

Barriers And Facilitators Of Community-Based First Responders In Providing First Aid To The Post-Crash Victims In The Road Accident Blackspots Of Alappuzha, South India.

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Abstract

Background: Road traffic accidents (RTA) are one of the major public health concerns, with 90% of fatalities reported from low- and middle-income countries. Two-thirds of these fatalities are among individuals aged 18-59, impacting health, social well-being, and economies of the nations. Immediate prehospital care and first aid by potential first responders are pivotal in improving survival rates for RTA victims. Therefore, understanding the barriers and facilitators faced by potential first responders is crucial for effective emergency support and first aid provision.

Methodology: A cross-sectional study was carried out across 35 high-risk road accident blackspots in Alappuzha district among 358 potential first responders. Purposive sampling was adopted to recruit the participants. Data collection was done using an interview schedule, and analysis of the collected data was performed using IBM SPSS Statistics 28 for Windows.

Result: Out of the 358 study participants, 273(76%) were autorickshaw drivers, 18(5%) were taxi drivers, and 67(19%) were engaged as shopkeepers or shop workers. Most participants had at least secondary education with a mean age of 48 years. Emergency support and First aid in road crash injuries were associated with training in First aid and knowledge of First aid and emergency support. Emergency assistance was found to be strongly associated with composite knowledge of first aid and emergency support (adj. OR: 3.75, 95% CI: 1.829 to 7.672). Composite knowledge of first aid and emergency support was associated with first aid training (adj. OR: 3.80, 95% CI: 2.282 to 6.332).

Conclusion: The present study reveals that composite knowledge of first aid and emergency support a significant determinant factor of providing first aid and emergency support to road traffic accident victims. The study also highlights the importance of first aid training and awareness of first aid in rendering emergency support during RTAs.

Keywords: community based first responders, First aid, post-crash victims, prehospital care, road traffic accidents

Date of Submission: 19-06-2024

Date of Acceptance: 29-06-2024

I. Introduction

Road traffic accidents (RTAs) are one of the major public health challenges, with over 1.24 million deaths and an extra 20-50 million injuries or impairments globally. The RTAs have an extensive public health burden with substantial financial repercussions, affecting not only the individuals who suffer but also their families and entire countries^{1,2}. The UN General Assembly declared the "Decade of Action for Road Safety" 2021–2030 in September 2020, with the bold goal of preventing at least half of all road deaths and injuries by 2030³. Public safety in low- and middle-income countries (LMICs) is gravely endangered by traffic accidents, with 92% of road traffic fatalities⁴. The first hour after trauma is crucial for saving lives, known as the "golden hour"⁵. It was observed that Road Traffic Injuries (RTI) in both urban and rural settings impacted young men. Only 20% of participants received first aid, and a similar percentage made it to the institution before the golden hour². Access to prehospital treatment can affect the reduction of road traffic accident disability, sequelae, and lethality, even though safety initiatives are essential for lowering injuries and fatalities. Research indicates that receiving high-quality pre-hospital and hospital care early can both avoid and reduce the risk of dying⁶. Research projects in six low- and middle-income countries have found that prehospital care can reduce the risk of fatalities caused by injuries by 25%⁷. Emergency systems in most LMICs are limited and inefficient, with only a small fraction of injured individuals receiving proper medical care at the crash site and safe ambulance transport.

Prehospital care is essential for trauma management but faces challenges in low-resource settings. Only 50% of the injured receive first aid from bystanders at the site, and many are taken to medical facilities by drivers or laypeople⁸⁻¹⁰. In most motor vehicle crash situations, laypeople are more likely to arrive at the crash site before the emergency services; utilizing the presence of these laypeople and providing them with first responder training can significantly reduce the complications resulting from RTIs¹¹. Training first responders is an effective strategy to improve outcomes in emergencies and untrained individuals at the scene of an accident can have far-reaching consequences¹⁰. Drivers can help the victims of road accidents by giving them first aid. Auto rickshaw drivers witness many road accidents as part of their job. They can help clear the road and save lives if they know how to give first aid¹². India has ~1% of global vehicles but accounts for 6% of Global Road Traffic Injuries¹³. With more than 400 road crash deaths each day, India is among the top-ranked countries regarding deaths due to RTIs¹⁴. One of India's most serious problems appears to be inadequate prehospital treatment, especially in rural areas where transportation and institutional trauma care are delayed¹⁵. Trauma care in India is a complex issue, with factors such as lack of first aid, delays in transport, late arrivals to hospitals, and human resource constraints contributing to poor trauma outcomes. In rural areas, pre-hospital care is crucial for reducing the number of deaths caused by road accidents^{10,16-19}. In Kerala, which became India's third most accident-prone state in 2023, road safety experts estimate an average of twelve deaths caused by traffic accidents in 2022²⁰. The present study aimed at assessing the barriers and facilitators of community-based first responders in providing emergency assistance and first aid to post-crash victims.

II. Material And Methods

Study Design, site, and population

A cross-sectional study was conducted among 358 potential first responders across 35 road accident blackspots in one of the South Indian districts, Alappuzha in the state of Kerala from January 2024 to March 2024. The study participants were selected from auto rickshaw drivers, taxi drivers, shopkeepers/workers within 200meter radius of the Road accident blackspots in the age group 18-59 years.

Study Location: The study was conducted across 35 road accident blackspots in Alappuzha District, Kerala.

Study Duration: The present study was conducted between January 2024 and March 2024.

Sample size: 358 participants

Sample size calculation: Assuming the prevalence of barriers among potential first responders in rendering emergency support and first aid as 37% (*Pallavisarji et al., 2013*), with an absolute precision of 5% and 95% confidence interval, the sample size was calculated to be 358. Samples were drawn from 35 Blackspots, with an average of 11 samples taken from each black spot.

Subjects and selection method: The study participants were selected from auto rickshaw drivers, taxi drivers, shopkeepers/workers around 200meter radius of the road accident blackspots in the age group 18-59 years. The participants were grouped into “drivers” (with auto/taxi drivers) and “non-drivers” (shopkeepers/shopworkers).

Inclusion criteria: Participants were recruited from autorickshaw/taxi drivers and shopkeepers/shop workers within 200 meters of the road accident blackspots who were engaged in the current occupation in the data collection area for at least 06 months. They had rendered informed consent.

Exclusion criteria: Those who were not willing to participate in the study.

Data collection: The Principal Investigator (PI) visited all 35 blackspots at different times to recruit the samples to get the perceptions of the participants working in various operational time slots. The study participants were met one-on-one at their working station to ensure privacy and were explained the research topic, the requirement of voluntary participation, and the process of withdrawal from the study. The samples were purposively selected after obtaining informed consent from each participant. The recruitment of the participants was completed by including all three groups of potential first responders to ensure the representation of each subgroup. The interview schedule used for the data collection had six significant themes a) Occupational information, b) Socio-Demographic information, c) Knowledge about emergency support and First Aid to Road crash victims, d) Awareness of accessing health services, transportation facilities, government-sponsored BLS ambulance systems, and health facilities e) Barriers to providing First Aid to the road crash victims, f) Facilitators in providing First Aid to the road crash victims.

Statistical analysis: Data collected was entered in Open Data Kit (ODK) and exported the files to SPSS licensed version 28 for Windows for further analysis. For all kinds of statistical tests, a p-value of less than 0.05 was considered for statistical significance. For categorical factors, frequencies and proportions were determined. The interview schedule contained 09 distinct questions regarding the provision of emergency support, first aid, and critical handling of post-crash victims.²¹ Each correct response to a question was awarded '1 mark', while incorrect responses received '0 mark'. The participant's composite knowledge scores were calculated by summing the scores awarded for all questions. Based on the composite knowledge score of '5' the study participants were grouped into two. Those participants with composite knowledge scores below '5' were classified as having 'inadequate knowledge,' while those with scores equal to or above '5' were categorized as having 'adequate knowledge.' Pearson's chi-square test was done to compare categorical variables using bivariate analysis. Logistic regression was subsequently performed and the strength of association between variables was determined through Odds Ratio and 95% Confidence Interval (CI). Multivariate analysis was done to find the best model for predicting the outcome of interest.

Ethical consideration: The Institutional Ethics Committee of Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) granted permission to conduct this study. Before collecting data, informed consent was obtained from them in the IEC-approved form before interviewing the participants. Each participant was given an identification number during the interview while collecting the information. Utmost priority was given to protecting the participant's privacy and confidentiality.

III. Result

In the current study, the age range of the potential first responders was 20 to 59 years, with a median age of 48 years. Auto rikshaw drivers comprised 76.3 percent of the 358 participants, followed by shop keepers or workers (18.7%) and taxi drivers (5%). Of the 358 participants, 62.5% had completed secondary school education, and the remaining participants (37.5%) had education above secondary school. (Table 1).

Table 1 Socio-demographic characteristics of the study participants (N = 358)

Variable	Number (%)
Median age in years(range)	48(20-59)
Age groups	
Age<48 years	154 (43.0)
Age ≥ 48 years	204 (57.0)
Current occupation	
Taxi Driver	18 (5.0)
Auto rikshaw Driver	273 (76.3)
Shopkeeper or shop worker	67 (18.7)
Duration of tenure in the current occupation	
< 6 months	5 (1.4)
6 months to 1 year	89 (24.9)
> 1 year	264 (73.7)
Educational status	
Formal-Primary education (up to 7 th Std)	22 (6.1)
Secondary education	202 (56.4)
Senior Secondary Education (Higher secondary)	113 (31.6)
Graduate and above	21 (5.9)
Timing of daily occupational engagement	
08.00 AM to 08.00 PM	286 (79.9)
08.00 PM to 08.00 AM	72 (20.1)

Among the 358 participants, 45.3 percent had received First Aid training and around 90 percent were aware of first aid methods to assist road crash victims. A smaller proportion of 10.9 percent (n=39) reported lacking awareness in this field. On further analysis, it was understood that Departments like Health, Police, and Motor Vehicle as the source of information in 42.6 percent and various media platforms such as television, radio, and internet in 32.6 percent. Additionally, 24.8 percent of individuals mentioned friends, coworkers, or colleagues as a source of information. Among different occupational groups, drivers had more awareness compared to non-

driver group. (Table 2). Of the 358 participants, 162 (45.3%) received First Aid training. The Motor Vehicle Department provided training to the largest number of (46.3%), followed by the Police Department with (42%). There exists a disparity between different occupational groups regarding training. Of the 67 non-driver groups (shopkeepers/shop workers), only 6 percent received training in first aid to RTA victims, while 44 percent of taxi drivers and 55 percent of auto drivers were trained. (Table 3).

Table 2 Awareness status of potential first responders in first aid and emergency support

Variable		Number (%)
Awareness of first aid to road crash victims (n=358)		
Not Aware		39 (10.83)
Aware		319 (89.17)
Source of awareness (n=319)		
Media (TV, Radio, News Paper, etc)		104 (32.6)
Friends/coworkers/colleagues		79 (24.8)
Departments like MVD/Health/Police		136 (42.6)
Awareness among different occupational groups(n=319)		
Current occupation	Aware (%)	Not aware (%)
Taxi driver	18(100)	00
Autorickshaw driver	267(97.8)	6(2.2)
Shopkeeper/shop worker	34(50.7)	33(49.3)

Table 3 Training status of potential first responders in First aid and emergency support

Variable		Number (%)
Training on First Aid to Road crash victims (n=358)		
No training received		196 (54.7)
Training received		162 (45.3)
Organizations providing the training (n=162)		
Motor Vehicle Department (MVD)		75 (46.3)
Police Department		68 (42.0)
Health Department		11 (6.7)
Non-Governmental Organizations		5 (3.1)
Road Safety Authority		3 (1.9)
Training status among different occupational groups(n=162)		
Current occupation	Trained (%)	Not trained (%)
Taxi driver	8(44.4)	10(55.6)
Autorickshaw driver	150(54.9)	123(45.1)
Shopkeeper/shop worker	4(6.00)	63(94.00)

It was found that 40.50% of respondents failed to correctly identify the primary causes of immediate fatalities in road crashes. Even if most of the potential first responders accurately responded to the question on immediate response to road crashes, a notable portion of respondents (80.45%) provided incorrect responses regarding the safe and essential handling of collision victims. Moreover, a larger proportion of respondents (56.42%) provided incorrect responses regarding removing a helmet from a conscious post-crash victim. When asked about the initial steps to take for a post-crash victim with a penetrating injury, responses were nearly evenly divided. For a post-crash victim with an open fracture, more respondents (59.38%) correctly identified the first response, but only 1.68% of respondents accurately identified the initial course of action for a post-crash victim experiencing choking and respiratory distress. (Table 4).

Table 4 Responses of the potential first responders to the questions on knowledge about First Aid and emergency support(n=358)

Variable	Correct response (%)
The first response towards the post-crash victim with Burn injury	336(93.85)
First response towards post-crash victim immediately following the crash	334(93.3)

The first response towards the post-crash victim with an open fracture	209(59.38)
Commonest causes of immediate fatality in Road traffic accidents	233(59.24)
The first response towards the post-crash victim with penetrating injury with bleeding	170(47.49)
Knowledge of the removal of helmet from the head of a conscious Road crash victim	156(43.58)
Necessity of critical handling and safe transportation of the post-crash victim	70 (19.55)
The first response towards the post-crash victim with Seizure	69(19.27)
The first response towards the post-crash victim with respiratory distress and choking	6(1.68)

Among the 358 participants, 55% had adequate knowledge about first aid and emergency support for post-crash victims, and 45% had inadequate knowledge. (Figure 1).

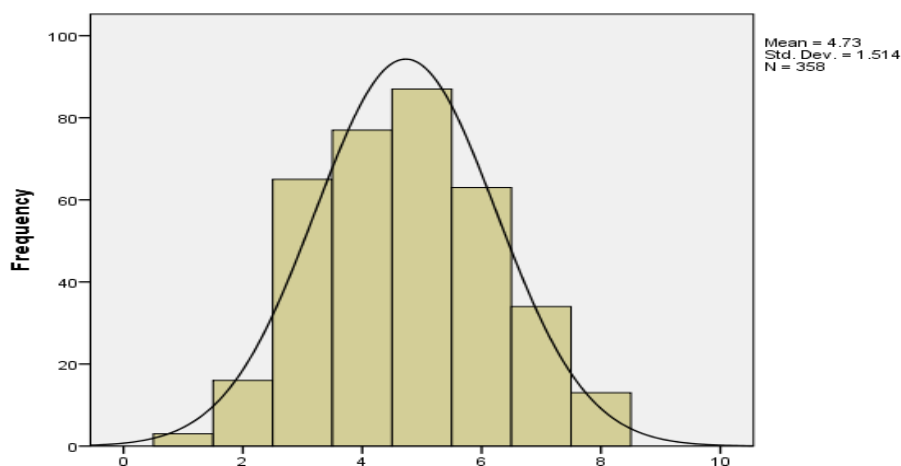


Figure 3 Distribution of composite knowledge score of the study participants

Among the 358 responders surveyed, 247 (69%) reported witnessing at least one road crash the previous year, while 111 (31%) did not witness any road crashes during the same period. Of the 247 responders, 219 (61.2%) witnessed at least one road crash during the previous year, and 28 (7.8%) reported witnessing more than one road crash in the same period. Among the various types of road accidents, those involving pedestrians, bicyclists, and two-wheeler passengers—including hit-and-run cases—constitute the road crashes experienced by vulnerable road users (VRUs). Out of the 247 reported road traffic accidents (RTAs), the ones involving VRUs account for two-thirds 70% (n=174) of the cases. Three-wheelers were involved in 17.4% (43 incidents) of road crashes, while four-wheelers contributed to 10.1% (25 incidents) of the total. Additionally, road crashes requiring extrication were reported in 2% (5 incidents) of the cases. Out of the 247 respondents who witnessed RTAs, nearly half of them 124(50.2%), accompanied the victims to the hospital and 22% (54) of responders assisted in extricating victims. Among those who witnessed road crashes, 49(19.83%) responders reported being unable to act, highlighting potential barriers or challenges faced during emergencies. Half of the respondents (46.94%) were unclear about the immediate response, and 23(46.94%) responders stated that they were alone and had no one to depend on in a strange place. Of the 49 first responders, 32 (65.31) had received no training, and 17 (34.69%) had some training in emergency support and first aid. (Table 5).

Table 5 Instances of road accidents witnessed by the participants in the last year

Variable		Response frequency	Percentage (%)
Witnessed at least one RTA in the previous year	Yes	247	69
	No	111	31
Total		358	100
First aid/emergency assistance provided	Yes	198	80.16
	No	49	19.04
Total		247	100

Association of different sociodemographic barriers and facilitators with immediate responses from the potential first responders who witnessed the road crashes was done using bivariate and multivariable analysis. In bivariate analysis we observed that composite knowledge of first aid and emergency care, current occupational status, and training in first aid and emergency care were associated with the rendering of emergency support and first aid by the potential first responders. Those potential first responders with adequate knowledge of first aid

and emergency support had 4.6 times higher odds of responding to road crashes compared to others with inadequate knowledge (Table 6). Compared to the non-driver group those first responders from the auto-taxi driver category had 3.3 times higher odds of rendering emergency support and first aid to the post-crash victims (Table 6). Those potential first responders who had some training in first aid and emergency support had 2.8 times higher odds of providing emergency assistance and first aid to the post-crash victims (Table 6). The association of composite knowledge in First aid and emergency assistance with the rendering of emergency support and first aid by the potential first responders remains unattenuated in multivariate analysis. Those potential first responders with adequate composite knowledge had 3.75 times higher odds (adjusted Odds ratio of 3.75(95%CI 1.829 to 7.672) of rendering emergency support and first aid to the post-crash victims while compared to those participants with inadequate (Table 6).

Table 6. Facilitators and Barriers of the potential first responders in providing emergency support and first aid to road crash victims.

Variable	Response of First aid and emergency care provided by the first responders (n=247)		p-value X ² test	*Crude OR (95%CI)	**Adj OR (95%CI)
	Service not rendered (%)	Service rendered (%)			
Composite knowledge of First aid and emergency support					
Inadequate knowledge (%)	34(34.34)	65(65.66)	<0.0001	Reference	
Adequate knowledge (%)	15(10.1)	133(89.9)		4.64 (2.359 to 9.119)	3.75 (1.829-7.672)
Current occupational status					
Non-Drivers (Shopkeeper/shop worker)	14(40.00)	21 (60.00)	0.003	Reference	
Taxi and auto drivers	35 (16.51)	177 (83.49)		3.37 (1.565 to 7.262)	2.17 (0.912 – 5.18)
Training status of the responders on First Aid to the road crash victims					
Not received training (%)	33 (28.21)	84 (71.79)	0.003	Reference	
Received training (%)	16 (12.31)	114 (87.69)		2.80 (1.446 to 5.417)	1.45 (0.671 – 3.131)
Awareness of First Aid for road crash victims					
Not aware (%)	8(34.79)	15 (65.21)	0.107	Reference	
Aware (%)	41(18.3)	183 (81.7)		2.38 (0.946 to 5.988)	NA
Educational status					
Up to Secondary education (%)	33(21.85)	118(78.15)	0.405	Reference	
>Secondary education (%)	16(16.67)	80(83.33)		1.40 (0.722 to 2.708)	NA
Duration of engagement in the current occupation					
<01 year	12(20.69)	46 (79.31)		Reference	

> 01 year	37(19.56)	152 (80.44)	1.00	1.07 (0.517 to 2.224)	NA
Timing of daily occupational engagement					
08.00 AM to 08.00 PM	33(17.28)	158(82.72)	0.209	Reference	
08.00 PM to 08.00 AM	16(26.23)	45(73.77)		0.61 (0.306 to 1.201)	NA
The age group of the responders					
Age <48	19(15.97)	100(84.03)	0.190	Reference	
Age ≥ 48	30(23.44)	98(76.56)		0.62 (0.328 to 1.175)	NA

*Crude OR – Crude Odds Ratio; CI – Confidence Interval

**Adj OR- Adjusted Odds Ratio

In order to explore the factors associated with overall composite knowledge in emergency assistance and first aid of the study participants, bivariate and multivariable analysis was done. Up on bivariate analysis the current occupation, training status, awareness status, and educational status of the potential first responders showed an association with the composite knowledge in First aid and emergency assistance. In comparison to the non-driver group, those participants from the auto-taxi driver group had 3.98 times higher odds of having adequate knowledge. Potential first responders with more education than those in secondary school had 2.02 times higher odds of possessing adequate knowledge compared to those participants with education up to secondary school. Those who got the opportunity to be trained in first aid and emergency support had 4.92 times higher odds of having adequate knowledge compared to other untrained participants. Similarly, those potential first responders who were aware of the first aid in Road traffic injuries had 3.9 times higher odds of possessing adequate knowledge compared to an unaware group of participants. The association of current occupation and training status in First aid among potential first responders with composite knowledge in First aid and emergency assistance remains unattenuated in multivariate analysis. (Table 7).

Table 7. Barriers to composite knowledge among first responders on First Aid and Emergency support

Variable	Composite Knowledge level		p-value X ² test	*OR (95%CI)	Adj OR (95%CI)
	Inadequate knowledge	Adequate knowledge			
The age group of the participants					
Age <48 years	68(44.16)	86(55.84)	0.871	Reference	
Age ≥48 years	93(45.59)	111(54.41)		0.94 (0.62-1.44)	NA
Current occupational status					
Non-Drivers (Shopkeeper/shop worker)	48(71.64)	19(28.36)	<0.001	Reference	
Taxi-auto drivers	113(38.83)	178(61.17)		3.98 (2.23-7.12)	2.32 (1.101-4.869)
Educational status					
Up to Secondary education	115(51.4)	109 (48.6)	0.003	Reference	
More than secondary education	46(34.32)	88 (65.68)		2.02	1.22

				(1.29-3.14)	(0.740 – 2.01)
Duration of engagement in the current occupation					
< 1 year	48(51.06)	46(48.94)	0.207	Reference	
> 1 year	113(42.8)	151(57.2)		1.39 (0.87-2.24)	NA
Training on First Aid to the road crash victims					
No	121(61.73)	75(38.27)	<0.001	Reference	
Yes	40(24.69)	122(75.31)		4.92 (3.11to 7.79)	3.80 (2.282 – 6.33)
Awareness on First aid to the road traffic injuries					
Not aware	27(69.23)	12(30.77)	0.002	Reference	
Aware	134(42.00)	185(58.00)		3.11 (1.52 to 6.35)	0.85 (0.34 -2.11)

IV. Discussion

By improving both prehospital and facility-based emergency care, it is expected that up to 54% of annual deaths in low- and middle-income countries (LMICs) could be avoided. Inexperienced laypersons frequently interact with individuals involved in accidents within the setting of emergency medical care before reaching the hospital. According to the World Health Organization (WHO), it is recommended that non-professionals contact emergency services, extinguish fires, protect the area, prevent additional accidents, ensure the safety of rescuers and onlookers, and provide basic first aid upon arrival at the site of a crash²². The present study seeks to evaluate the difficulties and facilitators of the community-based first responders in providing emergency assistance and First aid to the victims of RTA. The present study assessed the awareness of potential first responders about First aid and emergency support. Further, the barriers and facilitators of providing First aid and emergency support by the potential first responders were evaluated.

Current research had only male participants, similar to studies across the globe^{19,23-26}. The exclusive male participation in the study may reflect the type of study participants who were predominantly drivers or shopkeepers/helpers. As women are usually not engaged in these jobs, their participation was absent in the study. The current study's findings that 62.5% of study participants completed secondary education are consistent with the few similar studies. In a comparable study conducted in Uttarakhand among drivers of commercial taxis, buses and autorickshaws, sixty-six percent of participants had completed secondary school²⁴. Sixty-five percent of research participants in another study in Jodhpur among commercial cab drivers and auto rickshaw drivers had completed at least the eighth standard of education²⁶. The higher percentage of participants who attained education up to secondary school may indicate a state-specific pattern. In the current survey, 76.25 percent of participants were auto drivers, and 5 percent were taxi drivers. A similar study in Jodhpur reported that out of 200 participants, 50% were auto or taxi drivers²⁶. The higher proportion of auto drivers in the study may reflect that the current research centered on a district's road accident hotspots, where autorickshaws may be the most convenient form of rapid transit. The study in Jodhpur reiterates that "Autorickshaw drivers are mainly confined to premises of junctions and will be available most of the times in the urban, municipal corporation areas as a major conveyance and hence may own up the responsibility of providing care to the road accident victims in their vicinity in contrast to the cab drivers"²⁶.

In the current study 90 percent of the potential first responders were aware about the requirement of emergency support and First aids in Road crash injuries. In one of the similar studies conducted in Uttarakhand, 96 percent of the respondents had adequate knowledge first aid and immediate reactions to post-crash victims with burns in case of road traffic accidents²⁴. In another similar study at Jodhpur, 65.5% of the responders prioritized the emergency care of the post-crash victims, which is comparatively low when compared to the present research²⁶. The higher awareness among potential first responders may be the reason for good knowledge regarding these domains in both studies. In contrast, only 2 percent of potential first responders in the current study understood the appropriate course of action to follow while handling airway obstruction in victims of RTAs. In a comparable survey conducted in Jodhpur, only 3% of participants correctly answered the question about the

first response to respiratory difficulties experienced by motor vehicle crash victims²⁶. The shocking figures in this domain highlight the magnitude of the knowledge gap around one of the most essential life-saving issues for RTA victims. In another study conducted in Uttarakhand, 16.3 participants had adequate knowledge about handling airway obstruction²⁴. A better response among participants from Uttarakhand may be linked to a higher percentage of bus drivers in the sample, for whom the required training is mandatory for getting a driving license.

Regarding critical handling and safe transportation of post-crash victims, 70 participants (19.55%) in the current study correctly answered the question on critical handling and transportation of the post-crash victim. In another study in Ethiopia, 20 percent of the participants were aware of the best position for transporting the post-crash victim²³. In a study conducted in Jodhpur, only 3 percent of participants were knowledgeable regarding the proper recovery position of the crash victim²⁶, which may be attributed to the poor training status and knowledge of the potential responders. Even if both the studies show similar responses, the knowledge gap is very critical since inappropriate handling and transportation of the post-crash victim might have significant consequences on the victims' chances of survival and recovery. The low percentage of correct responses raises the potential of a skills and knowledge gap among potential first responders. This could be caused by inadequate training, a lack of resources, or challenges in accessing information. In the present study, two hundred and nine participants (59.38%) correctly answered the question in response to the immediate aftermath when a crash victim has open fractures. In a comparable study conducted in Ethiopia with taxicab drivers, 40.9 percent of the respondents correctly responded by responding as immobilizing the patient using splinting²³. In two distinct studies conducted in Uttarakhand and Jodhpur, the correct responses to a similar question were 54.3% and 55.3%, respectively^{24,26}, which is comparable with the present study. According to these results from several research, there is a significant lack of information about how to handle one of the most common injuries sustained in motor vehicle crashes.

Of the 358 participants, 170 respondents (47.49%) had adequate knowledge of the appropriate response to penetrating injury with bleeding. In a similar study conducted in Jodhpur, 31.5% of participants provided the correct responses related to this domain, while in Uttarakhand, 40% of participants provided correct responses on how to handle penetrating injury with bleeding in RTAs^{24,26}. In a survey conducted in Ethiopia, 33% of participants gave the correct response to handling penetrating injury²³. The present study highlights a higher awareness of appropriate immediate response to the penetrating injury with bleeding in the post-crash victim, which may be attributed to better training status among potential first responders. Even then, the level of awareness is lower, which necessitates the need for appropriate knowledge dissemination among potential first responders, as indicated by the diverse answers in various studies conducted at different times.

Within the last year, 69% of the potential first responders in the present research witnessed RTAs, and in 80% of those cases, emergency assistance was given. In a different Jodhpur survey, 70.5% of participants observed traffic accidents within a year, and 73.75% provided emergency assistance²⁶. Similar research was done in Uttarakhand, where 74.2% of participants noticed traffic accidents, and 91.5 offered immediate care to victims²⁴. In another study done in Ethiopia among 785 taxi drivers, 59.5% witnessed at least one road crash in a year but provided emergency support in 44.3% of cases²³. In one of the research studies in the Tumkur District of Karnataka, among 720 participants (186 auto drivers, 167 Bus drivers, 61 Ambulance drivers, etc), nearly 52% witnessed road crashes in one year, and 47% reported responding to the same¹⁹. Although the first responses among first responders in the present study are like the other studies done in India, the subtle differences may be attributed to the study participants; geographical factors, awareness, and training on first aid and emergency support. The potential first responders in the various studies provided a range of emergency supports such as extrication, hospital accompaniment, reaching out to the ambulance or police, administering first aid, etc., few individuals were unable to assist victims in RTAs. Forty-nine potential first responders were unable to provide emergency support to victims of RTAs. In a similar study conducted in the Tumkur district of Karnataka, roughly 37% of the participants refrained from giving any assistance, with the main contributing factors being uncertainty about what to do (42%) and worries about potential legal implications (29.8%)¹⁹. In another study conducted in Uttarakhand, it was found that 19 out of 211 events had not received any emergency response from potential first responders²⁴. The main causes of this were fear of legal issues (95%) and lack of information (5%). Around 30% of participants in the Jodhpur study reported not being involved in or providing any kind of emergency support, with the majority citing insufficient knowledge as the primary limiting factor²⁶. Unlike similar studies in different states, the proportion of potential first responders who were reluctant to render emergency support and first aid due to fear of legal complications was only 3 out of 49 cases (6%), which indicates the legal literacy about Good Samaritan law among participants. In the present study, 47% of the potential first responders held back from providing emergency support since they were not clear on what to do, which indicates a lack of knowledge and awareness, which is similar to the study conducted in Tumkur district, Karnataka. The proportion of participants who cited the reasons as knowledge insufficiency in Uttarakhand was 5%. In the case of the Uttarakhand study, most of the participants were taxi drivers working with the Government and private for whom training is mandatory for getting a driving license. The overall status of non-responsiveness from potential first responders

indicate the necessity of comprehensive knowledge dissemination, which shall empower them with skills and alleviate unnecessary apprehensions over legal controversies.

It was found out through the present research that first responders who are adequate knowledge in first aid and emergency support are 3.75 times more likely to provide emergency assistance than those who are not. Comparable studies in Ethiopia identified that individuals with good knowledge of first aid were five times more likely to offer help to others than those without ²³. Training, knowledge, and improved intended practices (emergency responses towards victims) were found to be strongly associated in one of the researches done in Jodhpur, with an OR of 15.376 (2.149, 110.017) ²⁶. In a different study conducted in the Tumkur District of Karnataka, PI concluded that potential responders are reluctant to administer first aid because they do not know the procedure and are afraid of possible consequences from the law ¹⁹. Thus, different studies across the globe point towards the necessity of having adequate knowledge about first aid and emergency support that may empower potential first responders to provide emergency assistance. Among the 358 participants who took part in the study, 162 (45.3%) received training in first aid and emergency assistance from various sources. In a previous study conducted in Karnataka, 62% of the participants received first-aid training. In one of the earlier research projects conducted in Jodhpur, the percentage of first responders who got first aid training was 3.5% ²⁶. The trained percentages of the potential respondents in the Uttarakhand study were 1.2% ²⁴ and Ethiopia 26.8% ²³. The disparities observed among various studies indicate that there are inadequacies in training about first aid and emergency support, which has hindered the progress of prehospital care. It was found through the present research that training in first aid and emergency support was a critical factor in predicting the level of knowledge of the potential first responders.

V. Study Limitation

The participants in this study including taxi-auto drivers, shopkeepers, and store workers, may not accurately represent the larger population of community-based first responders whose experiences, attitudes, and resource availability may differ, which limits the generalizability of the findings exclusively to black spots. There is a possibility that the participants provided socially desirable responses rather than reflecting their true attitudes or behaviors, contributing to the social desirability bias. The study participants in the present research are completely from the male gender, which is a limitation.

VI. Conclusion

Road traffic injuries (RTIs) cause significant economic costs, fatalities, and disability, and they pose a severe threat to public health. Improving the first aid knowledge of community-based first responders—such as shopkeepers and auto-taxi drivers can be a crucial strategy in effectively handling the aftermath of RTAs. The present study highlights that composite knowledge of first aid and emergency support is a significant indicator of giving first aid and emergency support to victims of road traffic accidents. The study also highlights the importance of first aid training and awareness in facilitating immediate assistance and first aid to victims of traffic accidents. Further studies to understand the perspectives of women potential first responders may give input for the policy-level implications in the long run.

Conflict of interest

The authors declare no potential conflicts of interest with respect to research, authorship and/or publication of this article.

Acknowledgements

I am grateful to the respondents for their participation in my present research and Prof Sankara Sarma P (Senior Grade Professor), Achutha Menon Centre for Health Sciences Studies (AMCHSS), for their invaluable advice and continuous support during my data collection, analysis, and interpretation. I would like to thank Dr Samson Mathew, Managing Director, NATPAC for the valuable support and guidance in my research.