Road Traffic Accidents and their Human Consequences: A Case Study from Eastern Nepal

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Abstract

One of the main causes of deaths and injuries worldwide is road traffic accidents (RTAs). The majority of RTA fatalities worldwide occur in low and middle-income nations. Human road accidents (HRAs) in Nepal are the leading cause of death and loss of property. Mortality and morbidity can be avoided with prompt actions and timely rescue. This paper aims to investigate the road safety of Koshi Province, for which patterns, mortality, and morbidity of human road accidents were examined. Secondary data available in the records of the Nepal traffic police website between 17th July 2023 to 15th July 2024 for all fourteen districts of Koshi Province were examined. Those data were exported to MS Excel and MS Word for preparing graphs and figures. The study found the major involvement of bikes/scooters in the accidents. Young adults make up the majority of HRAs victims, while middle age is least affected age group. Furthermore, most incidents have occurred in March and April. Most accidents that have been reported occurred in the afternoon. However, public transportation has been responsible for the majority of deaths. These cases represent basic challenges in city planning, transportation policy, enforcement, and public behavior. Just relying on the data of the government of Nepal from the website and not studying the interrelation of accident patterns, deaths, and injuries with other major parameters are the limitations of this study.

Keywords: Koshi Province, Nepal, road safety, road traffic accidents, traffic

Introduction

An unanticipated incident involving a minimum of one moving automobile on a public road that causes bodily harm, injury, or death is known as a human road accident (HRAs). The majority of these incidents are credited to human factors, which are frequently made worse by systemic problems like inadequate road infrastructure, poor vehicle maintenance, and unfavorable environmental conditions (Atreya et al., 2021; Gautam & Joshi, 2024). These human factors include speeding, drunk driving, distracted driving, and breaking traffic laws.

Accidents have been a common word for every one of us as we hear this word at least a day in our lives. It is characterized as an accident on a public or private road involving at least one moving vehicle that leaves at least one person hurt or dead (Pathak et al., 2014). It is estimated that 1.19 million individuals lose their lives in traffic accidents each year (WHO, 2024). An additional twenty to fifty million individuals sustain non-fatal injuries, many of whom become disabled. Individuals, their families, and entire countries suffer significant financial losses as a result of road accidents. For people who are killed or rendered incapacitated by their injuries, as well as for family members who must take time from work or school to care for the injured, these losses result from the expense of treatment and lost productivity (WHO, 2024). Additionally, 0.8% of the nation's GDP has been lost due to traffic accidents (Shrestha et al., 2017).

Traffic accidents have far-reaching effects that extend beyond the initial pain experienced by the parties involved. Additionally, they have a significant financial impact on victims, their families, and the entire nation's economy. The estimated 3% drop in a nation's gross domestic product is a result of the expense of treating injured people and the lost productivity of those who have died or become disabled for each country, each year (WHO, 2023). To reduce the devastating effects of road traffic accidents (RTAs) worldwide, this complicated effect emphasizes the critical need for comprehensive avenue protection programs, including infrastructure upgrades, education, and rigorous adherence to visiting regulations (WHO, 2023).

There is little proof that road accidents (RAs) have a negative economic impact in Nepal. The economic cost of RAs in Nepal was evaluated by a few international researchers (Chen et al., 2019; Dalal et al., 2013). According to research (Dalal et al.,

2013), RAs caused Nepal to lose an estimated 6.30% of its GDP in 2005. According to a different estimate, RAs will cost Nepal USD 778 million between 2015 and 2030, or 0.167 percent of its GDP (Chen et al., 2019). The entire cost of RTIs in 2007 was estimated to be USD 40.65 million based on statistics from the fiscal year 2006/07 (Chen et al., 2019). It was found that RAs cost USD 122.88 million in total in 2017, which includes direct costs, social costs, and emotional costs. The rising national financial burden related to avoidable RAs is demonstrated by the economic expenses of RTIs, which have tripled since 2007 and now account for 1.52% of the GDP (Banstola et al., 2020).

Human road accidents (HRAs) and aviation incidents have increased alarmingly throughout the nation, becoming serious public health concerns. Vehicles, roads, traffic signals, and human behavior are just a few of the many interconnected parts that make up transportation networks, which are by their nature, very complicated. Implementing efficient safety procedures and policies requires an understanding of the fundamental causes of accidents (Manandhar, 2022). According to data, the number of registered automobiles in Nepal has increased by 325% in just the years 2000 – 2011 (Tharu & Shrestha, 2021). There are more than 6 million registered automobiles in the nation as of the current fiscal year 2024 – 2025. Accident rates have increased as a result of the sharp rise in vehicle numbers, poor infrastructure, and inadequate implementation of safety laws. The Highway Police Office estimates that there are 65 road incidents on average per day, with seven fatalities and 83 injuries (Mishra & Niraula, 2024). Moreover, 80% of all accidents involve motorcycles, highlighting the critical need for focused actions to increase road safety (Atreya et al., 2021; Department of Roads Government of Nepal, 2016; Khadka et al., 2024)

In the fiscal year 2080–81, the Nepal government recorded 22,927 traffic accidents that claimed 2,369 lives, or around 1,033 fatalities for every 10,000 incidents. These numbers support a worrying trend in traffic safety, highlighting the necessity of focused initiatives and regulatory changes (Gurukul khabar, 2024). In Nepal, road traffic injuries are a significant problem, where there are more fatalities on highways outside of the Kathmandu Valley (Karkee & Lee, 2016). According to data, traffic accidents in Nepal claim the lives of seven people on average each day. Seven people are killed in

traffic accidents in Nepal every day, according to data from the Nepal Police (My Republica, 2024)

Human mistake is the main cause of Human road accidents, according to studies (Manandhar, 2022). Drivers, passengers, and vulnerable road users such as cyclists, pedestrians, and motorcyclists can all make mistakes that result in traffic accidents (Olszewski et al., 2016). The most common driving errors are excessive speeding (Islam & Mannering, 2020), emotional driving (Zhang et al., 2022), inexperienced driving (Stipdonk, 2017), drinking alcohol (Manandhar, 2022) and long-distance driving (Longman et al., 2021). Additionally, passengers may increase the likelihood of traffic accidents by deflecting the attention of other drivers (Khan et al., 2020). In case of Nepal, the prominent cause of accidents is reckless driving and over speeding. Additionally, alcohol consumption, mechanical failure and road condition are also responsible for HRAs (Gautam & Joshi, 2024). Furthermore, walking on the road, veering in front of oncoming traffic, and crossing roads away from crosswalks to approach points are all examples of pedestrian-related traffic accidents (Ojha, 2021).

Ensuring compliance with vehicle safety regulations is essential for the protection of both drivers and passengers (Bhalla & Gleason, 2020; Dhungana et al., 2024). HRAs are caused by factors such as overloading, incorrect handling or modification of vehicles used for public transit or training, mismatched tires, weak brakes, poor maintenance, and insufficient lighting (Wen et al., 2022). Wearing a helmet lowers the probability of death in motorcycle accidents involving two riders by 34%, according to research (Dee, 2009). The significance of helmet legislation in lowering highway mortality is further supported by research comparing states in the US, which show that those with helmet laws had fewer fatalities overall than those without (Brockhus et al., 2024). Since seat belts drastically lower the number of deadly auto accidents and catastrophic brain damage, they are an essential piece of safety gear. Seat belt use increases the number of fatalities and reduces the risk of internal brain damage from traffic accidents. According to the report (Dhungana et al., 2024), there are five main areas where Nepal's road safety laws need to be improved: seat belt requirements, helmet laws, speed limits, child restraint laws, and laws related to drinking and driving. A 51% reduction in HRA-related in-hospital mortality has been linked to seat belt use (Dhungana et al., 2024).

Poor road and vehicle conditions as well as careless driving are the main causes of accidents in Nepal (Karkee & Lee, 2016). Highway accidents claim the lives of more Nepalese each year than all natural calamities put together. Additionally, a different study suggested creating a community-based record system to gather more specific information on RTAs than police data (Khadka et al., 2022). We do, however, firmly feel that there is a dearth of scientific study of data gathered by the police.

Koshi Province ought to advocate for road safety in accordance with the Road Safety Action Plan 2021-30 and the United Nations (UN) Road Safety Decade of Action 2021-30 for 50 by 30 and Vision Zero (Khadka et al., 2024). There should be proof of RTAs using an extensive plan and community action strategies in order to create a complete policy. In this context, little is known about RTAs and the repercussions that follow, as well as the underlying causes of accidents. Thus, this study intends to investigate the patterns, morbidity, and mortality using secondary data and aims to fill the information gaps related to the number of deaths, number of casualties, vehicle types, time, months, and district in the area of HRAs in Koshi province of Nepal during the fiscal year 2080–81.

Methods

We collected data of accidents in Koshi province from the website of traffic police (Nepal Police, 2024a). Data were collected for the fiscal year 2080/81 (17th July 2023 to 15th July 2024). The number of accidents, deaths, casualties, and districts was mentioned on the website of the traffic police (Nepal Police, 2024a). Human accident data were downloaded, and the information of death by vehicle type, age, sex, time, month, and district was extracted. A total of 106 cases were analyzed (Nepal Police, 2024a). All collected data were exported to MS-Excel, and descriptive statistics were analyzed by preparing graphs from MS Word. None of the personal information has been disclosed in the article.

Results

Table 1 gives the information about the roads, registered vehicles and human resources present in Koshi Province, Nepal, as of fiscal year 2080/81 (17th July 2023 – 15th July 2024). It has a total of 5,821 kilometers of black toped road, 5,548 kilometers

of gravel, and 14,098 kilometers of bumpy road (Nepal Police, 2024b). For the management of these roads and 974,680 of the total vehicles running on these roads, 569 traffic personnel are working day and night. On average, about 43 KM of road, 1,646 vehicles and 8380 population is to be governed by per traffic police (Nepal Police, 2024b).

Table 1

Information about the roads, registered vehicles and traffic police in Koshi Province, Nepal

SN	Information	Number
1	Black topped road (KM)	5,821
4	Gravel road (KM)	5,548
5	Bumpy road (KM)	14,098
6	Total traffic police in province	569
7	Road length per traffic police (KM)	43
8	Total vehicles registered	974,680
9	Vehicle per traffic police	1,646

Source: province traffic police, 2024 (December 21, 2024)

Vehicle registration of fiscal year 2080/81 shows that small vehicles occupy the highest portion of roads with 29,778 (93.48%). Medium and large vehicles come next to list with 1,148 (3.6%) and 266 (0.84%), respectively. While machinery vehicles are 132 (0.42%) and others are 530 (1.66%) (Nepal Police, 2024b).

Table 2 gives the numbers of deaths and injuries in fiscal year 2080/81 in Koshi Province, Nepal. There were a total of 106 accidents accounted for by the traffic police, which caused 118 deaths and 101 injuries, among which 15 were pedestrians. While observing the sex distribution, a total of 97 males and 21 females have lost their lives, which includes 11 children of less than 14 years old. Out of this boy (<14) is 8 and girl (<14) is 3, which occupy about 6.77% and 2.54% respectively. Young generations were reported as the most affected victims in most of the fatalities, with an age group of 20-30. And the least affected were of the age group 45-50 (Nepal Police, 2024a).

Table 2

Distribution of accidents, deaths and injuries in the fiscal year 2080/81 in Koshi Province, Nepal

Characteristics	Number
Total RTA	106
Total death	118
Total injured	101
Sex distribution of deaths	
Male (Boy ≤14)	97 (8)
Female (Girl ≤14)	21 (3)
Injured	
Male (Boy ≤14)	72 (13)
Female (Girl ≤14))	29 (9)
Age involved in RTA (deaths)	
<14	11
14-20	6
20-25	23
25-30	15
30-35	8
35-40	10
40-45	11
45-50	7
50-55	13
55 and above	14
Number of pedestrians killed (with all age group)	15

Source: province traffic police, 2024 (December 21, 2024)

Table 3 illustrates the types of vehicles involved in accidents in fiscal year 2080/81 in Koshi Province, Nepal. Motorcycles/scooters are highly responsible for accidents, followed by cars/jeeps/van. Additionally, tripper/truck/lorry/tanker occupies the third place and bus the fourth (Nepal Police, 2024a).

Table 3

Number of vehicles involved in the accident

SN	Vehicle's type	Number of human road accidents
1	Bus	11
2	Tractor	10
3	Auto/tempo	3
4	e-rikshaw	3
5	Car/Jeep/Van	15
6	Microbus/ev-bus/Hiace	3
7	Motorbike/Scooter	66
8	Pickup	6
9	Tripper/Loory/Truck/Tanker	14
10	Cycle	9

Source: province traffic police, 2024 (December 21, 2024)

Figure 1 illustrates the number of accidents by districts of Koshi Province, Nepal in fiscal year 2080/81. Morang has the highest number of accidents, followed by Jhapa and Sunsari. In contrast, Solukhumbu has zero accidents recorded by the traffic police in the year (Nepal Police, 2024a).

Figure 1

District-wise human road accidents in eastern Nepal
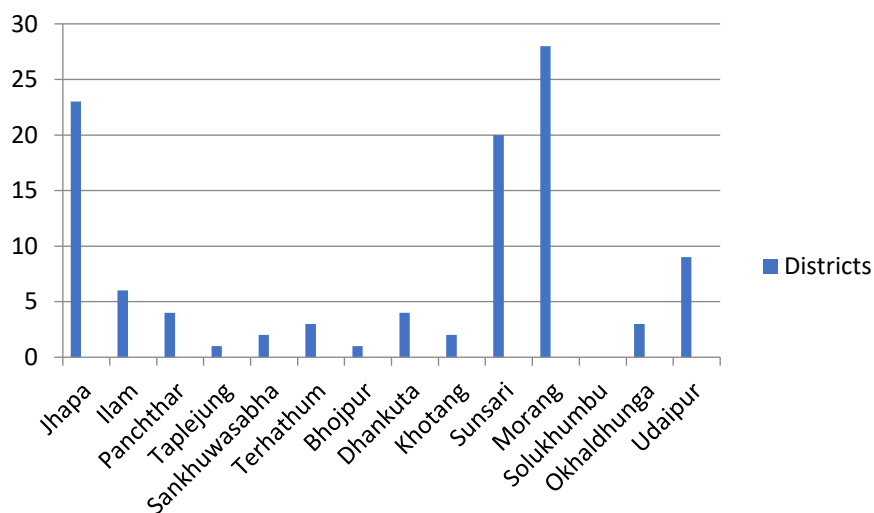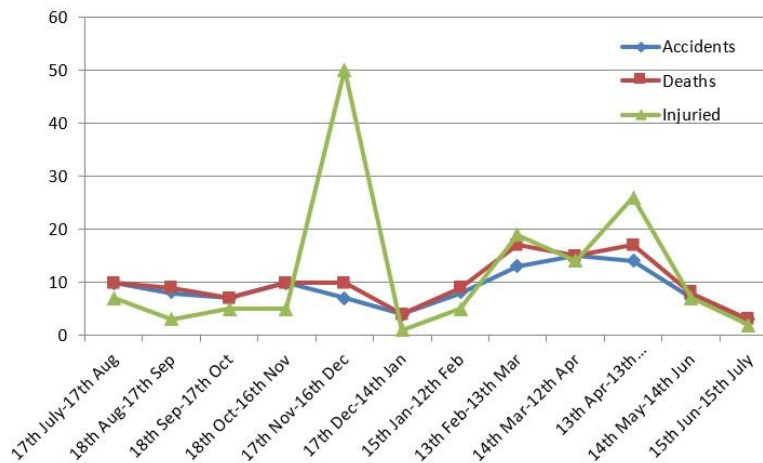

Source: province traffic police, 2024 (December 21, 2024)

Figure 2 shows the distribution of accidents, deaths, and injuries with respect to months in Koshi Province, Nepal, in fiscal year 2080/81 (from 17th July 2023 to 15th July 2024). The data clearly shows the highest number of HRAs occurs from 14th March to 12th April 2024, with the least accidents from 15th June to 15th July 2024.

Figure 2

*Monthly records of human road accidents in eastern Nepal*

Source: province traffic police, 2024 (December 21, 2024)

Figure 3 demonstrates the accident pattern related to time. The major accidents have occurs at the time between 12:00 PM to 6:00 PM. In Nepal, office hours end at 5:00 PM, which may have increased the number of deaths. The next highest number of accidents has taken place at the time between 6:00 PM to 12:00 AM (Nepal Police, 2024a)

Figure 3

Time of human road accident in eastern Nepal
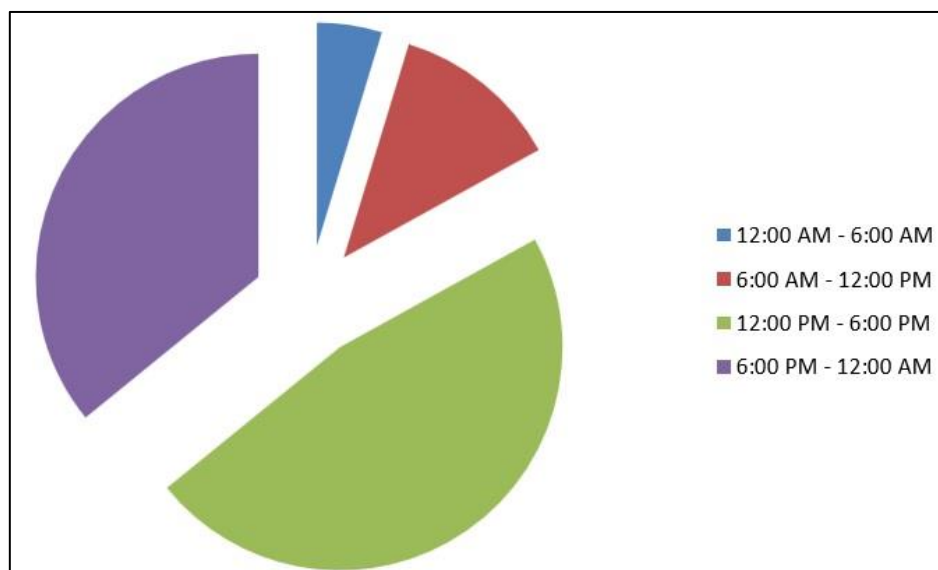
Source: province traffic police, 2024 (December 21, 2024)

Discussion

According to rough estimates, the annual cost of traffic accidents is 1% of GDP in developing nations, 1.5% in transitional nations, and 2% in nations with high levels of motorization. Transport Research Laboratories produced an estimated $518 billion worldwide (Jacobs & Astrop, 2000).

Even though there is little data on health research and development related to motor vehicle safety, it is reasonable to assume that the lack of such investment adds to the problems of increasing severity and the growing divide between high- and low-income nations. Road traffic collisions are predicted to be the third leading cause of Disability Adjusted Life Years (DALYs) by the year 2000; however, according to economic data, just US$1 was spent for each DALY caused by these collisions in 1990 (Mackay & Tiwari, 2001).

According to the analysis of secondary data, there is a shortage of traffic police officers in this Nepali province. Each of the 248 traffic police assigned to the control of the 25141 km of roads and 51523 automobiles is in charge of covering approximately 101.38 km and 207.75 vehicles per day (Nepal Police, 2024b).

Every year, we observed an increase in the number of vehicles registered, with two-wheelers accounting for the majority of HRA participation. There have been 101 injuries and 118 fatalities from 106 accidents. Two-wheelers have been reported to be the most involved, followed by cars/jeeps/vans, and buses, respectively. Nevertheless, the majority of fatalities this year have been caused by public vehicles. Some studies (Ghosh, 1992; Jha & Agrawal, 2004; Mehta, 1968) shows similar results.

The majority (32.20%) of HRA victims are those in the 20–30 age range. Similar findings were found in some studies (Ghosh, 1992; Mehta, 1968). The fact that this is the most active stage of life, when there is a desire to take risks, likely explains why there are more cases in this age range (Jha & Agrawal, 2004). It was also found that 62.71% of casualties were found to be between the ages of 20 and 50. This demonstrates that RTA participation is higher among those in the most active and productive age groups. The community suffers a significant financial loss as a result. Other investigations (Balogun & Abereoje, 1992; Jha, 1997) also reported similar findings. It was observed that the number of accident cases decreased below the age of 20 and above the age of 50, respectively. This could be because children are looked

after by elders and are hence less prone to use vehicles. The decreased percentage of HRAs among people of 60 and older may be because these individuals are typically less active. In this study, the male-to-female ratio was 4.6:1. Numerous authors (Dias et al., 2024; McCarty & Kim, 2024) have observed the male predominance. This might be because females spend more time indoors and have less active lifestyles.

The months of mid-February/ mid-March and mid-April/ mid-May January recorded the greatest number of HRA victims. Fog in Feb/Mar may be a contributing factor for accidents. Additionally, April/May is the end of the Nepali solar year, which may be another factor for HRAs because during the New Year, people want to enjoy and travel (Jha, 1997; Rosyidi et al., 2024). Winter months and rainy months had higher accident rates. Other people also made a similar observation (Ghosh, 1992; Mehta, 1968).

The densely populated districts of eastern Nepal (Jhapa, Morang, and Sunsari) recorded the highest percentage of accidents (66.98%). Out of the total 106 accidents, Solukhumbu recorded zero accidents. Just relying on the government's data may be the main weakness of this result.

The majority of accidents (47.16%) occurred during the period of 12:00 – 18:00. This may be because Nepali office time ends at 17:00 in summer and 16:00 in winter. Furthermore, 35.90% of accidents occurred between 18:00 to midnight. This may be because of low visibility at night, reckless driving, and the habit of alcohol consumption during night-time. Similar reports have been presented in some articles (Dhungana et al., 2024; Jha, 1997).

Conclusion

According to the study's findings, Koshi Province's human road accidents statistics indicate concerning needs. In conclusion, human traffic accidents are a serious problem due to the numerous and avoidable economic, social, and psychological consequences they bring in addition to the fatalities and injuries they cause. Coordinated efforts from several sectors, including urban planning, transportation, health, and law enforcement, are needed to address this problem.

The responsible factor for HRAs lies with individual behaviors, especially of young male drivers and motorcyclists. Lack of enforcements, safety research, public transport operators, environmental conditions, and policy and data shortcomings at the governmental levels are equally responsible for human road accidents in eastern part of

Nepal. This complicated interaction of variables highlights the necessity of multiple strategies to successfully lower HRAs.

A comprehensive approach integrating emergency treatment, engineering, education, supervision, and evidence-based legislation is needed to reduce human road accidents. To make roads safer and stop unnecessary casualties and financial suffering, the public, civic society, and government must work together.

The study's main conclusion is that, particularly in developing areas like eastern Nepal, human road accidents are a serious yet avoidable public health and development concern. To lower traffic accidents, save lives, and preserve national production, comprehensive action is desperately needed. This includes more traffic enforcement, focused public education, better infrastructure, trustworthy data systems, and political commitment. Resolving RTAs is a social justice, public health, and financial security issue in addition to a transportation problem.

Limitations

The following are the delimitations of the study:
1. The study mostly relies on data from Nepal police, which might not be accurate, current, or complete.
2. The results may not accurately reflect the national situation or apply to other areas because they are based on data from a single province in eastern Nepal.
3. Although the study mentions a few behavioral characteristics, it does not offer an exhaustive review based on driver interviews or first-hand behavioral data.
4. Road infrastructure, traffic conditions, and law enforcement procedures are not directly observed in the study, which would have provided important context.
5. Road quality, vehicle conditions, and safety features—all significant contributors to accidents—are rarely discussed.
6. The study did not look at long-term trends or changes in accident patterns over several years, instead appearing to represent a single point in time.
7. The study primarily looks at age and gender, but it doesn't include data on other factors that might be significant, such as occupation, education level, or socioeconomic situation.
8. The efficacy and enforcement of the region's current road safety rules, regulations, and initiatives are not assessed in this study.

Conflict of interest

The authors declare that they don't have factors that could have appeared to affect the work presented in this paper.

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