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Original Research Article

An Epidemiological Analysis of Delayed Presentation of Orthopaedic Polytrauma Patients to the ED

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Conflict of interest: Nil

Abstract:

Objectives: This study aims to investigate the epidemiology of trauma and reasons for delays in reaching Emergency Departments (ED) in developing countries. Additionally, it focuses specifically on understanding the characteristics and causes associated with polytrauma patients.

Methods: This prospective observational study conducted at Bhima Bhoi Medical College and Hospital in Odisha, India from December 2022 to September 2023 aimed to investigate polytrauma cases in the Emergency Medicine department. Criteria for inclusion involved individuals aged 20 to 60 with workplace or road traffic injuries, while exclusion criteria comprised specific skeletal injuries. Data, including patient demographics, injury details, and emergency response factors, were collected and analyzed statistically using SPSS version 21.

Results: In the ten-month period, the Emergency Department received 265 polytrauma patients, with 60 meeting inclusion criteria. Among them, 70.67% were male, averaging 34.2 years. Road traffic accidents accounted for 64% of cases, occupational injuries for 35%, and 37.67% of patients were under alcohol influence. Only 32% reached the hospital within the golden hour, and significant correlations were found between alcohol intake and the mode of injury and the time of injury and the arrival time of government-run ambulances.

Conclusion: This study highlights challenges in polytrauma care in low and medium-income countries, emphasizing the imperative for improved pre-hospital systems, including addressing road traffic concerns and transportation difficulties. Urgent measures, such as encouraging public involvement and increasing patrolling on accident-prone highways with ambulances can enhance timely trauma care within the critical golden hour.

Keywords: Polytrauma, road traffic accidents, workplace accidents, ambulances.

Introduction

Recent decades have seen rapid motorization and industrialization in developing nations, including India, focusing attention on non-communicable diseases, particularly trauma [1]. The absence of organized emergency response systems in these regions leads to delays and complications for trauma patients, with polytrauma, involving two or more severe injuries and an Injury Severity Score (ISS) of 16 or higher, presenting a significant risk of increased mortality and disability [1, 2].

Developed nations have seen a decrease in polytrauma incidents due to improved safety measures, while developing countries face a contrasting trend. The World Health Organization (WHO) predicts a fifth-place global mortality ranking by 2030 for developing nations, driven by road traffic accidents (RTAs) [3]. Economic factors contribute to a disproportionate increase in polytrauma cases, highlighting the pressing need for better healthcare infrastructure and preventive measures [4].

Around 90% of polytrauma cases occur in low- and middle-income countries, where limited resources and inadequate pre-hospital care systems contribute to delayed arrivals at emergency departments, significantly impacting overall morbidity and mortality [5]. In developing countries, a majority of

trauma-related fatalities occur before reaching the hospital [5].

In 2010, India reported the highest global mortality rates due to Road Traffic Accidents (RTA), with 161,736 deaths, according to the National Crime Records Bureau [6]. Polytrauma, stemming from incidents like RTAs, occupational injuries, falls, and assaults, requires prompt attention [6]. The "golden hour" post-trauma is critical, and actions taken during this period significantly influence mortality and disabilities [7].

Effective polytrauma management involves a collaborative, multidisciplinary approach with specialists such as emergency physicians, orthopedic surgeons, trauma surgeons, general surgeons, neurosurgeons, and radiologists. Adhering to the Advanced Trauma Life Support (ATLS) protocol during this time enhances survival rates and reduces associated morbidity.

Despite the critical importance of timely intervention, there is a scarcity of studies examining the epidemiology of trauma and reasons for delays in reaching Emergency Departments (ED) in developing countries. This study aims to uncover specific epidemiological characteristics and identify the causes of delays for polytrauma patients accessing emergency care.

Methods

This study was conducted at Bhima bhoi medical college and Hospital, Balangir, Odisha from December 2022 to September 2023. It was a prospective, observational epidemiological inquiry within the 60-bed Emergency Medicine department. All individuals with polytrauma attending the emergency department were encompassed in the study, meeting criteria such as an age range of 20 to 60 years, injuries stemming from workplace accidents (comprising mechanical mishaps and elevation falls), or road traffic and the exclusion of patients with polytraumatic skeletal injuries (excluding neurological trauma and compression injury to the abdomen and chest).

Exclusion criteria included patients with a low Glasgow Coma Scale (GCS), young and elderly populations, and other injury patterns. Upon arrival at the trauma bay, the emergency team categorized patients into Level 1, Level 2, or Level 3 trauma groups. Immediate life-saving measures were instituted, and treatment initiated based on specific injuries. Epidemiological data, covering aspects like age, sex, mode of injury, drinking behaviour, injury incident time and reason, emergency arrival delay, and mode of transfer, were gathered. Information regarding who brought the patient to the hospital was also obtained.

Statistical Methods

All collected data were input into Excel sheets and organized. Statistical analysis, employing SPSS version 21, involved assessing continuous data as mean. Categorical data, reported as numbers and percentages, underwent scrutiny using the Chi-square test or Fisher's exact test as applicable. A p-value < 0.05 was considered statistically significant.

Results

Over a ten-month period from December 2022 to September 2023, our institute's Emergency Department (ED) received a total of 265 polytrauma patients. For our study, we included 60 patients who met the inclusion criteria. The majority of the patients (70.67 %) were male, with an average age of 34.2 yrs.

According to our findings, 64 % of the polytrauma cases were a result of road traffic accidents, while 35 % were associated with occupational injuries. About 37.67 % of the patients were under the influence of alcohol at the time of injury. In terms of transportation to the hospital, 40.66% arrived in hired or self-owned vehicles, and the rest utilized government-run ambulances. Notably, 45.67 % of patients were brought to the hospital by non-governmental organizations, public, or authorities, while 55.12 % were brought in by their co-workers or family. Only 32 % of patients managed to reach the hospital within the golden hour (within one hour of the injury) (Table 1).

Regarding the timing of injuries, 54.12 % occurred during the day, while 46.66 % occurred during the night. About 23.80 % of patients faced delays in reaching the hospital, mainly due to the distance of the accident. Other significant causes included financial constraints (16.67 %) and traffic-related delays (16.67 %). Alcohol intake correlated significantly with the mode of injury. More patients under the influence were involved in road traffic accidents (RTA), while fewer under the influence sustained occupational injuries ($p = 0.000117$).

The correlation between the mode of injury and the type of vehicle used for transport was non-significant ($p = 0.4230$). Patients in RTAs often used government-run ambulances, while those with occupational trauma used private vehicles. The mode of injury significantly correlated with the time of injury ($p = 0.000293$). Government-run ambulances arrived earlier than private vehicles ($p = 0.000031$). In RTAs, non-family members, including police, NGOs, and onlookers, often accompanied patients ($p = 0.001874$).

Table 1: Typical patient characteristics enrolled in the ED of the hospital

Variable	Value
AGE	34.2 yrs (average)
20 to 30	26
31 to 40	18
41 to 50	5
51 to 0	11
Gender distribution	
Men	42 (70.67 %)
Women	18 (30.0 %)
Mechanism of injury	
Road Traffic Accident	38 (64 %)
Workplace Injuries	22 (36.6 %)
Impact of alcoholic intake	
Under Influence	22 (37.67%)
Without Influence	38 (62.33%)
Means of transport to medical facility	
Hired vehicle/Self vehicle	24 (40.66%)
Govt sponsored Ambulance	36 (60.00 %)
Taken to the hospital by	
Police/Public	27 (45.67%)
Co-workers/Family	33 (55.12 %)
Presentation time lag	
Less than 1 Hour	19 (32 %)
More than 1 Hour	41 (68 %)
Incident time	
Day	32 (54.12 %)
Night	28 (46.66 %)

Discussion

Polytrauma stands out as a major contributor to disability and fatalities in India [8]. A comprehensive understanding of prehospital and emergency trauma management is crucial for reducing the significant morbidity and mortality associated with it. Although trauma is unavoidable, ensuring its effective management remains a challenge [9]. This study aimed to unravel key aspects such as the nature of the injury, the time taken to reach the hospital, the mode of transportation to the emergency department (whether by ambulance or private vehicle), the timing of polytrauma occurrences (day or night), the role of alcohol, and whether patients were brought by family or co-workers to our hospital's Emergency Department (ED).

The objective is to propose effective strategies for prevention and pre-hospital management. Additionally, by investigating the causes of delays in hospital access, we aim to enhance our system and, consequently, reduce mortality and morbidities associated with polytrauma. Limited research exists on the epidemiology and causes of delays in the arrival of polytrauma patients at the emergency department, particularly in developing countries like ours. Our findings consistently showed a higher prevalence of polytrauma among males, aligning with similar studies [8-10].

Their involvement in tasks such as driving vehicles, operating machinery, and manual labour inherently exposes them to risks. In our study, the average age of patients was determined to be 34.2 yrs, with the majority of polytrauma cases occurring in the 20 to 40 age group. This aligns with findings from other studies, including those by Kamal et al and Nilachal et al [10, 14]. Interestingly, minimal trauma was observed in the 40-50 age group, potentially attributed to their inclination to adhere to rules and maintain good hand-eye coordination and fitness compared to their younger and older counterparts.

Road traffic accidents emerged as the predominant cause of polytrauma in our study, consistent with findings from other Indian studies [15, 16]. The noteworthy impact of alcohol influence on hand-eye coordination and motor skills is evident, contributing to 15-20% of accidents resulting in polytrauma [8].

In our study, individuals under the influence were significantly more involved in road traffic accidents than occupational hazards. The diurnal pattern indicated a higher incidence of road traffic accidents at night which is comparable to that of other studies [17-19]. About 58.33% of patients arrived in government-run ambulances, differing from studies

showing private vehicle preference. This shift may be attributed to improved ambulance services. There was no significant correlation between the mode of injury and the type of vehicle used for transport. Notably, 70% of patients reached our emergency department over an hour after injury, possibly due to referrals from smaller centers to our tertiary care facility.

Urban center challenges in transportation stem from the distance to rural districts, causing delays. Our study identified distance, finances, and traffic as primary causes for delayed arrivals at the emergency department. Improvements in the referral system, awareness of free ambulance services, and highway ambulance corridors are essential. A lack of decision-makers also contributes to delays.

Our findings revealed a significant correlation between the mode of injury and accompanying attendants. Road traffic accident victims were often brought by public or officials, while occupational injuries were typically brought by family members and co-workers. This is explained by the prompt response of co-workers or family members during working hours for occupational injuries, while road traffic accident victims may remain unattended until discovered. Government efforts promoting the "good Samaritan" concept are expected to reduce reluctance in assisting accident victims.

Conclusion

The current study focussing on the epidemiological evaluation and causes of delayed presentation of orthopaedics polytrauma patients to emergency department underscores the challenges faced by polytrauma patients in low and medium-income countries, emphasizing the need for improved prehospital systems. Key issues include road traffic concerns, transportation difficulties, resource limitations, and the necessity for coordinated efforts to enhance prehospital services. Encouraging public involvement in immediate response activation by onlookers is vital, and implementing a comprehensive road safety education program for school children can significantly elevate standards. Increased patrolling on accident-prone highways, accompanied by ambulances, has the potential to save lives by ensuring prompt trauma care within the critical golden hour.

Limitations

The study's limitations include a single-center focus and a potentially limited sample size, raising considerations about generalizability and statistical power. Additionally, retrospective design and possible selection bias could influence the robustness of the findings.

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