

Original Research Article

Immobilization and evacuation of accident victims by first responders in Delhi, India: a survey

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ABSTRACT

Background: Despite many improvements, pre-hospital care is known to be inconsistent and inefficient across India. This contributes to high mortality and morbidity of accident and medical emergency victims. Pre-hospital care may be provided by bystanders, but they are known to hesitate due to multiple reasons. The first aiders (ambulance staff or police personnel) who are responsible for providing appropriate initial care are not adequately trained to manage all aspects of emergency situations including extrication, cardiopulmonary resuscitation, management of bleeding, and protection of the spine evacuation and transfer. The current study was conducted to gauge the knowledge of first aid among bystanders and first aiders in Delhi national capital region.

Methods: Two separate surveys with closed-ended questions were formulated for the bystanders and first aiders in english and hindi. A sample of 511 bystanders and 309 first aiders (108 ambulance and 201 police personnel) completed the survey between February 2019 and April 2019. Data was analysed descriptively. Comparison were made across demographic variables for the bystanders. For first aiders, comparisons were made between ambulance staff and police personnel, and between emergency medical technicians and drivers.

Results: The average total scores for the bystanders were $38.5 \pm 14.2\%$. Slight differences across age and educational qualifications were found. The average total score for the first aiders was $34.3 \pm 12.3\%$. Ambulance personnel scored significantly better than police personnel in evacuation ($70.3 \pm 26.6\%$ versus $42.6 \pm 26.5\%$) and CPR subdomains ($37.6 \pm 19.4\%$ versus $21.9 \pm 14.7\%$). The emergency medical technicians scored better than the driver in their total and first aid subdomain scores.

Conclusions: The knowledge amongst first responders including bystanders and first aiders was low and efforts to educate and train them would improve the much-needed quality of pre-hospital care.

Keywords: Emergency medical services, Bystander, Ambulance, Road traffic crashes, Pre-hospital care, First-aid, Injury

INTRODUCTION

The WHO has given high importance to emergency medical systems (EMS) to provide quality and timely care to all and strengthen the healthcare systems.¹ EMS includes well-equipped ambulances and a prompt provision of pre-hospital care by skilled and trained staff

while transporting the patient to the hospital/health facilities.² India is witnessing a high rate of accidental injuries possibly linked to rapid urbanization, industrialization and motorization that emphasize the need for high standards of EMS.³⁻⁵ From 2005 to 2018, India has seen a 6% increase in the total number of road crashes but the proportion of fatalities has increased from 19 to

29.5%.^{6,7} This may be due to an increase in average vehicle size, speed and high impact collisions in tandem with poor pre-hospital trauma care.⁸ An epidemiological study in Delhi revealed that a higher proportion of patients of spinal cord injury are complete in India as compared to developed nations probably due to improper handling and transportation of patients.⁹ Other studies have shown that people fail to recognize symptoms and trivialize serious medical emergencies such as stroke or falls.¹⁰

A study from North India showed that only 15% of patients who experienced an out-of-hospital cardiac arrest survived and that cardiopulmonary resuscitation provided by bystanders improved outcomes significantly.¹¹ However, most trauma victims in India receive no medical attention within the first hour of injury, thus, abating the concept of the 'golden hour' of survival that is essential to reduce morbidity and mortality.^{4,12-14} In low to middle-income countries, mortality and disability associated with injuries and time-sensitive illnesses such as cardiac arrest, stroke, falls or violence can be reduced if pre-hospital care is improved.¹⁵

The WHO recommends that prompt care should be provided by first responders who are either bystanders as the first tier of care or pre-hospital care providers (hereafter called as first-aiders) as the second and third tier of care.¹ Studies have shown that bystanders in India hesitate to offer medical assistance due to fear of getting into legal hassles, poor knowledge, unwarranted delay while waiting for paramedics, presumptions that other bystanders will intervene, fear of delivering improper care or fear of getting infected.^{16,17}

Thus, it is imperative that bystanders have both the confidence and the knowledge to correctly administer first-aid to the victims.¹⁸

India also lacks trained and skilled first aiders.¹⁹ Nielsen et al reported that in the region of Delhi, less than 50% of victims of injury or emergencies were transported by untrained or BLS trained EMS personnel but a similar number were transported by commercial or private vehicles that provided no pre-hospital care.²⁰ There is a lack of regulation and standardization with little checks on the quality and quantity of EMS services provided.²¹

In the National Capital Region (NCR) of Delhi, an autonomous body called Centralised Accident and Trauma Services (CATS), provides EMS with a fleet of over 250 equipped ambulances and trained personnel.²² It currently runs in a public-private partnership model. This may improve the status of pre-hospital care that was found to be very poor in previous studies.²³ However, no information exists regarding their current knowledge and practices.

The aim of the study were to assess the knowledge of first aid among the bystanders and first aiders in Delhi NCR. The study also identified specifically lacunae in knowledge regarding key domains of pre-hospital care.

METHODS

Questionnaire formulation and validation

This is a cross-sectional survey study, conducted at Indian Spinal Injuries Centre, New Delhi, India and the data was collected from February 2018 to April 2019. Two separate surveys consisting of 15 and 30 closed-ended questions for the bystanders and first aiders respectively were formulated by an expert panel in english. The panel consisted of 15 medical professionals including spine and orthopaedic surgeons, intensivists, emergency and general physicians. Survey items were finalized based on literature findings and expert opinions. The questions were divided into 6 emergency sub-domains described as follows: (a) extrication: emergency situations requiring disentanglement to release or freeing the victim; (b) evacuation: the act of removing and/or shifting a victim from any accident site; (c) immobilization: for fixation of broken bones/joints. Specific questions pertaining to head, neck, and spine injuries were also included; (d) first-aid: medical treatment given to victims in cases of falls, bleeding, loss of consciousness, penetrating and other injuries; (e) CPR: Cardiopulmonary resuscitation for reviving a victim; (d) others: miscellaneous conditions such as altered sensorium

Demographic questions about age, gender, educational, and employment status of each respondent were included. Any technical medical terms were avoided in the questionnaire for the bystanders. Each question had 5 responses, out of which only one response was correct and marked as 1 point. The last response for each question was 'I do not know the correct response' and choosing this option was rated as 0 point.

Bystanders and health care professionals working at tertiary care centre (blinded for review), New Delhi excluding those who helped in the formation of the questionnaire were randomly chosen (N=32) for content validation of the questionnaires to know the completeness, difficulty level, appropriateness of the accidental narratives in real life, level of interest and understand ability of questions. Each question was marked on a 10-point Likert scale with 10 as the best score. The question/responses were considered appropriate only when >80% rated them above 8. After validation, the questionnaires were translated to Hindi and back translated to check the appropriateness of the translated material.

Administration of the questionnaire

The surveys were administered in person and through an online survey portal in Delhi NCR. For the bystanders, people above the age of 18 years were approached either directly from educational institutes, hospital visitors, nearby residential areas, security personnel, or by sending a link to the online survey by phone messaging services like WhatsApp. First aiders included CATS ambulance and police personnel who were approached by going to

CATS ambulance base stations and police headquarters respectively across Delhi.

Statistical analysis

The results for demographics, overall score and scores for each emergency subdomain were calculated and descriptively analyzed. Comparisons were made within bystanders across age and educational qualifications. The age was categorized as 'less than 30', '31 to 50' and 'more than 50 years'.

Respondents were categorized as having school, under and postgraduate level education. For first aiders, comparisons were made across all sub-domains between ambulance and police personnel, and between emergency medical technicians in the ambulance and ambulance drivers. Considering this survey as a test, the cut off for passing was kept at 80% as used by other standard BLS certification courses.

Independent student t-test or one-way analysis of variance (ANOVA) was used to detect significant differences between 2 or more groups, respectively. Post-hoc testing was done using the Tukey Kramer test to find significant pairwise differences if any. Statistical significance was set at $p \leq 0.05$.

RESULTS

A total of 511 respondents from the bystanders (age: 31.85 ± 11.5 years, 230 males and 281 females) were analysed. Seventy-six percent (387 respondents) completed the survey in person. The mean score was $38 \pm 14\%$ (range- 7 to 93%) (Table 1). The results for the average scores in the subdomains of evacuation, CPR, first-aid and immobilization are described in Figure 1.

There was a statistically significant difference across age groups ($F=6.098$, $p=0.002$) and educational level ($F=3.740$, $p=0.024$). Post hoc testing showed that respondents less than 30 years of age scored significantly less ($4.2\% \pm 1.3\%$, $p=0.003$) than the 31-50 years group. Respondents with school level education scored significantly less ($4.1\% \pm 1.5\%$, $p=0.019$) than the respondents with postgraduate degrees.

Two-thirds suggested that they would give water to an unconscious victim and almost half of the respondents would try to align a deformed fractured limb. In cases of penetrating injury with a rod, more than half would try to pull the rod slowly or quickly before rushing to the hospital.

Most people did not suspect spinal cord injury and would rub limbs of an immobile patient after shallow water diving, remove the helmet of a patient complaining of neck pain after an accident and reposition an immobile patient after fall (Table 1).

Table 1: Questionnaire general public.

Questions	Correct response (%)
Knowledge of medical emergency number within Delhi NCR	50.9
First response towards unconscious road traffic crashes (RTC) victim	21.5
First response towards victim fallen from stairs	28.4
Causes of spinal cord injury	
Management of bleeding at accident site	39.5
Correct technique of transfer of pregnant women	
Knowledge about transfer of severed finger	66.9
Giving water to drink to an accident victim	14.9
Management of broken and deformed limb	
Choice amongst available resources for applying tourniquet at accident site	
Approximate time for breathing check before initiating mouth to mouth	26.6
Response towards unconscious patient	
First response towards a rescued drowning victim who is conscious but unable to move limbs	
First response towards child with penetrating injury	
Appropriateness of removing helmet after RTC	19.2

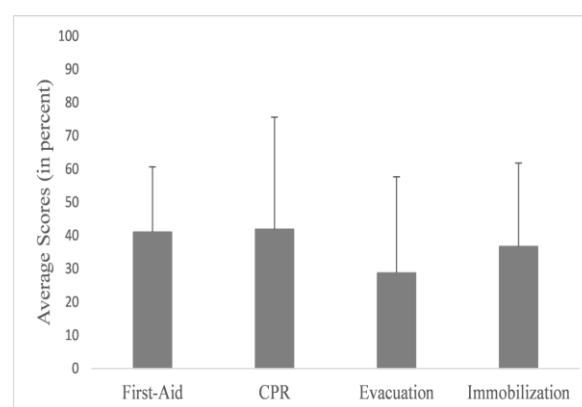


Figure 1: Mean scores across sub-domains for bystanders.

Responses were gathered from 109 ambulance personnel that included 55 EMT and 44 drivers (overall mean age: 28.8 ± 5.5 years, 105 males). Responses were also collected from 201 police personnel (age: 39.8 ± 13.8 years) (Table 2). Their overall score was $34.3 \pm 12.3\%$. The overall score ($42.4 \pm 11.7\%$) and first-aid subdomain score ($43.8 \pm 21.1\%$) for EMT were significantly higher than that of drivers

(35.9±12.3% and 33.3±18.2%) (p=0.008 and 0.010) respectively. The ambulance personnel (including drivers) had a significantly higher (p<0.05) overall mean score (39.1±12.3%), higher subdomain scores in evacuation

(70.3±26.6%) and CPR (37.6±19.4%) as compared to the police personnel (overall - 31.7±11.5%, evacuation- 42.6±26.5% and CPR 21.9±14.7%) (Figure 2).

Table 2: Questionnaire first aider.

Questions	Correct response (%)	
	Ambulance staff	PCR personnel
Identification of a first responder	8.3	10
Cause of spinal cord injury	26.6	55.7
Initial step to revive a drowning victim	27.5	25.9
First response towards a person trapped in a car	0.9	15.9
Requirement of endo-tracheal intubation	22.9	18.9
Requirement of oxygen administration	28.4	14.9
Minimal requirement of people for transfer accident victims	68.8	78.1
Hand stuck in juicer/mixer- correct extrication step	36.7	35.8
Correct airway management in an unconscious victim	63.3	39.8
Immobilization of suspected spinal cord injury	48.6	32.8
Correct technique for patient transfer	83.5	38.8
Correct sequence of resuscitation	22.0	11.9
Correct technique of transfer of a pregnant woman after a fall	58.7	10.9
First response towards an unconscious patient not breathing	38.5	19.4
Transfer of patient with penetrating injury	75.2	76.1
Appropriate and correct technique of removing helmet	40.4	23.4
Choosing whom to help first in an accident involving multiple victims	45.9	42.3
Management of broken and deformed limb	17.4	35.8
Management of bleeding at accident site	42.2	17.9
Reasons for altered sensorium	5.5	24.9
Ratio of compression to breaths by single rescuer for adults	71.6	23.9
Ratio of compression to breaths by single rescuer for child	22.9	5
Correct response to victim on fire	85.5	84.1
Initial response to light headedness due to possible serious internal bleeding	38.5	32.8
Risk of disease transmission when caring for open, bleeding wounds	29.4	20.4
Type of breaths for CPR in children	17.4	27.4
Management of open chest wound	39.4	24.9
Management of nosebleed	23.9	24.9
Characteristics of a splint	53.2	52.2
What is flail chest	28.4	25.4

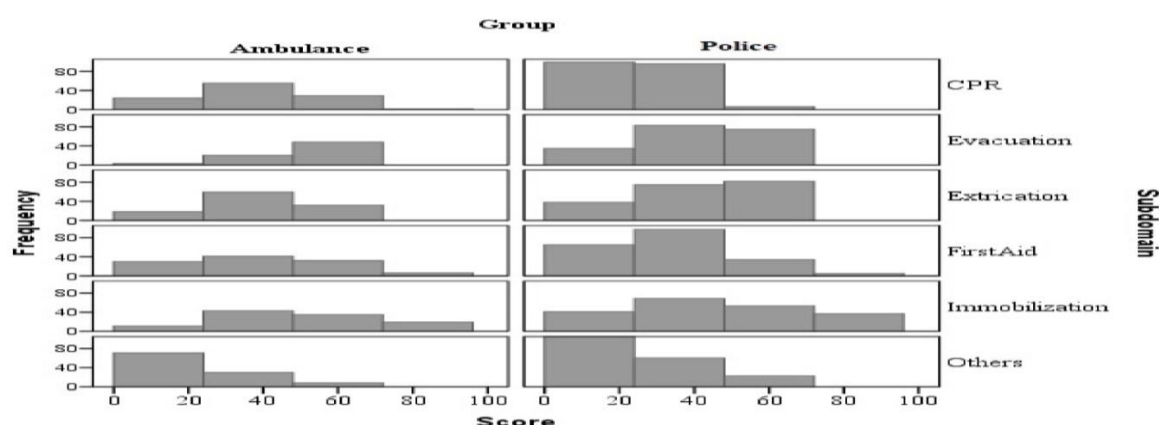


Figure 2: Histogram showing the sub-domain scores of ambulance staff and police personnel.

DISCUSSION

The results of the surveys show overall poor performance by the respondents from the bystanders and first aiders as depicted by total and subdomain scores. Though statistically significant, the differences across age groups and educational status among the bystanders were small (less than 5%).

The responses of the bystanders may be affected by popular myths and lack of knowledge. Only 50% of respondents knew the emergency number '102'. This is similar to results found in earlier reports.^{16,24} In many western countries, one number is used for all types of emergencies and is a better solution than expecting people to remember different appropriate numbers. On average for all questions, 9% of subjects chose the option 'I do not know'. Other respondents either hesitated to declare their ignorance or presumed that they knew the correct answers.

An earlier study by Pallavisarji et al found that one-third of the first responders avoided giving any first aid to accident victims because of a lack of knowledge, and 42% lacked sufficient confidence in their pre-hospital care skills delivery.²⁵ Systems of pre-hospital care are rudimentary in many low- and middle-income countries, leaving the initial stabilization and transportation of the injured to the untrained laypersons.²⁰ According to a systematic review, the frequency of first-aid given by bystanders to trauma casualties worldwide ranges from 11% to 65%.²⁶ Studies have found that short and intensive trauma training improved the performance and confidence of trainees. The authors of the current study, therefore, recommend standardized and periodic first aid training for people of all ages and backgrounds.²⁷⁻³⁰

None of the first aiders scored the cut-off (80%) required in the survey. The nature of the work argues against keeping the cut-off lower. The EMTs scored overall better than the drivers as expected. However, differences were not observed in the scores of extrication, CPR, and immobilization domains suggesting that EMTs are not adequately trained. In Delhi, the minimum requirement for becoming a CATS EMS provider is a graduate diploma in nursing or pharmacy and EMS Basic certification.

There is no mandatory requirement for them to undertake any EMS-advanced courses or refresher courses at regular intervals. The CATS drivers are required to clear secondary school education and hold a valid driving license.³¹ Despite specific training, this lack of difference suggests major lacunae in the standard of EMT training and implementation. People with limited knowledge of first aid tend to have a decreased ability in managing the severity of injuries in real situations.

In Delhi, non-EMS first responders are mostly police and fire department personnel who are expected to be BLS trained. Despite this, they scored worse than the ambulance

staff in CPR and patient evacuation domains suggesting scope for improvement in their training.

The results also suggest that most of the first aiders did not suspect spinal injuries in victims of a traumatic episode. This is confirmed from earlier studies that report that 88.7% of patients did not receive any form of primary pre-hospital management on the journey between the site of injury and the tertiary care hospital.^{9,32,33} Furthermore, many responses from trained first aiders continue to be driven by popular practices/myths such as giving abdominal thrusts to get water out in drowned victims or applying tourniquets instead of compression to stop bleeding. Many first aiders were not updated with the current sequence of resuscitation and almost all did not know the CPR ratio for children. This emphasizes the need for initial quality and periodic refresher courses to upgrade their knowledge as per the latest scientific guidelines.

Limitations

There are a few limitations of the present study. Among bystanders, no illiterate persons were included considering the survey design of the study. They should be included in future studies as they are a big component of the Indian society. No private ambulance professionals were approached as they are commonly involved in only transporting patients and are not the first choice for emergency services at accident sites. Another limitation of the study was the lack of details obtained regarding the type of education and time since the completion of the trauma training course for ambulance personnel. There may be variability in the curriculums and this information could be useful in assessing the lacunae of current training programs.

CONCLUSION

The current study found that the knowledge amongst bystanders and first aiders was low. The results of this study emphasize an urgent need to improve first-aid knowledge among both bystanders and trained first aiders. The government should enforce strengthening the quality of pre-hospital care within India.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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