

# Minimum data set (MDS) based trauma registry, is the data adequate? An evidence-based study from Odisha, India

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### ABSTRACT

**Background:** In majority of the low- and middle-income countries (LMICs), the societal cost of injuries are alarming. The severity and magnitude of the road traffic injuries (RTI) in India are not estimated accurately due to the lack of availability of data. The data are limited on the aspects such as demographics, cause, severity of injury, processes of care, and the final outcome of injuries. This study aimed to determine the feasibility of setting up a sustainable trauma registry in Odisha, India, and to determine the demographics, mechanism, severity, and outcomes of injury reported to the facilities/hospital. **Materials and Methods:** A prospective observational study was conducted at Srirama Chandra Bhanja Medical College and Hospital (SCB-MCH), Cuttack, India. Injured patients who reported/admitted to the emergency department were observed, and data were collected by using a minimum data set (MDS) developed by the World Health Organization (WHO). Data were collected for a period of one month in June 2015. Observations were collected on 20 variables. The completeness of data collection ranged from 60% (19 variables) to 70% (23 variables) out of total 33 variables. **Results:** This study uses 145 cases of injury reported in SCB-MCH. Out of the total reported population at the trauma registry, about 21% were females. Nearly 45% of the injury occurred on road/street. RTI accounted for 36.6% of injury. Out of the total admitted cases, 2.8% died in the emergency department, 11% were discharged to home, and 7.6% left against medical advice. Majority of the respondents have reported single injuries (77%). Head injuries were more common and severe among majority of the reported cases (44.1%), followed by neck injury (28.3%) and chest (15.9%). **Conclusions:** This study indicates the challenges in obtaining complete data on injury. Data were missing in terms of admission, discharge, and Glasgow Comma Scale (GCS) among the studied population. This study suggests that individual GCS scoring should be done instead of total GCS scoring in each trauma patient. By collection and storage of adequate data, better policy decisions can be implemented, which will minimize and prevent trauma cases and maximize the utilization of the available resources.

**Keywords:** Glasgow Comma Scale, injury, low-and middle-income countries, minimum data set, road traffic accidents, trauma registry

### Introduction

Injuries has emerged as one of the important public health concerns recently. Majority of the world economies are undergoing through structural changes accompanied with

the heavy industrialization and motorization.<sup>[1,2]</sup> Although the process of industrialization has brought with it various benefits, still the benefits are always accompanied by some prices. The trends in injuries and road accidents have increased among both the developed and developing countries.<sup>[3]</sup> There are evidences on the number of lives lost in road accidents which indicates the declining trends among the high-income countries, while increasing trends in the developing countries

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and low- and middle-income countries (LMICs).<sup>[4,5]</sup> The burden of injury both in terms of societal and economic costs are increasing substantially.<sup>[6]</sup> Injury and deaths due to road traffic accidents (RTAs) are a major public health problem in developing countries where more than 85% of all deaths and 90% of disability-adjusted life years (DALYs) were lost because of road traffic injuries (RTI).<sup>[3,7-8]</sup>

The trend in injuries and death is becoming alarming in the developing countries.<sup>[9]</sup> As a developing country, India is no exception. The number of fatal and disabling road accidents are increasing day by day and is a real public health challenge for all the concerned agencies to prevent it.<sup>[10]</sup> Not a day passes without RTA happening in the roads in India in which countless number of people are dead or disabled.<sup>[11]</sup> Those who are affected or dead are mostly people in their prime productive age.<sup>[12]</sup> The highest burden of injuries and fatalities is borne disproportionately by poor people, as they are mostly pedestrians, cyclists, and passengers of other mode of transportation.<sup>[6,13]</sup> Injuries are the most fatal cause of death and are exerting huge financial burden on the households.<sup>[14,15]</sup> It is projected that by 2020, the burden of injuries globally will equal that of communicable diseases (CDs), and in China, Latin America, and the Caribbean, it will exceed CDs.<sup>[16,17]</sup>

India is passing through a major epidemiological transition—sociodemographic changes and technological revolution due to rapid industrialization, urbanization, economic liberalization, and changing social, cultural, and political situation.<sup>[11,18]</sup> It is not only the RTAs but also the increase in other injuries, whether intentional or unintentional, that has become a major public health problem. The National Health Profile of India (2009) lists injury as the third leading cause of death in India.<sup>[19-21]</sup> Recent calculations by the Planning Commission of India estimate the total societal cost of injury in India to be approximately 3% of India's gross domestic product (GDP).<sup>[11,22]</sup> While injury prevention is certainly the most cost-effective approach to this problem, the hospitals also have an obligation to monitor the care delivered to the victims of trauma.

With the evolution of quality improvement (QI) programs in health care, the role of a trauma registry was established. Continuous, measurable improvement of care given to the injured patient is the goal of any QI program. A trauma registry is a timely, accurate, and comprehensive data source which allows for continuous monitoring of the process of injury care.<sup>[23]</sup> Trauma registries are used to collect, store, and retrieve data describing the etiological factors, demographic characteristics, diagnoses, treatments, and clinical outcomes of individuals who meet specified case criteria.<sup>[24]</sup>

In India, current data on the demographics, cause, severity, care, and outcome of injuries are not well documented, leaving the government with insufficient data to guide policy decisions.<sup>[25]</sup> There is an urgent need to develop these hospital-based repositories of injury cases or trauma registries.

This study aims to determine the feasibility of setting up a sustainable trauma registry and also to define the demographics, mechanism, severity, and outcomes of injury reported in the hospitals in Odisha, India.

## Materials and Methods

A prospective observational study was conducted at Srirama Chandra Bhanja Medical College and Hospital (SCB-MCH), Cuttack, India. All the reported cases for the injuries to the emergency department were observed, and data were collected using a minimum data set (MDS) developed by the World Health Organization (WHO). Data were collected for a period of one month in June 2015. All the cases admitted to the department during that period were included in this study. A data collection form was created to include the 33 variables listed in the current draft of the MDS trauma registry, currently in the process of development by the WHO Global Alliance for the Care of the Injured (GACI).<sup>[26]</sup> The variables included in the MDS cover the range of variables necessary to distinguish a trauma registry from injury surveillance, including demographics, injury event, processes of care, injury diagnosis, severity, and outcome. Following the period of data collection, the trauma registry was examined for completeness, demographics, mechanism, severity, and outcomes from the injury.

**Ethical Consideration:** Necessary permission for the study was taken from Institutional Ethical Committee of Indian Institute of Public Health (IIPH), Bhubaneswar. Permission was also taken from Dean cum Principal and Superintendent of SCB-MCH and the Casualty Medical Officer. Prior written consent was also obtained from the respondents for interviewing, recording, and utilizing the data.

## Results

The study takes into consideration 145 reported/admitted cases of trauma injuries in SCB-MCH. Observations were collected on 20 variables. The completeness of data collection ranged from 60% (19 variables) to 70% (23 variables) out of total 33 variables. In the total reported cases of trauma, about 21% were females. The mean age of the injured patients among females and males were 28.37 and 38.27 years, respectively. This study reveals that the highest burden of the trauma/RTA were borne by the most productive age groups of the population. Age-wise distribution of the trauma patients showed by Pareto histogram indicates that the share of the population in the age range of 25–34 years, followed by 15–24 years and 35–44 years, was highest among the included patients [Figure 1]. These findings indicate that the highest burden on the productive age groups may have long-term implications for the country in terms of societal, economic, and health aspect. Majority of the injury cases have occurred on roads and streets (45%) and while working (48%).

About 33% of the injury cases have taken place while traveling. RTA (37%) were the highest constituents of the injuries

followed by accidental falls (32%), and 10% was due to homicidal attempts [Figure 2]. Results further reveal that majority of the individuals (68%) have used ground ambulance to reach the hospital and less than 1% was escorted by the police. About 40% of the injury cases were directly reported to the emergency department without any inter-facility services. The survival status of the reported injury cases also indicates that out of the total reported cases, majority of the patients have survived and about 3% have died in the emergency department. Majority of the cases have admitted to the hospital wards (77%), and about 11% cases were discharged to home, while 7.6% left against the medical advice [Figure 3]. The cases reported for trauma in the facility center were serious in the nature followed by the severe and moderate cases [Figure 4]. The nature of injury indicates that nearly 77% of the reported cases had experienced single injuries, and about 23% have experienced multiple injuries. Maximum of the reported population had experienced injury in the extremities of head (41%), neck (28.3%), and chest (15.9%). Cases that have been admitted to the wards were mainly related to closed fracture (24%), concussion (18%), burn (13%), and abrasion (13%).

Furthermore, our study indicates that as per the Glasgow Comma Scale (GCS) ratings regarding the Coma severity based on eye, verbal, and motor criteria, around 74% of the cases have immediately responded to the eye and verbal signals. About 68% of the trauma patients have responded to the motor functioning [Table 1].

The overall GCS scoring of the majority of the patients was in T-15 category, which indicates the lesser urgency for close attention and reassessment [Figure 5]. However, the lesser GCS scores (<15) do not indicate that the patient did not require closer medical attention and observation. Any further decision about the management of trauma cases, its severity, and further treatment plans should be based on not only the GCS scoring but also the basis of clinical evidences and contexts.

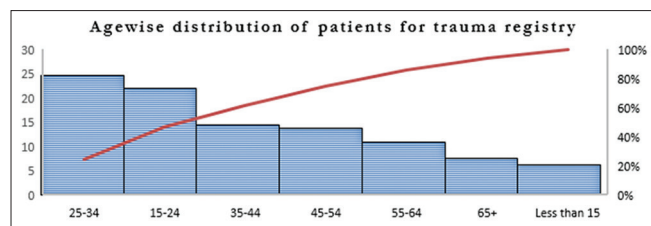


Figure 1: Age-wise distribution of the patients for trauma

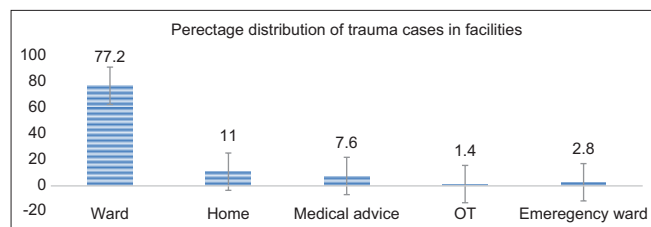


Figure 3: Disposition of the trauma cases in facility centers

## Discussion

According to the WHO,<sup>[10]</sup> injury accounts for 16% of the global burden of disease, a burden that is especially notable in LMICs, which bear approximately 90% of the total burden of injury. As such, it is clear that trauma is at the fore in the hierarchy of diseases ravaging the expanding population in many developing countries including India, where the dual dilemma of CDs such as malaria and HIV/AIDS and emerging non-communicable diseases (NCDs) such as cardiovascular diseases (CVDs) have put enormous strain on the over-stretched albeit inadequate health system.<sup>[27]</sup> Many developing countries are lagging in their response

Table 1: Coma severity based on eye, verbal, and motor criteria

Trauma GCS Score	Percentage
<b>Best Eye Response</b>	
Spontaneously	73.8
To verbal command	11.7
To pain	11.7
No eye opening	2.1
Not assessable (trauma, edema, etc.)	0.7
<b>Best verbal response</b>	
Oriented	73.8
Confused	13.1
Inappropriate words	10.3
Incomprehensible sounds	2.1
No verbal response	0.7
<b>Best motor response</b>	
Obeys commands	68.3
Localizes pain	15.9
Withdrawal from pain	8.3
Flexion to pain	4.8
Extension to pain	1.7
No motor response	1

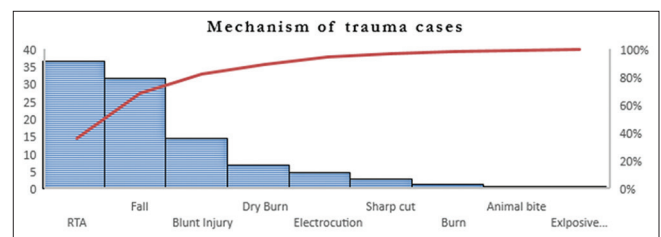


Figure 2: Mechanism of injury

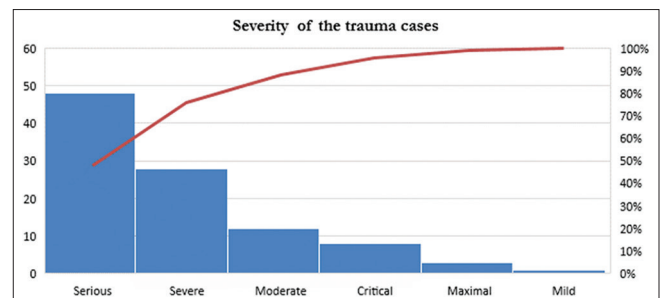
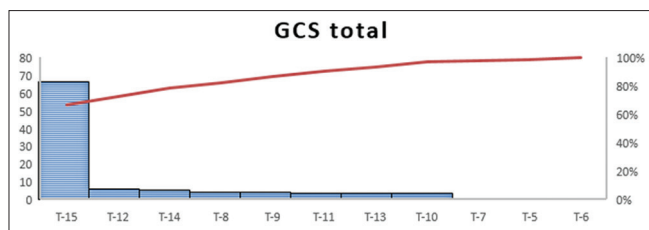


Figure 4: Nature and severity of the injury



**Figure 5:** Total GCS scoring of the patients reported for the trauma in the facility centers

toward improving trauma management systems whose spectrum, quantum, future prospects, and practices have continued to expand.<sup>[28]</sup> India is no exception, where the burden of trauma is increasing due to the lack of adequate documentation and unavailability of medical records, which makes the scenario more complicated.<sup>[29,30]</sup>

This study focuses upon the unavailability of medical records and standardized data on trauma cases. Through the MDS, WHO,<sup>[10]</sup> we have collected the information on the trauma cases reported to the SCB-MCH. This study indicates that majority of the reported cases were among the males. Literature also supports the present findings,<sup>[29]</sup> where it was observed that males were more prone to accidental injury as compared to females. It is also mentioned that males are more vulnerable and are more often the victims of injuries in comparison to females.<sup>[31,32]</sup> Also, as men are often the sole earners in majority of the households, they have to travel for work. Males are also more mobile due to their job profiles, resulting into higher number of road fatalities, and in turn higher catastrophic spending. Women may typically not be in the jobs that may have a higher risk of injuries. Few other cited reasons were that males are more aggressive and careless as compared to females.<sup>[11,12]</sup> Females are also generally risk averters and are more cautious, and are less associated with accidental injury.<sup>[33]</sup> They often use to walk, as maximum do not possess a valid driving license and have lower participation in the workforce.<sup>[16,33]</sup>

This study also indicated that maximum cases of injuries have been reported during work or during occupation.<sup>[34]</sup> Nearly 50% of these deaths and injuries occur in the developing countries.<sup>[35]</sup> In India, occupational injuries contributed to 2% of total deaths, 1.8% of total life-years lost due to disabilities, and 2% of DALYs in 1990.<sup>[36,37]</sup> Our study shows that around 90% of the reported injuries were unintentional while 10% trauma occurs due to homicides such as burn and fire-related injuries. Burn injuries can be accidental, suicidal, and homicidal. More women suffered burn injuries compared to men in all age groups, except among those 44–59 years of age.<sup>[38,39]</sup>

In this study, maximum reported cases for injuries belong to the age group of 25–34 years followed by 15–24 years and 35–44 years. Another notable finding of the study was that majority of the patients were in the productive age groups. Only 10% of victims under 15 years of age group are affected. Various studies from India and across the globe have also noted

similar finding in their studies.<sup>[11,12,25,30]</sup> Number of factors has been mentioned to be responsible for higher injuries among the above-mentioned group.<sup>[40,41]</sup> These age groups are significantly involved in the job force as well as other productive activities.

Majority of the population in this age group are regular commuters.<sup>[42]</sup> However, fragility was not responsible for the higher intensity of injury among these age groups. This study reveals that RTA constitutes the highest share in the trauma cases, and is the major factor responsible for the mortality and morbidity.<sup>[43]</sup> The outcome of the fall is mainly dependent on the nature of the landing surface, height of fall, and use of any protective devices. Some of the particular high-risk behavior like alcohol consumption, driving in high speed, and so on is common in this specific group. So, adult males are commonly involved in RTAs.<sup>[26]</sup>

With the heavy industrialization which is accompanied by accelerate motorization in last two decades, the number of pedestrian death/accidental injuries has increased tremendously.<sup>[14,44]</sup> The RTA death is also increasing as there is lack of stringent norms and policies that can prevent the occurrence of fatalities on road. Another interesting finding of our study was that the occurrence of injuries in homes was also higher among the sampled population. This may be due to age composition again where majority of the cases of falls and injuries have been reported among the elderly population.<sup>[44,45]</sup> With the advent of ageing, the older population are more fragile and more prone to these injuries.<sup>[46,47]</sup> It was also observed that geriatric age group have reported maximum cases under accidental falls. Nearly two thirds of falls occur at home. Falls often result in variety of musculoskeletal injuries including fractures.

This study also highlighted that maximum people came to the center by ground ambulance while the least number of people have been accompanied by the police. A study has also mentioned that the injured victim was usually rescued by a local commuter/road passer-by and contrary to the popular belief, that they are helped by the police.<sup>[48]</sup> This study also showed that majority of the trauma patients have been hospitalized due to the severity of injuries. Furthermore, it was also observed that majority of the patients have experienced injuries on extremities, followed by head, neck, and chest. Further management of trauma is confirmed by the requirement of long-term follow-up of these patients.<sup>[49]</sup> Studies also indicated that the head injury was more severe and needs acute and long-term care of these patients.<sup>[50]</sup>

Finally, our study has also recorded the observation on the basis of GCS coma severity based on eye, verbal, and motor criteria. Our results highlighted that majority of our patients have responded on eye, verbal, and motor stimulus. Further maximum number of the patients have scored T-15 on the GCS total score, indicating the fact that these trauma injuries do not require close medical attention and observation.<sup>[51,52]</sup> However, no general conclusion can be drawn from the above facts, and further investigations are required on this aspect.<sup>[53]</sup>



## Conclusion

Limited number of studies have been published from India on trauma-related injuries, severity, nature, and other important characteristics. If a significant number of registry records lack diagnoses and associated diagnosis codes, the resultant “data gap” may adversely affect the overall validity of the registry and may also adversely impact the validity of any state or national database to which registry data are subsequently contributed. A trauma registry serves its purposes only to the extent that the data it contains are complete, accurate, and adherent to case inclusion criteria and individual data field definitions. Periodic data audits are feasible and effective for maintaining data quality. Good quality, reliable, and representative information is very vital and is the foundation to formulate injury prevention programs in India. The currently available data reveal only the number of deaths due to different causes of injuries in India. However, only the number of deaths and injuries is not enough to formulate injury prevention programs, there is a need to study many other parameters including information about who are the affected people, what are their characteristics, where are injuries occurring, and how are injuries occurring.

Further information is required on the causes, types of injuries occurring, and what are the plans, policies, and programs that need to be developed. A major barrier for this is the availability of comprehensive information on injuries. The existing systems for trauma care are elementary in nature, predominantly restricted to cities and semi-urban areas, at an embryonic stage, predominantly supported by non-government and private agencies without integration of region or statewide systems. Such systems do not exist in rural and remote areas to offer prompt life-saving treatment and safe transfer to an appropriate facility. The development of a nationwide computerized trauma registry has been suggested to bring out the risk factors, circumstances, and chain of events leading to the accidents and to support the policy making and health management at the national level in India.

In our study, it has been seen that there are deficiencies in trauma care due to lack of skilled human resources; physical resources in terms of infrastructure, equipment, and supplies; and the process of organization and delivery. Often, there is a lack of evaluation and quality assurance mechanisms to monitor systems. Recent studies have also reported that there has been nearly 15%–30% reduction in deaths in different parts of the world due to better organization of overall trauma care at different levels. Important factors responsible for increasing secondary injuries and complications are non-availability of first aid, delay in transfer of patients from the injury site to a hospital, lack of definitive treatment in the first-contact hospitals (such as first aid, recognition of internal body organ injury), absence of triage (matching patients to hospitals according to the severity of injury), and external medico-legal (waiting for the police to arrive and move the patient, legal problems, lack of provision of care by hospitals) problems.

This study has important implications for trauma care clinicians and policy makers in India. It is apparent that there needs to exist a level of support for the development of trauma registries toward trauma system development. Poor handling of daily emergencies should be improved to manage disasters in an effective manner. Using trauma registries, and mature trauma systems, the health status of the population can be improved tremendously, which will also help in reducing the unwanted burden of mortality and morbidity.

## Policy implication

Prior to developing trauma care policy, there is need for establishing trauma registry in the state. The data from the registry could provide important information on designing appropriate interventions for trauma care.

## Limitation of study

It might be difficult to generalize the results to whole state as the study is conducted in a tertiary care hospital, SCB-MCH. Data about the patients attending a private health care are not included. As the study was conducted at a casualty, data about the patients attending the Outpatient Department (OPD) are not included.

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## Conflicts of interest

There are no conflicts of interest.

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