

ORIGINAL ARTICLE

Impact of Road Traffic Accidents: Understanding Causes, Consequences, and Mitigation Strategies

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ABSTRACT

Road accidents pose a significant challenge in both developed and developing nations, aggravated by rapid population growth and economic expansion. India, particularly, deals with a surge in vehicle registrations, directly correlating with an alarming increase in road traffic accidents (RTAs). This paper delves into an analysis of the multifaceted causes contributing to RTAs in Haryana, shedding light on potential strategies for mitigation. Drawing insights from 100 RTA cases between 2022 and 2023, the study assesses the impact of these accidents on Haryana's populace. By fostering awareness, the research aims to furnish governmental efforts with actionable insights towards curbing traffic accidents. The findings underscore the overarching factors fuelling RTAs, encompassing fatalities and injuries resultant from these occurrences.

KEYWORDS

- Cause of road traffic accident • fatalities, physical evidence

INTRODUCTION

India's road transportation network is pivotal to the country's economy, serving as the primary mode of transportation with its ever-expanding traffic share. However, alongside

this modernization comes a concerning trend: the surge in Road Traffic Accidents (RTAs). Alarming, over 90% of road traffic deaths occur in low and middle-income countries, as highlighted by WHO reports.¹ In India, this burden is particularly pronounced, with the

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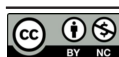
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nation boasting the highest rate of road crash fatalities and injuries worldwide.

Annually, approximately 4.5 lakh vehicle crashes occur, resulting in 1.5 lakh fatalities. The escalating volume of motorized traffic, characterized by rapid acceleration and speed, stands as a primary contributor to RTA injuries. Shockingly, despite accounting for only 1% of global automobiles, India contributes to 11% of all road deaths. The economic toll of these incidents is staggering, estimated at Rs 5.96 lakh crore, equivalent to 3.14% of the nation's GDP, according to a report by the Ministry of Road Transport and Highways, 2019⁸.

Across the world, approximately 1.3 million people die each year in traffic-related accidents². Road traffic injury is now the leading cause of death for children and young adults aged 5–29 years, signalling a need to address this issue on priority. In 2022, Uttar Pradesh recorded the highest death rate, followed by Tamil Nadu, Maharashtra, Karnataka, and Rajasthan. Focusing on Haryana, a northern state with a population of 25,351,462, reveals a concerning trend⁹. Despite boasting an impressive road infrastructure, including national highways and state highways, Haryana witnessed a 5% increase in road accidents from 2021 to 2022. According to the Integrated Road Accident Database (iRAD), 4,604 lives were lost in 10,083 road accidents in Haryana up to November 2023, with an additional 8,547 individuals sustaining injuries.

The impact of these accidents reverberates through families and communities, yielding significant socio-economic ramifications. Understanding the multifaceted causes of RTAs is imperative for developing effective mitigation strategies. Factors such as driver behaviour, vehicle features, road conditions, and environmental effects all contribute to the incidence of RTAs.^{7,10}

This study aims to elucidate the level of uncertainty surrounding the total count of individuals killed or injured in RTAs in the districts of Karnal and Kurukshetra in Haryana between 2022 and 2023. By shedding light on these statistics, policymakers can craft and reinforce regulations to curb the incidence of RTAs, thereby fostering safer roadways and preserving lives.

METHODOLOGY

A cross-sectional research approach was employed from July 2022 to July 2023 to investigate the causes of traffic accidents. The study focused on analyzing 100 cases of traffic accidents occurring within the districts of Karnal and Kurukshetra in Haryana, India encompassing district roads, state highways, national highways, and rural roads.

Data for the study were collected directly from the accident scenes and from individuals who succumbed to injuries sustained in traffic accidents. Information vital to each incident was collected from post-mortem reports, police station records, and on-site investigations of the accidents.

Based on Table 1 and Chart 1, different categories in which traffic rule violations contributed to road accidents and fatalities in Kurukshetra and Karnal during the years 2022-2023 can be analysed.

RESULT

The data, comprising 100 accident cases, was collected from two major districts of the state of Haryana, namely Karnal and Kurukshetra, India. The analysis covers the period from July 2022 to July 2023, and the following observations were made:

Table 1: Road accidents, fatalities and injuries by traffic rule violation in Karnal and Kurukshetra, Haryana, India

Category	Kurukshetra			Karnal			Total		
	Accident	Killed	Injured	Accident	Killed	Injured	Accident	Killed	Injured
Over speeding	21	11	29	19	12	11	40	23	40
Drunken driving	10	09	16	05	01	04	15	10	20
Wrong side drive	06	01	07	09	09	04	15	10	11
Road environment	02	00	02	06	03	04	08	03	06
Others	13	05	10	09	04	12	22	09	22

Causative factors of RTA

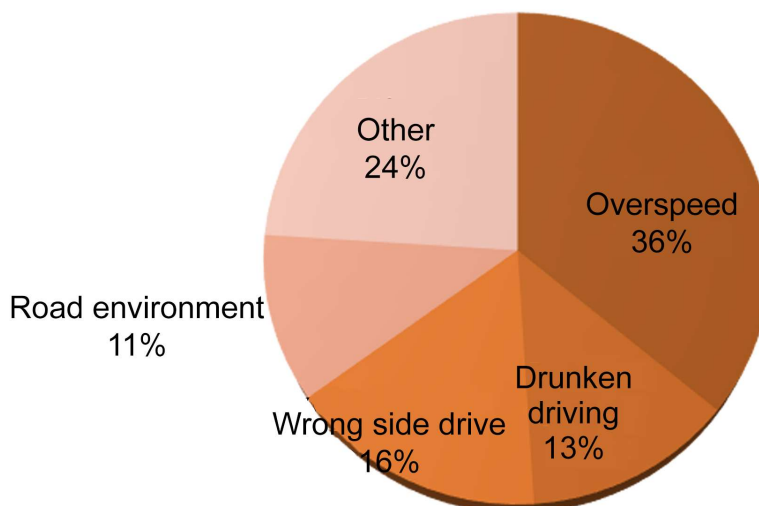


Figure 1: Showing causative factors of Road Traffic Accidents in Karnal and Kurukshetra, Haryana, India

1. Over speeding:

- In Kurukshetra, over speeding accounted for 21 accidents, resulting in 11 fatalities and 29 injuries.
- In Karnal, over speeding caused 19 accidents, leading to 12 fatalities and 11 injuries.
- Combined, over speeding contributed to a total of 40 accidents, 23 fatalities, and 40 injuries.
- Over speeding was the primary cause, accounting for 40% of accidents and 41.81% of fatalities during the study period.

2. Drunken driving:

- In Kurukshetra, drunken driving caused 10 accidents, resulting in 09 fatalities and 16 injuries.
- In Karnal, drunken driving led to 5 accidents, resulting in 1 fatality and 4 injuries.
- Combined, drunken driving contributed to a total of 15 accidents, 10 fatalities, and 20 injuries.
- Drunken driving contributed to approximately 15% of accidents, 18.18% of fatalities, and 20.20% of injuries.

3. Wrong side driving:

- In Kurukshetra, driving on the wrong side resulted in 6 accidents, 1 fatalities, and 7 injuries.

- In Karnal, this violation led to 9 accidents, 9 fatalities, and 4 injuries.
- Combined, wrong side driving contributed to a total of 15 accidents, 10 fatalities, and 11 injuries.
- Driving on the wrong side accounted for roughly 15% of accidents, 18.18% of fatalities, and 11.11% of injuries.

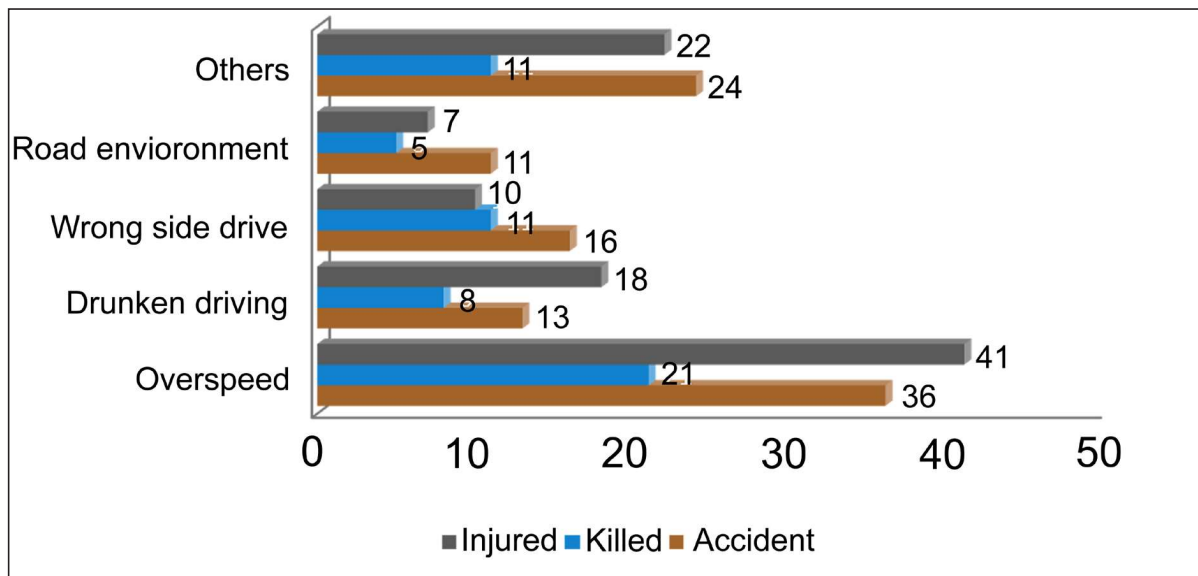
4. Road environment:

- In Kurukshetra, road environment-related factors caused 2 accidents, no fatalities, and 2 injuries.
- In Karnal, these factors resulted in 6 accidents, 3 fatalities, and 4 injuries.
- Combined, road environment-related factors contributed to a total of 08 accidents, 03 fatalities, and 06 injuries.
- Road environment-related factors comprised about 08% of accidents, 5.45% of fatalities, and 6.06% of injuries.

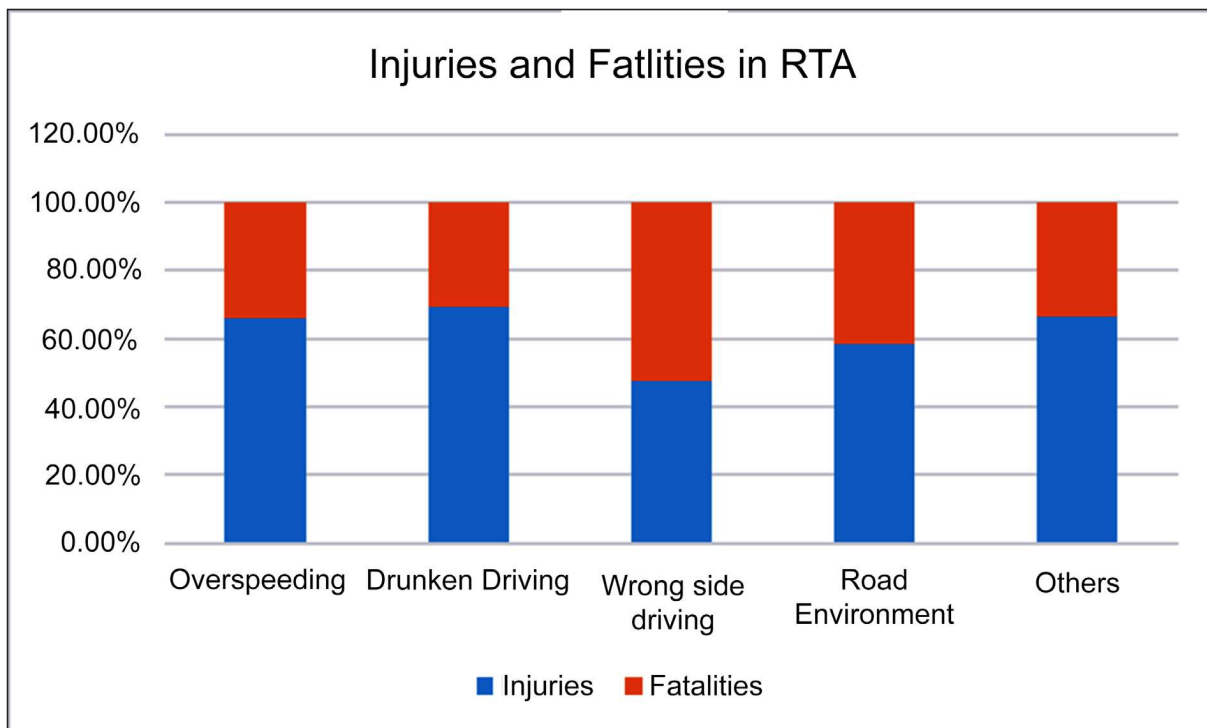
5. Others:

- This category includes various traffic violations such as mobile phone use, weather conditions, rash driving, low visibility, vehicle defaults, and sleepiness.
- In Kurukshetra, other violations led to 13 accidents, 05 fatalities, and 10 injuries.
- In Karnal, they resulted in 09 accidents, 04 fatalities, and 12 injuries.

- Combined, other violations contributed to a total of 22 accidents, 09 fatalities, and 22 injuries.
- Other violations constituted approximately 22% of accidents, 16.36% of fatalities, and 22.22% of injuries.



Graph 1: Showing causes of RTA based on data collected between July 2022 to July 2023



Graph 2: Showing the percentage share of persons injured/killed in RTA due to different contributing reasons in the specified period.

The data from Kurukshetra and Karnal underscores the pressing issue of road safety in these regions, revealing several prominent causes of accidents and fatalities. Over speeding emerges as a significant contributor

to road accidents in both areas, aligning with global trends outlined in the World Health Organization's "Global Status Report on Road Safety 2018". This report highlights the pervasive impact of speeding on road fatalities

worldwide, emphasizing the urgent need for targeted interventions to address this issue effectively. Moreover, research has consistently shown a correlation between high speeds and increased crash severity, further underlining the importance of measures aimed at curbing over speeding.^{11,13}

Drunken driving remains a concerning factor, significantly elevating the risk of accidents and fatalities on the roads of Kurukshetra and Karnal. The National Highway Traffic Safety Administration's "Traffic Safety Facts: Alcohol-Impaired Driving" underscores the dangers associated with driving under the influence of alcohol, emphasizing its detrimental effects on judgment, reaction time, and coordination. To combat this menace, robust enforcement measures and public awareness campaigns are imperative to deter individuals from engaging in this hazardous behaviour and to promote responsible alcohol consumption.^{5,6,12}

- Instances of wrong side driving present a particularly hazardous scenario, often resulting in head-on collisions and fatal accidents. Studies, such as those highlighted in the Indian Road Safety Campaign's "Enforcement Strategies for Road Safety," stress the crucial role of strict enforcement in deterring such reckless behaviours^{3,4}. Authorities must prioritize the enforcement of traffic regulations to prevent wrong side driving incidents and ensure the safety of road users in Kurukshetra and Karnal.

Poor road conditions, inadequate signage, and deficient safety measures also contribute significantly to accidents related to road environmental factors in both regions. The International Road Federation's "Road Safety Toolkit" advocates for comprehensive infrastructure improvements and the implementation of robust safety measures to mitigate these risks. Proactive measures, such as enhancing road infrastructure and implementing effective safety protocols, are essential to creating safer road environments and reducing the incidence of accidents.

Furthermore, various other factors, including distracted driving, vehicle defects, and pedestrian-related incidents, further complicate the road safety landscape. Research, such as that conducted by the National Safety Council on "Distracted Driving," underscores the need for a holistic approach encompassing

education, enforcement, and infrastructure development to address these diverse factors effectively. By adopting evidence-based strategies and fostering collaboration across sectors, Kurukshetra and Karnal can work towards fostering safer road environments and reducing the toll of road accidents on their communities.

CONCLUSION

The analysis of road traffic accidents (RTAs) in the districts of Karnal and Kurukshetra, Haryana, between July 2022 and July 2023 has shed light on several critical insights. The data underscores the persistent challenges faced in ensuring road safety, with factors such as over speeding, drunken driving, wrong side driving, and road environment contributing significantly to the incidence of accidents. The findings emphasize the urgent need for targeted interventions, including stricter enforcement of traffic regulations, public awareness campaigns, and infrastructure improvements. By addressing these multifaceted issues comprehensively, policymakers and stakeholders can work towards fostering safer roadways and reducing the toll of road accidents on individuals and communities. Furthermore, ongoing research and data collection efforts are crucial for continually refining and implementing effective strategies to mitigate the risks associated with RTAs and safeguard the well-being of road users.

Conflict of Interest: Nil

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