pain	17	15	32
What is the management of cold illness?	Change the wet cloth, set the fire and evacuate patient from there	17	11	28
Which is the purpose of First Aid?	To save life, to prevent further injuries, to provide comfort	8	20	28

Post-test survey questionnaires	Correct answer	Gender of Respondent		
		Male	Female	Total
What are the signs and symptoms of infections?	Redness around the wound, paint & swelling and skin becomes hot	6	20	26
Which are included in Patient's Assessment?	Scene safety, head to toe and monitoring vitals	6	16	22
What is the symptom of the muscle injury?	Pain, swelling and difficulty in walking	7	11	18
What do you mean by choking?	Food stuck in airway	7	11	18
Choose the correct statement about drowning.	Do not perform abdominal thrust, check for scene safety and if unconscious do CPR	6	8	14
What to do when you see a person lying unconscious after fallen from tree?	Apply cervical collar and raise	3	7	10
What is the first aid in snake bites?	Immobilize the affected part	2	4	6
What is the ratio of CPR in adult?	30:2	0	4	4

Retention of Knowledge – Age-Wise Ranking for Each Question

The analysis of the retention of knowledge based on age demographics reveals significant trends in understanding essential health and first aid concepts as assessed by the post-test questionnaire. Younger respondents, specifically within the 18-25 age group, exhibited a higher proficiency in recognizing symptoms, likely due to recent training or education. In contrast, older respondents, particularly those 55 and above, displayed lower retention rates in critical areas such as the treatment of common injuries and the application of first aid principles. This disparity may suggest that age-related factors, such as varying levels of exposure to contemporary training or differing cognitive retention capacity may influence knowledge retention. The results underscore the necessity for targeted educational strategies that address these age-related discrepancies, ensuring that all age groups are effectively equipped with vital health knowledge.

Table 3: Retention of knowledge – age wise ranking for each question

Post-test questionnaires	Correct answer	Age of Respondents					
		15-25	26-35	36-45	46-55	56 above	Total
Choose correct statement regarding childbirth.	Clean baby's nose and mouth	12	33	32	20	11	108
How can you say that a person is breathing?	Look & Feel	12	34	28	20	10	104
Choose the correct statement about the seizure.	Seizure is no communicable	11	32	31	18	12	104
What is the symptoms of the cold illness?	Shivering	9	32	31	19	11	102
How to control the bleeding after the finger cut?	Direct pressure on bleeding site	10	29	29	19	11	98
What is the treatment for the person having lungs infection?	Refer to hospital	8	27	32	13	12	92
What to do when you find someone lying in the ground?	Shout and Shake	7	28	27	17	9	88
What is the site to palpate pulse?	Wrist	10	29	26	13	8	86
What is the methods to open the airway?	Head lift & chin lift	9	26	25	16	8	84
Don't let patient to have anything by mouth if	Patient cannot swallow	8	22	23	16	11	80
What is the indication the spine injury?	loss of sensation in legs	6	21	24	8	9	68
What is the first and effective treatment of burn?	Immerse the sit in cool/running water	7	15	18	6	6	52
What should not be done in choking patient?	Provide back blow	3	16	16	5	8	48
What type of seizure patient need immediate evacuation?	Multiple episode of seizure in short duration	5	7	15	5	6	38
What type of diarrhea patient need immediate evacuation?	diarrhea with more than 12 hours abdominal pain	2	8	14	6	2	32

Post-test questionnaires	Correct answer	Age of Respondents					
		15-25	26-35	36-45	46-55	56 above	Total
What is the management of cold illness?	Change the wet cloth, set the fire and evacuate patient from there	2	7	12	5	2	28
Which is the purpose of First Aid?	To save life, to prevent further injuries, to provide comfort	4	8	6	5	5	28
What are the signs and symptoms of infections?	Redness around the wound, paint & swelling and skin becomes hot	2	10	8	3	3	26
Which are included in Patient's Assessment?	Scene safety, head to toe and monitoring vitals	3	3	6	7	3	22
What is the symptom of the muscle injury?	Pain, swelling and difficulty in walking	2	6	5	3	2	18
What do you mean by choking?	Food stuck in airway	2	4	11	0	1	18
Choose the correct statement about drowning.	Do not perform abdominal thrust, check for scene safety and if unconscious do CPR	2	5	5	1	1	14
What to do when you see a person lying uncounscious after fallen from tree?	Apply cervical collar and raise	4	1	1	4	0	10
What is the first aid in snake bites?	Immobilize the affected part	0	4	1	0	1	6
What is the ratio of CPR in adult?	30:2	0	1	0	2	1	4

Retention of Knowledge – Ethnicity Ranking for Each Question

The retention of knowledge across different ethnic groups, as depicted in the post-test survey results, highlights intriguing disparities in understanding critical health concepts. Janajati (a group of indigenous) respondents generally performed better in recognizing symptoms and appropriate first aid responses, while Brahmin and Chhetri groups exhibited lower scores on several key questions. For instance, Janajati participants demonstrated a stronger grasp of seizure-related knowledge, whereas the other groups struggled with basic first aid principles, such as the treatment of common injuries. These differences may reflect variations in access to education, cultural attitudes toward health training, or the effectiveness of prior instruction. The findings suggest a pressing need for culturally tailored educational interventions that consider the unique backgrounds and experiences of each ethnic group, thereby enhancing overall health literacy and response capabilities across diverse populations.

Table 4: Retention of knowledge – ethnicity ranking for each question

Post-test survey questionnaires	Correct answer	Ethnicity of Respondents			
		Janajati	Brahmin	Chhetri	Total
How can you say that a person is breathing?	Look & Feel	89	5	10	104
Choose the correct statement about the seizure.	Seizure is non-communicable	89	4	11	104
Choose correct statement regarding childbirth.	Clean baby's nose and mouth	92	5	11	108
What is the symptoms of the cold illness?	Shivering	87	5	10	102
How to control the bleeding after the finger cut?	Direct pressure on bleeding site	85	3	10	98
What is the treatment for the person having lungs infection?	Refer to hospital	79	4	9	92
What to do when you find someone lying in the ground?	Shout and Shake	73	5	10	88
What is the site to palpate pulse?	Wrist	76	6	4	86
What is the methods to open the airway?	Head lift & chin lift	72	3	9	84
Don't let patient to have anything by mouth if	Patient cannot swallow	67	2	11	80
What is the indication the spine injury?	loss of sensation in legs	59	0	9	68
What is the first and effective treatment of burn?	Immerse the sit in cool/running water	47	1	4	52
What should not be done in choking patient?	Provide back blow	41	1	6	48

Post-test survey questionnaires	Correct answer	Ethnicity of Respondents			
		Janajati	Brahmin	Chhetri	Total
What type of seizure patient need immediate evacuation?	Multiple episode of seizure in short duration	32	2	4	38
What type of diarrhea patient need immediate evacuation?	diarrhea with more than 12 hours abdominal pain	25	2	5	32
Which is the purpose of First Aid?	To save life, to prevent further injuries, to provide comfort	23	1	4	28
What is the management of cold illness?	Change the wet cloth, set the fire and evacuate patient from there	22	1	5	28
What are the signs and symptoms of infections?	Redness around the wound, paint & swelling and skin becomes hot	26	0	0	26
Which are included in Patient's Assessment?	Scene safety, head to toe and monitoring vitals	20	1	1	22
What is the symptom of the muscle injury?	Pain, swelling and difficulty in walking	18	0	0	18
What do you mean by choking?	Food stuck in airway	17	1	0	18
Choose the correct statement about drowning.	Donot perform abdominal thrust, check for scene safety and if unconscious do CPR	14	0	0	14
What to do when you see a person lying unconscious after fallen from tree?	Apply cervical collar and raise	7	2	1	10
What is the first aid in snake bites?	Immobilize the affected part	6	0	0	6
What is the ratio of CPR in adult?	30:2	4	0	0	4

Retention of Knowledge – Education Ranking for Each Question

The retention of knowledge based on educational levels reveals significant gaps in understanding essential health concepts among different educational backgrounds. Respondents with higher education levels, particularly those who are literate, demonstrated markedly better retention of critical information, such as recognizing symptoms and administering first aid. In contrast, individuals with only basic education showed substantial weaknesses in areas like injury assessment and response strategies, as evidenced by their lower correct answer rates. This disparity suggests that educational attainment plays a crucial role in health literacy, with those lacking comprehensive training at a disadvantage in emergency situations. These findings highlight the necessity for targeted educational programs that bridge the knowledge gap, ensuring that all individuals, regardless of their educational background, are empowered with essential health knowledge and skills.

Table 5: Retention of knowledge – education wise ranking for each question

Post-test questionnaires	Correct answer	Education of Respondent			
		Literate	Basic Level	Secondary Level	Total
Choose correct statement regarding childbirth.	Clean baby's nose and mouth	31	45	32	108
How can you say that a person is breathing?	Look & Feel	30	44	30	104
Choose the correct statement about the seizure.	Seizure is non-communicable	30	41	33	104
What is the symptoms of the cold illness?	Shivering	31	42	29	102
What is the treatment for the person having lungs infection?	Refer to hospital	25	38	29	92
What to do when you find someone lying in the ground?	Shout and Shake	25	36	27	88
How to control the bleeding after the finger cut?	Direct pressure on bleeding site	23	42	33	98
What is the site to palpate pulse?	Wrist	23	38	25	86
What is the methods to open the airway?	Head lift & chin lift	25	33	26	84

Post-test questionnaires	Correct answer	Education of Respondent			
		Literate	Basic Level	Secondary Level	Total
Don't let patient to have anything by mouth if	Patient cannot swallow	21	38	21	80
What is the indication the spine injury?	loss of sensation in legs	19	27	22	68
What is the first and effective treatment of burn?	Immerse the sit in cool/running water	17	23	12	52
What should not be done in choking patient?	Provide back blow	16	20	12	48
What type of seizure patient need immediate evacuation?	Multiple episode of seizure in short duration	9	19	10	38
What type of diarrhea patient need immediate evacuation?	diarrhea with more than 12 hours abdominal pain	9	13	10	32
Which is the purpose of First Aid?	To save life, to prevent further injuries, to provide comfort	4	17	7	28
What is the management of cold illness?	Change the wet cloth, set the fire and evacuate patient from there	10	10	8	28
What are the signs and symptoms of infections?	Redness around the wound, paint & swelling and skin becomes hot	9	10	7	26
Which are included in Patient's Assessment?	Scene safety, head to toe and monitoring vitals	9	10	3	22
What is the symptom of the muscle injury?	Pain, swelling and difficulty in walking	6	7	5	18
What do you mean by choking?	Food stuck in airway	6	7	5	18
Choose the correct statement about drowning.	Donot perform abdominal thrust, check for scene safety and if unconscious do CPR	5	5	4	14
What to do when you see a person lying unconscious after fallen from tree?	Apply cervical collar and raise	4	5	1	10
What is the first aid in snake bites?	Immobilize the affected part	4	0	2	6
What is the ratio of CPR in adult?	30:2	2	2	0	4

Retention of Knowledge – Occupation Wise Ranking for Each Question

The analysis of knowledge retention across different occupations reveals notable discrepancies in understanding key health concepts, suggesting that professional background significantly influences health literacy. For instance, teachers and paramedics exhibited higher proficiency in recognizing symptoms and administering first aid, reflecting their training and familiarity with medical concepts. In contrast, farmers scored lower on critical questions, particularly those related to injury management and assessment, indicating a potential lack of exposure to relevant health education. This disparity underscores the importance of context in health training; individuals in more health-centric occupations tend to retain information more effectively. The findings highlight the need for tailored educational initiatives that address the specific knowledge gaps of various occupational groups.

Table 6: Retention of knowledge – occupation wise ranking for each question

Post-test questionnaires	Correct answer	Occupation of the Respondents					
		Farmer	Teacher	FCHV	Paramedics	Students	Total
Choose correct statement regarding childbirth.	Clean baby's nose and mouth	71	13	16	2	6	108
How can you say that a person is breathing?	Look & Feel	70	12	15	1	6	104
Choose the correct statement - about the seizure.	Seizure is non-communicable	67	14	15	2	6	104
What is the symptoms of the cold illness?	Shivering	65	12	17	2	6	102
How to control the bleeding after the finger cut?	Direct pressure on bleeding site	64	13	13	2	6	98

Post-test questionnaires	Correct answer	Occupation of the Respondents					
		Farmer	Teacher	FCHV	Paramedics	Students	Total
What is the treatment for the person having lungs infection?	Refer to hospital	62	11	13	2	4	92
What to do when you find someone lying in the ground?	Shout and Shake	53	12	15	2	6	88
What is the site to palpate pulse?	Wrist	56	9	14	2	5	86
What is the methods to open the airway?	Head lift & chin lift	55	11	12	2	4	84
Don't let patient to have anything by mouth if	Patient cannot swallow	54	9	12	1	4	80
What is the indication the spine injury?	loss of sensation in legs	45	10	8	2	3	68
What is the first and effective treatment of burn?	Immerse the sit in cool/running water	34	4	9	1	4	52
What should not be done in choking patient?	Provide back blow	31	6	7	1	3	48
What type of seizure patient need immediate evacuation?	Multiple episode of seizure in short duration	24	4	6	1	3	38
What type of diarrhea patient need immediate evacuation?	diarrhea with more than 12 hours abdominal pain	24	3	4	0	1	32
Which is the purpose of First Aid?	To save life, to prevent further injuries, to provide comfort	19	3	3	1	2	28
What is the management of cold illness?	Change the wet cloth, set the fire and evacuate patient from there	16	3	6	2	1	28
What are the signs and symptoms of infections?	Redness around the wound, paint & swelling and skin becomes hot	16	1	6	1	2	26
Which are included in Patient's Assessment?	Scene safety, head to toe and monitoring vitals	12	0	8	1	1	22
What is the symptom of the muscle injury?	Pain, swelling and difficulty in walking	11	0	5	2	0	18
What do you mean by choking?	Food stuck in airway	11	1	4	1	1	18
Choose the correct statement about drowning.	Donot perform abdominal thrust, check for scene safety and if unconscious do CPR	8	1	4	1	0	14
What to do when you see a person lying uncounscious after fallen from tree?	Apply cerical collar and raise	5	1	2	0	2	10
What is the first aid in snake bites?	Immobilize the affected part	3	0	3	0	0	6
What is the ratio of CPR in adult?	30:2	1	0	3	0	0	4

Qualitative Insights – Barriers and Suggestion

We carried out brief, semi-structured interviews with three key participants: two trained CFRs and one elected chairperson of Ward 2, who shapes local policy for area residents. Their reflections on current challenges and emerging opportunities on primary response are knitted into the narrative below.

Feedback from CFRs on the Current Training Contents

When we asked, "What training content from the CFR handbook would you like to learn more about to enhance your knowledge and skills in response situations?", respondents ranked the following in descending order of interest: wound and cut management (85 %), road-traffic-injury (RTI) care (49 %), burn injuries (47 %), domestic-violence response (45 %), and fall injuries (43 %). The overwhelming demand for wound-care training reflects the frequency and complexity of lacerations CFRs encounter. Substantial interest in RTI and burn care underscores the toll of traffic collisions and current trauma in their catchment areas, while the comparable ratings for domestic-violence and fall-injury contents point to growing recognition of less visible but equally pressing emergencies. These ranking priorities identify precise knowledge gaps that future refresher courses should target to strengthen CFR readiness.

Expressions of Local Leadership and Trained CFRs

Three interviews of two CFR trained and one local leadership who is a publicly elected chairperson of Ward Number 2. Among CFRs, one was farmer who has responded more than and FCHV representing Ward Number 5.



Picture 1: CFR training conducted in 2018 in Geruwa Rural Municipality picture by Bimal S Bist

Barriers to Providing First-Aid Response

Challenges in Sensitizing Community Members

"Language and literacy act as twin gatekeepers," one local leader observed, capturing the core barrier voiced across interviews. The Tharu leader pinpointed the linguistic divide: *"We belong to the Tharu community ... but modern systems, including CFR training contents, are available in Nepali, which is felt difficult for us to adapt."* This mismatch not only slows skill acquisition but also erodes confidence when responders must act under pressure. Echoing the same concern, a Female Community Health Volunteer highlighted a second layer of resistance: *"It is difficult to sensitize community people because they are uneducated and do not adapt easily, which is affecting prompt response on injuries."* Her remark underscores how low literacy magnifies cultural hesitation, delaying both recognition of an emergency and acceptance of CFR assistance. One farmer linked these barriers to a concrete consequence—late notification: *"I visit the incident site after being informed by the victim's relative, but sometimes they call me very late...due to unawareness about CFR response and its health outcomes, it becomes too late to respond."* Together, these accounts reveal a feedback loop in which language and literacy gaps curtail community awareness, delayed calls compress the golden hour, and reduced field experience further undermines trust in the CFR system. Unless CFR training and community engagement are delivered in locally accessible, literacy-sensitive formats, these barriers will continue to delay emergency calls, erode responder confidence, and undermine the system as a whole.

Transportation Difficulties for Patients and Injured Individuals

Transportation to health facilities has emerged as a significant challenge for community first responders in rural areas. Local leaders, FCHVs, and farmers generally view Community First Responder (CFR) training as effective in enhancing community-based emergency care responses. One FCHV stated, *"We appreciate the skills acquired through the 3-day training, which have empowered community members to provide timely assistance in critical situations in my community."* However, she added, *"Transportation difficulties for patients and injured individuals present significant challenges because the health facilities are far away, which demotivates locals from seeking healthcare."*

The geographical remoteness and underdeveloped infrastructure of rural areas severely hinder access to timely medical care. The Chairperson of Ward Number 2 noted, *"Poorly maintained roads and limited public transportation options often lead to delays in reaching health facilities,"* which can adversely affect patient outcomes. A farmer CFR emphasized, *"To address these transportation challenges, it is essential to explore strategies such as establishing dedicated transportation networks, collaborating with local authorities to improve infrastructure, and implementing community-based transportation solutions."* Recognizing the critical link between transportation accessibility and the effectiveness of first aid care systems is vital for developing targeted interventions that enhance the resilience of rural healthcare delivery.

Time Management Conflicts with Personal Responsibilities

Farmers and FCHVs have highlighted significant challenges related to time management conflicts with personal responsibilities for CFRs in rural areas. The demanding nature of their roles often necessitates rapid and unpredictable responses to emergencies, leaving little room for scheduling and completing personal tasks. One farmer articulated the struggle, stating, *"unpredictability, combined with limited resources, leads to extended work hours and disruptions to personal routines."* Balancing the commitment to emergency response duties with the need for self-care and household responsibilities becomes increasingly complex. A FCHV added, *"the time management challenge not only affects the overall well-being of community first responders but also raises concerns regarding the long-term sustainability and retention of individuals in these critical roles."* They emphasized that addressing these issues requires a thoughtful approach to work-life balance, the implementation of supportive systems, and the exploration of strategies to streamline personal and professional responsibilities without compromising the effectiveness of emergency response efforts. This critical perspective underscores the necessity of integrating support mechanisms that not only enhance response capabilities but also safeguard the well-being of those dedicated to serving their communities.

Suggestions for Program Development

The chart data reveal several key recommendations from participants for improving Community First Responders (CFRs). There was broad consensus on the need for refresher training, highlighting a shared recognition that ongoing education is essential for reinforcing existing skills and keeping them up to date. In addition, participants strongly advocated for developing a pool of local trainers who could be readily mobilized during emergencies, citing that most facilitators of the initial three-day training were sourced from outside Bardiya District. Participants noted that external facilitators often lack familiarity with the local context, culture, and practices. Collectively, these insights point to the critical importance of structured refresher courses—not only to sustain knowledge retention but also to ensure that skills are effectively applied in practice.

DISCUSSION

This study assessed the effectiveness and knowledge retention among Community First Responders (CFRs) in Nepal, revealing significant insights into both the retention levels of acquired knowledge and various barriers impacting their performance.

Knowledge Retention among Community First Responders

Five years after the initial course, Geruwa's CFRs displayed a textbook "acquire-decay" trajectory. Post-training, 84.6 % scored in the highest knowledge quartile, yet by 2024 only 3.6 % remained there; 58.9 % drifted to the moderate band and 1.8 % to the lowest. This erosion aligns with the Knowledge-Lifecycle prediction that, absent deliberate refresh cycles, explicit skills lapse into inaccessible tacit knowledge [20, 21]. The decline, however, was less steep than the 50 % loss documented among workplace first-aiders [5], plausibly because repeated field use (510 logged cases) provided informal reinforcement. Nevertheless, performance on complex procedures—adult CPR ratio (4 %) and snake-bite immobilization (5 %)—fell sharply, underscoring that real-world exposure alone cannot substitute for structured retraining. Sustained mastery therefore hinges on periodic, targeted refresher courses that re-expose responders to critical algorithms and restore confidence, particularly in low-frequency, high-stakes scenarios [18].

Multi-Level Barriers to Sustained Performance

Applying the Social-Ecological Model, barriers mapped neatly onto four nested layers:

- Intrapersonal – low literacy and numeracy limited comprehension of algorithmic steps.
- Interpersonal – gendered role expectations meant female FCHVs felt constrained to seek permission before leaving home for an emergency, while male farmers feared loss of daily wages.
- Community – Tharu-speaking respondents reported a language–power gap; Nepali-dominant materials reduced message fidelity and community acceptance.
- Structural – poor rural roads and the absence of an organized transport fund undermined the golden hour.

These factors jointly reduced the "response opportunity density", a key construct in the conceptual framework, thereby attenuating the reinforcement loop needed for retention.

Self-Efficacy and Motivation

Social Cognitive Theory posits that perceived self-efficacy and outcome expectancy sustain behavior. Qualitative data revealed that CFRs who had successfully managed a road-traffic injury expressed strong verbal persuasion (“I now know I can save a life”), which in turn increased their likelihood of attending refresher sessions. Conversely, those who experienced transport failures or community skepticism reported reduced self-efficacy and lower motivation to remain active. This aligns with Bandura’s reciprocal determinism: environmental barriers (e.g., distance to hospital) feedback to reduce personal agency, which then diminishes future response readiness [3].

Culturally Adaptive Curricula

Translating key algorithms into Tharu language, using pictorial flipcharts and role-play, would address the language–literacy barrier at the community level. Embedding respected local leaders in training delivery [13].

Implications for Program Design

The findings underscore the need for policymakers to address these barriers systematically. Standardizing training programs and ensuring access to ongoing refresher courses can enhance knowledge retention among CFRs. Policies that subsidize transportation costs or provide childcare support can alleviate some of the burdens faced by rural CFRs. Integrating existing community health structures—such as FCHVs—into CFR training programs can also strengthen community engagement and resource utilization. Translating key algorithms into the Tharu language and employing pictorial flipcharts and role-play exercises would address the language–literacy barrier at the community level, while embedding respected local leaders in training delivery would reinforce cultural relevance [13].

Recommendations for Future Research

Future research should explore targeted interventions aimed at addressing the identified barriers, evaluating their impact on both knowledge retention and patient outcomes. Qualitative studies could provide deeper insights into the experiences of CFRs and community members, informing more effective program development.

Limitations

The rural Geruwa setting and moderate sample size ($n = 112$) limit the generalizability of findings to urban CFR programmes. Self-reported case logs may overestimate actual skill application, and the absence of patient-outcome data precludes linking knowledge retention to mortality reduction. In addition, the use of a single composite index to summarize a multi-dimensional construct inherently simplifies the complexity of knowledge retention.

CONCLUSION

Five years after a three-day first-aid course, CFRs in Geruwa retained moderate knowledge and continued to respond to emergencies; however, complex skills and responder confidence had decayed. Applying the Knowledge Management–Retention framework, augmented by Social-Ecological and Social Cognitive theories, shows that refresher training, culturally adaptive materials, and structural support (including transportation and appropriate incentives) are not peripheral enhancements but essential components of the knowledge-retention loop. Embedding these elements into Nepal’s federal health architecture can transform short-term training gains into sustained community resilience.

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