

Epidemiological Evaluation and Causes of delayed presentation of Orthopaedic polytrauma patients to Emergency Department - A Tertiary Care Centre Experience

Shiv Shanker Tripathi¹, Swagat Mahapatra^{2*}, Suruchi Ambasta³, Rajiv Ratan Singh Yadav¹, Pankaj Aggarwal², Harsh Pratap Singh⁴, Manish Kumar Verma⁵

¹Associate Professor, Department of Emergency Medicine, Dr RMLIMS, Lucknow, U.P., India

² Associate Professor, Department of Orthopaedics, Dr RMLIMS, Lucknow, U.P., India

³Assistant Professor, Department of Anaesthesiology and Critical care, SGPIMS, Lucknow, U.P., India

⁴Senior Resident, Department of Orthopaedics, Dr RMLIMS, Lucknow, U.P., India

⁵Junior Resident, Department of Biochemistry, GSVM Medical College, Kanpur, U.P., India

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Abstract

Introduction: Polytrauma is a leading cause of death and disability with high financial burden. The study was done with an aim to delineate specific epidemiological characteristics as well as to determine specific causes of delays of polytrauma patients in reaching emergency departments (ED). **Materials and Methods:** All patients with Orthopaedic polytrauma fulfilling the inclusion criteria, within a six month period were included in our study. Epidemiological data and causes of delay were tabulated and appropriate statistical analysis was done. **Results:** 60 patients who fulfilled the inclusion criteria were included in our study. 71.67% were male. The mean age in our series was 35.2 ± 8.34 years. Mode of trauma as per our study was 65% following road traffic accidents. 36.67% of patients were under influence of alcohol at time of injury. Patients who arrived in hospital by hired/ self-owned vehicle constituted 41.66% and rest of patients were found to arrive in Govt. run ambulance. Only 18 patients (30%) could reach the hospital in the golden hour (<1 hr.). 55% of patients sustained an injury during day time (9.00AM-9.00PM) and 45% were injured during the night. 18.33% of patients reached the hospital late due to distance of accident from the hospital. Other major causes of late presentation included lack of finance, and traffic related delay constituting 16.67% each. **Conclusion:** Less than one-third of the patients presented to the emergency within 1 hour of the time of injury which stresses the need to improve prehospital care and transport in our country.

Keywords: Orthopaedic polytrauma patients, Emergency Departments, Advanced Trauma Life Support (ATLS), road traffic accidents (RTAs), Injury Severity Score (ISS).

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Introduction

Majority of developing countries including India have undergone massive changes since the last couple of decades following rapid motorisation and industrialisation. These changes have shifted the focus more towards non-communicable diseases especially trauma. Organized emergency response systems for transfer of trauma patients to hospitals are absent and the consequent delays could cause significant complications. A polytrauma is a combined trauma, where there are two or more severe injuries affecting at least two anatomical regions; rarely, two or more severe injuries in one anatomic area, whereas at least one of these is life-threatening [1]. Usually Polytrauma patients have higher chances of mortality and disability than that due to their individual injuries. Polytrauma could be defined in term of an Injury Severity Score (ISS) equal to, or greater than 16 [2]. According to the WHO report on road safety, RTAs would be the fifth most common cause of mortality around the world by the year 2030 [3]. Because of increased focus on safety, regulations and advanced prehospital care; incidence of polytrauma, death and disabilities due to polytrauma are continuously decreasing in developed world. Polytrauma cases are increasing at a disproportionately high rate in developing countries due to economic

growth, increased road traffic and lack of safety and regulations [4]. Around 90% of polytrauma cases occur in low- and middle-income countries. In countries with limited resources and poor pre-hospital care systems, delayed presentation to emergency department significantly contributes to overall morbidity and mortality. The majority of trauma deaths, particularly in developing countries, occur in the prehospital setting [5]. It has been reported that India has the highest mortality rates from RTA in the world, with 161,736 RTA deaths in 2010 (National Crime Records Bureau, India) [6].

The usual causes of polytrauma are road traffic accidents (RTAs), occupational injuries, fall from height, and assault. Time lag between injury and treatment has a significant effect on the prognosis of the patient First 60 min after trauma has been considered as the "golden hour" of trauma [7]. Appropriate actions taken during this golden hour period are the decisive factor for mortality or disabilities associated with polytrauma. The effective management of polytrauma patients requires a multidisciplinary team work approach, usually, consisting of emergency physician, orthopaedic surgeon, trauma surgeon, general Surgeon, neurosurgeon, and radiologist. Golden hour management according to ATLS (Advanced Trauma Life Support) protocol if done properly, ensures increased survival and decrease associated morbidity significantly. There are very few studies regarding epidemiology of trauma and causes of delay in reaching ED in developing countries. The aim of this study was to delineate specific epidemiological characteristics as well as to

*Correspondence

Dr. Swagat Mahapatra

Associate Professor, Department of Orthopaedics, Dr RMLIMS, Lucknow, U.P., India.

E-mail: drswagat@gmail.com

determine specific causes of delays of polytrauma patients in reaching emergency departments.

Materials and methods

This study was conducted at Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow. A tertiary care 1100 bedded multispecialty teaching hospital. This was a prospective non interventional epidemiological study conducted in the 30 bedded department of emergency medicine. All patients with polytrauma attending the emergency department between 1st July 2019 and 31st December 2019 were included in the study. Inclusion criteria included patient age between 20-60 years, mode of injury being road traffic accidents and occupational accidents(including machinery injuries and fall from height) and patients with orthopedic polytrauma (Head injury and blunt trauma to chest and abdomen were not included). Exclusion criteria included patients with low GCS, extremes of age and other modes of trauma. All patients once received in the trauma bay were triaged by the emergency team and graded as Level 1, Level 2 or Level 3 trauma. Resuscitation measures were instituted and treatment was started as per specific injury. Epidemiological data was collected including age, sex, mode of injury, alcohol status, time of injury, time delay in presentation to emergency, cause of delay as per patient attendants and mode of transfer (personal/ hired vehicle or 108 ambulances). We also enquired regarding who brought the patient to emergency (Police, family members, coworkers or onlookers). All data was entered into

excel sheets and tabulated. Statistical analysis of the data was done using SPSS version 21. Continuous data was analyzed as mean \pm standard deviation. Categorical data was reported as numbers and percentages and were analyzed using Chi-square test or Fisher's-exact test as appropriate. The value $p < 0.05$ was considered statistically significant.

Results

A total of 530 polytrauma patients presented to the ED of our Institute, during the period of 6months from July 2019 to December 2019. Among all polytrauma patients, 60 patients who fulfilled the inclusion criteria were included in our study. Majority of our patients (71.67%) were male. The mean age in our series was 35.2 ± 8.34 years. Mode of trauma as per our study was 65% following road traffic accidents and 35% following occupation injury related trauma. 36.67% of patients were under influence of alcohol at time of injury. Patients who arrived in hospital by hired/ self-owned vehicle constituted 41.66% and rest of patients were found to arrive in Govt. run ambulance. We also found that 46.67% of patients were brought to hospital by local police, NGO's and onlookers while 53.33% were brought by their family or co-workers. Only 18 patients (30%) could reach the hospital in the golden hour (<1 hr.). 55% of patients sustained an injury during day time (9.00AM- 9.00PM) and 45% were injured during the night (9.00PM- 9.00AM) (TABLE 1).

Table 1:General Characteristics of patients

VARIABLE	VALUE
AGE	Mean- 35.2 \pm 8.34
20-30	27
31-40	17
41-50	6
51-60	10
SEX DISTRIBUTION	
Male	43(71.67%)
Female	17(28.33%)
MODE OF INJURY	
Road Traffic Accident	39(65%)
Occupational Injuries	21(35%)
INFLUENCE OF ALCOHOL	
Under Influence	22(36.67%)
Without Influence	38(63.33%)
MODE OF TRANSFER TO HOSPITAL	
Hired vehicle/Self vehicle	25(41.66%)
Govt sponsored Ambulance	35(58.33%)
BROUGHT TO HOSPITAL BY	
Police/Onlookers	28(46.67%)
Family/Co-workers	32(53.33%)
TIME DELAY IN PRESENTATION	
<1 Hour	18(30%)
>1 Hour	42(70%)
TIME OF INJURY	
DAY (9.00 AM-9.00 PM)	33(55%)
NIGHT (9.00 PM-9.00 AM)	27(45%)

23.80% of patients reached the hospital late due to distance of accident from the hospital. Other major causes of late presentation included lack of finance, and traffic related delay constituting 16.67% each (TABLE 2).

Table 2: Primary cause of delay in reaching emergency

PRIMARY CAUSE OF DELAY	NUMBER OF PATIENTS	PERCENTAGE
Distance	10	23.80%
Lack of awareness regarding proper Hospital	4	9.52%
Delayed 1 st Referral	6	14.29%
Lack of Manpower	4	9.52%
Lack of Finances	7	16.67%
Unavailability of transport vehicle	3	7.14%
Traffic Related Delay	7	16.67%

Others	1	2.38%
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Correlation of Alcohol intake and mode of injury revealed more number of patients under alcohol influence had RTA while lesser number of patients sustaining occupational injuries were under influence as proved by significant p value of 0.000225 (TABLE 3).

Table 3: Correlation of Alcohol intake and mode of injury

VARIABLE	Under Alcohol Influence	Not under Alcohol Influence
RTA	25	14
Occupational Injuries	3	18

RTA: Road Traffic Accident

The chi-square statistic is 13.6107. The p-value is 0.000225. Significant at $p < 0.05$.

The chi-square statistic with Yates correction is 11.6827. The p-value is .000631. Significant at $p < 0.05$.

Correlation of mode of injury with type of vehicle used for transport was found non-significant with p value of 0.4184 (TABLE 4).

Table 4: Correlation of Mode of injury with type of vehicle used for transport

VARIABLE	Govt. Sponsored Ambulance	Hired/Self Owned Vehicle
RTA	22	17
Occupational Injuries	9	12

The Fisher exact test statistic value is 0.4184. The result is not significant at $p < 0.05$

Most patients sustaining injury following RTA arrived to hospital using Govt. run ambulance while most patients sustaining occupational trauma arrived in private vehicles. Correlation of mode of injury with time of injury was found significant with p value of 0.000105 (TABLE 5).

Table 5: Correlation of Mode of Injury with Time of Injury (Day/Night)

VARIABLE	DAY	NIGHT
RTA	15	24
Occupational Injuries	19	2

The chi-square statistic is 15.0395. The p-value is 0.000105. Significant at $p < 0.05$.

The chi-square statistic with Yates correction is 12.9959. The p-value is .000312. Significant at $p < 0.05$.

Govt. run ambulance was found to reach the hospital earlier as compared to private vehicle. Correlation of mode of transfer with time delay in arrival was found significant at p value 0.000021 (TABLE 6).

Table 6: Correlation of Mode of transfer with time delay in arrival

VARIABLE	< 1 HOUR	>1 HOUR
Hired/Self Owned Vehicle	1	24
Govt. run Ambulance	20	15

The chi-square statistic is 18.1036. The p-value is .000021. Significant at $p < 0.05$.

The chi-square statistic with Yates correction is 15.843. The p-value is .000069. Significant at $p < .05$.

Most patients of RTA were accompanied by non-family including police, NGO's and onlookers. Correlation of mode of injury with attendants accompanying the patient to the hospital was found significant with p value of 0.001901 (TABLE 7)

Table 7: Correlation of Mode of Injury with Attendants accompanying the patient

VARIABLE	POLICE/ONLOOKERS	FAMILY/COWORKERS
RTA	20	10
Occupational Injuries	8	22

RTA: Road Traffic Accident

The chi-square statistic is 9.6429. The p-value is 0.001901. Significant at $p < 0.05$.

The chi-square statistic with Yates correction is 8.1027. The p-value is .00442. Significant at $p < .05$.

Table 8: Key learning points

GENERAL	
1	Polytrauma could be defined in term of an Injury Severity Score (ISS) equal to, or greater than 16
2	Road traffic accidents would be the fifth most common cause of mortality around the world by the year 2030
3	Time lag between injury and treatment has a significant effect on the prognosis of the patient
4	Appropriate actions taken during this golden hour(1 st 60 min) period are the decisive factor for mortality or disabilities associated with polytrauma
OUR STUDY	
5	Males under influence, night driving and machinery operating- high chances
6	Age group of 40-50 years – deceased incidence(adherence to rules and good hand eye coordination)
7	Alcohol influence – increased incidence(poor hand eye coordination and motor skills)
8	More road traffic accidents occur during night
9	Major Causes of delay- Distance from the hospital, traffic related, finance issues, delayed referral.
10	Decreasing pre-hospital delay will significantly improve outcomes.

Highlight points
Suggestions for decreasing delay

- Increased administrative focus on traffic management and better distribution of pre-hospital services
- Strengthening of pre hospital transportation facilities

- Improving public awareness regarding use of common services helpline
- Good Samaritan concept for better onlooker response
- Public health campaigns and improvements in infrastructure
- Improving legislations regarding occupational safety and road safety

Discussion

Polytrauma is one of the most common causes of disability and death in India [8]. Common knowledge regarding prehospital and emergency management of trauma greatly reduces the morbidity and mortality associated with it. Trauma is inevitable but its proper management is not [9]. This study was done with the idea of understanding of the mode of injury, delay time to hospital arrival, transportation mode to emergency department, whether ambulance or private vehicle, time of polytrauma (Day/night), under the effect of alcohol, brought to hospital by near and dear or co-worker in ED of our hospital; so that effective prevention and pre-hospital management strategies could be suggested. Also we could have a better understanding what the causes of delay to hospital access are and thus we can improve our system and hence decrease mortality and morbidities of polytrauma. There is minimal similar research to evaluate the epidemiology and cause of delay in the arrival of polytrauma patients to emergency department in developing countries like ours. In our study, males were found to be more predisposed to sustain polytrauma than females; this is consistent with other studies that showed a male preponderance [8]. This can be explained by the fact that males are still the primary breadwinners in many households in low and medium income countries. Also they are engaged in driving vehicles, operating machinery and do manual work which puts them at risk. The mean age of patients in our series was found to be 35.2 ± 8.34 . Majority of polytrauma were sustained by the patients of age group 20–40. Our data was comparable to other studies including data by Kamal ET al [10] and Nilachal ET al¹¹. Minimal trauma was sustained in the age group of 40–50 years. This may be explained by the fact that people in this age group usually adhere to rules and are relatively fit with good hand eye coordination as compared to their younger and older counterparts. Road traffic accidents were the predominant cause of polytrauma in our study which was consistent with other Indian studies [12,13]. Alcohol influence significantly impacts hand eye coordination and motor skills and is important factor in 15–20% of accidents causing polytrauma [8]. In our study, a significant percentage of people under influence were found to be involved in road traffic accidents while lesser patients under influence faced occupational hazards (TABLE 3). This can be explained by the fact that most occupational injuries occur more during the daytime when people are working, alert and sober. The diurnal variation of polytrauma showed that more road traffic accidents occur during night (TABLE 5) when there is increased chance of alcohol consumption, lack of sleep due to long driving hours, decreased visibility due to weather and vehicular glares. Our data is comparable to other Indian studies like Kochar ET al [14]. Mode of transport to the emergency department was noted and 58.33% of patients were found to arrive in Govt. run ambulances while the rest came in private vehicles. This is different from data by Roy et al where majority of patients chose not wait for ambulances and arrived in emergency by private vehicles. The increase use of Govt. run ambulances may be attributed to establishment of common telephonic helpline, availability of cell phones with majority of people, establishment of highway ambulance services and 108 ambulance services. We also observed that there was no statistically significant finding when we correlated mode of injury with type of vehicle used in transport (TABLE 4). We found that 70% of patients reached our emergency department >1 hour after sustaining injury. This data was similar to studies by Clement ET al [9] and Kiran ET al [16]. This delay may be explained by the fact that ours is a tertiary care centre and most patients arriving here had been referred from smaller centres. Also being an urban centre the distance from rural

districts causes a problem in transportation and contributes to the delay. As per our study distance from the hospital, lack of finances in arranging transport and traffic related delay formed the most important causes of reaching the emergency department late. Delay in reaching emergency is problematic and requires further discussion for improvement of referral system, availability and awareness of free ambulance service and provision of ambulance corridors on highways to prevent traffic delays. Lack of decision making manpower is also a common factor for delay. We found statistically significant correlation between mode of injury and attendants accompanying the patient. Most road traffic accident victims were brought to hospital by onlookers or authorities while most occupational injuries were brought by co-workers and family (TABLE 7). This can be explained by the fact that occupational injuries occur during working hours in presence of many people and hence there is responsiveness on the part of co-workers or family members to shift the patient to hospital while RTA victims may be stranded alone and unattended on the road till they are found by pedestrians or other drivers. Even after finding the victims, many people chose to ignore them in anticipation of medico legal complications. This is expected to decrease in the future due to persistent efforts by the government in promoting the concept of good Samaritan.

Conclusion

This study shows the challenges faced by polytrauma patients and lack of pre-hospital systems in low and medium income countries. Increased focus on road traffic issues, transportation difficulties, lack of resources and concerted efforts to improve the poor distribution of prehospital services for better management of polytrauma patients. Harnessing public supports to inculcate the ethos of saving life by activating immediate response by the onlookers of the accident An integrated road safety education program among school children will also dramatically improve the road safety standards in coming decades.—Onlookers at the site and increased patrolling on the accident prone high ways by police with ambulances will save many precious life by ensuring the care in trauma care golden hour.

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