



Road Transport and Safety Protocols in Nepal and India

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Abstract

The relationship between Nepal and India is marked by shared cultural, religious, and trade ties, but both countries face challenges in developing their road transportation infrastructure due to diverse geographical terrains. Road injuries pose a significant public health challenge, leading to fatalities and disabilities, and incurring social and economic costs. The data for this comparative study on road transportation and safety practices in Nepal and India was gathered from various credible sources. These sources included reliable government reports, reports from road safety organizations, and reports from the World Health Organization (WHO). The result of the study revealed that both nations need to strengthen their road safety practices to reduce accidents and fatalities. Key legislative factors related to road safety also require improvement in both countries. The study emphasizes a collaborative approach involving multiple stakeholders to combat road safety challenges, focusing on modifying road user behaviors, improving road planning and maintenance, and strengthening governance and enforcement mechanisms. By incorporating multi-faceted approaches and strong political commitment, both Nepal and India can create a safer road environment, leading to improved economic progress and a better quality of life for their citizens. Furthermore, emphasizing road safety priorities between India and Nepal presents a valuable opportunity for collaborative regional initiatives. These joint efforts can enhance and support the road safety strategies of each country, leading to more effective and efficient implementation. By working together, they can significantly improve road safety in the region and achieve successful outcomes, benefiting both nations and contributing to safer transportation between them.

Keywords: Road accidents, road safety, road transportation

Introduction

Nepal, a prominent country in southern Asia situated around 28.3949° N and 84.1240° E, covers an expansive landmass of 147,181 square kilometers. Nepal's northern border primarily consists of mountainous terrain and shares its connection with China, whereas its southern border, comprising mostly plains, is linked to India in the eastern and western directions (CBS, 2023). The relationship between Nepal and India is diverse, characterized by an open border and robust interpersonal connections between the people of both nations (Shukla, 2006). Nepal and India have enjoyed a profoundly illustrious and amicable relationship, primarily rooted in shared cultural, religious, and trade ties (Dahal, 2018).

Nepal's economy heavily relies on agriculture, which accounts for 80% of its Gross Domestic Product (GDP) (Paudel, 2019). Nepal experiences diverse climatic conditions, including the Terai region (plains), hilly areas, and the majestic Himalayas. Within a relatively short distance of 145 to 241 kilometers, the terrain exhibits a significant variation in altitude, ranging from 50 meters in the Terai to an impressive 8,488 meters at the summit of Mount Everest in the Himalayas. This wide range of geographical diversity presents a considerable challenge when it comes to the development of Nepal's road transportation infrastructure (Pande, 2017).

Road transportation plays a crucial role in fostering economic growth and sustainable development (Chin et al., 2021; Yang et al., 2022) by connecting individuals to employment opportunities, facilitating the movement of goods, and providing access to essential services such as education and healthcare (Lucas, 2011; Pereira et al., 2017). As a landlocked country, Nepal relies heavily on its road connections with China and India to facilitate trade (Faye et al., 2004; Nayak, 2016). However, at present, there is only one dependable road link connecting the Kathmandu Valley to India. Therefore, the development of additional routes that connect India and China would yield significant economic advantages for Nepal, fostering increased trade and commerce opportunities.

India's road network is vast and diverse, comprising various categories of roads. It includes National Highways, State Highways, District Roads, Rural Roads, Urban Roads, and Project Roads. India possesses the second-largest road network globally, with a total length of 63,86 lakh kilometers, following the United States of America, which has a road network spanning

66.45 lakh kilometers (MORTH, 2018). The country's road network consists of a significant portion of rural roads, followed by national highways, district roads, urban roads, state highways, and project roads, with varying lengths and shares in the total road infrastructure (Pande, 2017).

Importantly, the development of road infrastructure has been instrumental in propelling economic progress, generating employment opportunities, and enhancing the overall quality of life for the citizens of both countries (Srinivasu, 2013, Yu, 2023). Despite witnessing growth in the road network, there remains an urgent need for further investments in this sector to address the growing demands and challenges posed by the country's evolving transportation needs. Because road injuries pose a significant public health challenge, leading to a high number of preventable fatalities and disabilities. These accidents impose substantial social and economic costs, including sudden deaths, injuries, disabilities, and loss of income (WHO, 2018).

In 1990, road accidents were ranked as the 9th leading cause of death worldwide, but the trends suggest they may rise to the 5th position (WHO, 2009). Annually, these accidents claim the lives of 1.3 million individuals and cause approximately 50,000 accidents globally, with young people aged 15 to 29 being the most affected group (WHO, 2013). The majority of these fatalities and injuries, about 90%, occur in low and middle-income countries, placing immense strain on already burdened healthcare systems, resulting in the loss of valuable human resources, and inflicting profound emotional and economic consequences on families and nations (Laytin, 2019). Within the WHO Southeast Asia (SEA) region, road accidents account for more than a quarter of global deaths. In 2013, an estimated 316,000 people lost their lives in road accidents in the SEA region, with over 50% of these fatalities involving vulnerable road users, particularly users of two and three-wheel vehicles (WHO, 2015).

2. Materials and Methods

The research methodology for this comparative study on road transportation and safety practices in Nepal and India employed a cross-sectional research design, enabling a comprehensive analysis by collecting data from both countries at a single time point. The data sources, including reliable government reports, transportation ministries, road safety organizations, and the WHO reports, yielded information on road network length, road types, road accidents, fatalities, injuries, and road safety policies. Descriptive statistics were used to summarize the data, offering

an overview of road transportation and safety in both nations. Comparative analysis was then conducted, identifying similarities and differences in factors like the percentage of paved roads, road network length, accident rates, and road safety measures. The study culminated in recommendations to enhance road safety based on the findings.

3. Result and Discussion

3.1 Status of the Road Network in Nepal

Table 1 presents an overview of the status of the road network in Nepal. The road types include Asphalt Road, Earthen Road, and Gravel Road, with the total length of each category indicated. In 1998, the Strategic Road Network (SRN) consisted of 2905.00 kilometers of Asphalt Road, 179.00 kilometers of Earthen Road, and 1656.00 kilometers of Gravel Road, amounting to a total length of 4740.00 kilometers. Over the years, there has been a gradual increase in the length of the road network. By 2017/18, the length of Asphalt Roads had expanded to 6979.33 kilometers, Earthen Roads covered 4191.42 kilometers, and Gravel Road accounted for 2276.87 kilometers, resulting in a total length of 13447.62 kilometers. Cumulatively, the total length of Asphalt Road within the SRN from 1998 to 2017/18 was 47358.1 kilometers. The length of Earthen Road reached 24815.1 kilometers, and Gravel Road measured 17924.3 kilometers during the same period. During the study period, the total length of Nepal's Strategic Road Network amounted to 90,097.4 kilometers.

Table 1: Status of Road Network in Nepal.

Year	Asphalt Road	Earthen Road	Gravel Road	Total
1998	2905.00	179.00	1656.00	4740.00
2000	2974.00	171.00	1649.00	4794.00
2002	3028.74	168.38	1663.84	4860.96
2004	3494.73	614.49	883.51	4992.73
2006/7	4258.20	3079.48	2061.7	9399.38
2009/10	4952.11	3817.76	2065.15	10835.02
2011/12	5573.55	4173.55	1888.49	11635.58
2013/14	6368.98	4389.47	1735.49	12493.94

2015/16	6823.43	4030.55	2044.22	12898.20
2017/18	6979.33	4191.42	2276.87	13447.62
Total	47358.1	24815.1	17924.3	90097.4

(Source: DoR, 2018)

3.2 Status of Road Network in India

Table 2 provides an overview of the different categories of roads in India, their respective lengths, and the percentage share of the total road network. The length of National Highways (NHs) stands at 1,32,500 kilometers, representing 2.13 % of the total road network. State Highways (SHs) cover a length of 1,86,528 kilometers, accounting for 3% of the total. District Roads have a total length of 6,32,154 kilometers, constituting 10.17% of the road network. Rural Roads cover a significant portion, with a length of 45,35,511 kilometers, representing 72.97% of the total. Urban Roads have a length of 5,4,683 kilometers, accounting for 8.76% of the network. Lastly, Project Roads span 3,54,921 kilometers, making up 5.71% of the total road network in India. In total, the road network in India amounts to 63,86,297 kilometers.

Table 2: Status of Road Network in India as of 2017-2018.

Category	Length (km)	% of Total Share
Project Roads	3,54,921	5.71
Urban Roads	5,4,683	8.76
Rural Roads	45,35,511	72.97
District Roads	6,32,154	10.17
State Highways (SHs)	1,86,528	3
National Highways (NHs)	1,32,500	2.13
Total	63,86,297	100

(Source: MORTH, 2018)

3.3 Road Safety Measures

Table 3 provides a comparative analysis of road safety measures between India and Nepal. The measures are organized into five pillars: Road Safety Management, Safer Road and Mobility,

Safer Vehicles, Safer Road Users, and Post-Crash Response. Under the Road Safety Management pillar, both Nepal and India have designated lead agencies, funding in the national budget, national road safety strategies, and fatality reduction targets. However, funding to implement the strategies is only partially available in both countries. Regarding Safer Roads and Mobility, both countries have requirements for audits or star ratings for new road infrastructure, inspections or star ratings for existing roads, and policies and investments in urban public transport. However, Nepal only has partial provisions for design standards for the safety of pedestrians and cyclists and investments to upgrade high-risk locations, while India fully meets these criteria. In the Safer Vehicle aspect, India has established several safety standards, encompassing seat belts, anchorage, child restraints, frontal and side-impact protection, electronic stability control, pedestrian protection, and motorcycle anti-lock braking system standards. Conversely, Nepal has yet to adopt these safety standards. Under Safer Road Users, both countries have national speed limit laws, maximum speed limits for different areas, national drink-driving laws, and national motorcycle helmet laws. However, Nepal does not have laws specifying Blood Alcohol Concentration (BAC) limits for the general population or different driver categories. Random breath testing is carried out in both countries. Nepal does not have a national drug-driving law, while India does. Regarding Post-Crash Response, both Nepal and India have partial provisions for a national emergency care access number and trauma registry.

India and Nepal share certain similarities in terms of road safety measures, but overall, India has a more comprehensive framework with a higher level of regulations and standards across the five pillars of road safety. India has made significant progress in implementing measures to enhance road safety, including designated lead agencies, funding in the national budget, national road safety strategies, and fatality reduction targets. Additionally, India has provisions for safer roads and mobility, safer vehicles, and safer road users, including specific standards for seat belts, child restraints, impact protection, and mobile phone use while driving. On the other hand, while Nepal has made progress in road safety, there is still a need for improvement in implementing certain measures. Nepal could focus on enhancing its standards for road design, vehicle safety, and road user behavior to further improve road safety outcomes. Overall, both countries can continue working towards strengthening their road safety practices to ensure the well-being of their citizens and reduce accidents and fatalities on the roads.

Table 3: Road Safety Measures between India and Nepal

Vehicles	India	Nepal
Pillar 1: Road Safety Management		
Funding in the national budget	Yes	Yes
Designated lead agency	Yes	Yes
Funding to implement strategy	Partial	Partial
National road safety strategy	Yes	Yes
The target for fertility reduction	Yes	Yes
Pillar 2: Safer Road and Mobility		
Provision for pedestrian/cyclists safety in design standard	Yes	Partial
Audits/star ratings required for new road infrastructure	Partial	Partial
Investments to upgrade high-risk locations	Yes	No
Inspections/star ratings of existing roads	Yes	Yes
Policies and investment in urban public transport	Yes	Yes
Policies promoting walking and cycling	No	No
Pillar 3: Safer Vehicle		
Seat belt anchorage standards	Yes	No
Seat belt standards	Yes	No
Frontal impact standards	Yes	No
Child restraint standards	No	No
Electronic stability control standards	No	No
Side impact standards	Yes	No
Motorcycle anti-lock braking system standards	Yes	No
Pedestrian protection standards	Yes	No
Pillar 4: Safer Road Users		
Maximum urban speed limit	Yes	Yes
National speed limit law	Yes	Yes
Maximum motorway speed limit	Yes	Yes

Maximum rural speed limit	Yes	Yes
BAC limits the general population	Yes	No
National drink-driving law	Yes	Yes
BAC limits professional/ commercial drivers	Yes	No
BAC limit young or novice drivers	Yes	No
National drug driving law	Yes	No
Random breath testing carried out	Yes	Yes
Helmet law applies to drivers and passengers	Yes	Yes
National motorcycle helmet law	Yes	Yes
The law refers to helmet standard	Yes	No
The law requires the helmet to be fastened	Yes	No
National seat belt law	Yes	Yes
Child passengers on motorcycles	Not restricted	Not restricted
National child restraint law	No	No
The law applies to front and rear seat occupants	Yes	No
National law on mobile phone use while driving	Yes	Yes
Restrictions on children sitting in the front seat	No	No
Law also applies to hands-free mobile phones	Yes	No
The law prohibits hand-held mobile phone use	Yes	No
Pillar 5: Post-Crash Response		
Trauma registry	Partial	Partial
National emergency care access number	Partial	Partial
National Assessment of emergency care systems	No	No
Formal certification for pre-hospital providers	Yes	No

Source: WBG 2019a

3.4 Status of Key Legislative Factors

Table 4 provides a summary of key road safety legislation in Nepal and India. In Nepal, there is no specific law or the existing law does not meet best practice standards for speeding, drink-driving, helmets, and child restraints. The legislation concerning seatbelts is set at the province

level, implying potential variations in regulations across different regions of the country. On the other hand, in India, the legislation for speeding and drink-driving is set at the provincial level, indicating potential differences in regulations among various states. Helmets do not have a specific law or do not meet best practice standards. However, seat-belt legislation meets the criteria for best practice, ensuring that seat-belt usage is regulated appropriately. Similar to Nepal, child restraints in India do not have specific laws or do not meet best practice standards. It highlights the varying levels of road safety legislation and the need for improved and consistent regulations in both Nepal and India to enhance overall safety on the roads.

Table 4: Status of Key Legislative Factors.

Countries	Drink-driving	Speeding	Seat-belts	Helmets	Child restraints
Nepal					
India					
	Legislation at the province level only				
	No law or does not meet the best practice				
	Meets some of the criteria for best practice				
	Meets criteria for best practice				

(Source: WHO, 2018)

3.5 Comparison of Risk Fatalities

Table 5 presents a comparison of road user fatality risks between Nepal and India. In Nepal, the fatality rate is 17.0 per 100,000 people, meaning that approximately 17 individuals out of every 100,000 in the population die in road traffic accidents. Similarly, in India, the fatality rate is slightly lower at 16.6 per 100,000 people. When considering fatalities per 10,000 vehicles, Nepal has a higher rate of 40.0, indicating 40 road traffic fatalities for every 10,000 vehicles. In contrast, India has a lower rate of 13.0 per 10,000 vehicles. These figures highlight the risks faced by road users in both countries and emphasize the need for effective road safety measures to reduce fatalities and improve overall safety on the roads.

Table 5: Comparing the Risks of Fatalities.

Fatalities Risks	India	Nepal
Fatalities per 10,000 vehicles	13.0	40.0
Fatalities per 100,000 people	16.6	17.0

(Source: WBG 2019a)

3.6 Road Traffic Death Rate in Nepal and India

Table 6 provides an overview of the trends in road traffic death rates per 100,000 population in Nepal and India between the years 2007 and 2015. In Nepal, the death rate per 100,000 population was 15.1 in 2007, which saw a slight increase to 16 in 2009. Over the following years, there was a gradual rise, reaching 17 in 2013, and a further increase to 17.3 in 2015. Meanwhile, in India, the death rate per 100,000 population was 16.2 in 2007, which experienced an increase to 18.9 in 2009. However, there was a subsequent decrease to 16.6 in 2013, followed by a notable rise to 21.2 in 2015. The regional average death rate across the studied period was 16.6 in 2007, 18.5 in 2009, 17 in 2013, and 20.2 in 2015. These statistics highlight the variations in road traffic death rates over the specified years.

Table 6: Road Traffic Death Rate in Nepal and India.

Country	2007	2009	2013	2015
India	16.2	18.9	16.6	21.2
Nepal	15.1	16	17	17.3
Regional	16.6	18.5	17	20.2

(Source: WHO, 2009, 2013, and 2015)

Rustagi et al. (2017) conducted a study in India and found that poor adherence to existing laws regarding helmet use, speed limits, and mobile phone usage were significant contributors to road traffic crashes. They recommended the integration of engineering, technological, and environmental approaches, and behavior modification to address the increasing trend of road traffic crashes in India. Similarly, Timmermans et al. (2019) revealed that the unsafe behavior of

professional drivers often engages in law-breaking behaviors and gets distracted by their phones. Similarly, Wang et al. (2019) identified factors such as speeding, nighttime driving, inadequate safety margins, accidents involving freight vehicles, and road design as major contributors to road traffic accidents.

The economic impact of road traffic injuries in Nepal amounts to approximately 1.52% of the country's gross national product, highlighting the increasing financial burden caused by accidents (Banstola, 2020). Vulnerable road users, particularly pedestrians, cyclists, and two-wheel vehicle users, account for approximately 54% of all fatalities and injuries in Nepal. Around 40% of the road accident victims in Nepal in 2017/18 were under the age of 26, and transport injuries ranked as the second leading cause of death among the age group of 15-49 (WHO, 2018). In Nepal, more than 60% of fatal road accidents can be attributed to driver-related offenses, including traffic violations, drunk driving, overloading, and speeding (Thapa, 2013).

In India, road accident deaths account for approximately 11% of the global total, with serious implications for the safety of pedestrians, cyclists, and motorcyclists. Two-wheeled riders, including cyclists, motorcyclists, and pedestrians, contribute to over 36% of all fatal crashes in India. The age group between 18 and 45 represents 69% of the fatalities, impacting national productivity. The distribution of road accident fatalities and injuries in India varies based on age, gender, month, and time. The age group of 30-59 years is identified as the most vulnerable population, with males experiencing higher levels of fatalities and injuries compared to females. Additionally, road accidents tend to be more prevalent during extreme weather conditions and working hours (Singh, 2017).

Rosen et al. (2022) conducted a study on global road traffic death rates and found that there was a significant decrease overall between 2010 and 2016. However, this positive trend was not consistent across all regions, as low-income countries (LICs) and specifically the African Region experienced an increase in death rates during that period. The study emphasized the role of a country's income level, indicating that low and middle-income countries (LMICs) had higher death rates compared to high-income countries (HICs). Additionally, the study evaluated the progress in implementing recommended policies and practices based on the five pillars of road safety. Their findings revealed a sluggish advancement in achieving key road safety indicators,

suggesting limited progress in the implementation of these important measures. Furthermore, the slow progress in implementing recommended road safety policies and practices highlights the need for concerted efforts to effectively improve road safety and reduce fatalities. Legislation and enforcement interventions have demonstrated effectiveness in LMICs, it is essential to expand research efforts to evaluate other interventions. Additionally, embracing holistic approaches that consider the complexities of road transport systems can yield more significant and sustainable advancements in road safety (Tavakkoli, 2022).

India faces a significant issue of road safety, with a notable occurrence of road traffic accidents leading to fatalities and injuries (Gururaj, 2014). Despite the implementation of several policies and programs by the government, the problem continues to persist due to various challenges in their execution. To effectively address this issue, it is imperative to develop a comprehensive framework that relies on reliable data and involves the collaboration of multiple stakeholders. This coordinated approach will enable the implementation of solutions more effectively and holistically (Mohan, 2020). By bringing together government agencies, private sector organizations, civil society groups, and other relevant stakeholders, a collaborative effort can be made to tackle road safety challenges in India (Krishna, 2023).

Road traffic injuries in Nepal are on the rise, but there is limited effort to promote the development of a safer road system (Giri et al., 2023). Negligent behavior by road users is identified as a major contributor to accidents in Nepal (GoN, 2013). To combat this issue, it is crucial to enhance knowledge and awareness among road users, which can positively influence their decision-making and encourage safer road practices. Furthermore, addressing challenges such as poor road design, construction, and maintenance, as well as inadequate vehicle standards is imperative. The lack of investment and enforcement of existing road safety legislation also presents a hurdle. To enhance road safety, it is vital to focus on modifying road user behaviors, improving road planning and maintenance practices, and strengthening governance and enforcement mechanisms is vital (Pandey, 2022). Efforts to enhance road traffic safety have been undertaken by countries and international organizations globally. To effectively improve road safety, it is crucial to foster mutual understanding and communication among stakeholders from different countries and organizations (Morimoto et al., 2022). This collaboration allows for the exchange of knowledge and experiences, the harmonization of standards, the identification of

shared challenges, resource sharing, and the development of advocacy and policies. Furthermore, it is crucial to comprehend the various factors that contribute to accidents. Merely enforcing traffic rules and imposing strict penalties will not be sufficient to resolve this ongoing issue. The transformation of mindset among drivers, and other road users, along with a realization of their responsibilities, is necessary to bring about a meaningful change. Addressing the present challenges and requirements of road safety necessitates strong political commitment and the implementation of comprehensive strategies. By incorporating these multi-faceted approaches, it is possible to create a safer road environment and reduce the incidence of road traffic accidents.

4. Conclusion

Nepal and India share a unique and diverse relationship characterized by shared cultural, religious, and trade ties. Both countries face challenges in developing and maintaining their road transportation infrastructure due to their varied geographical terrain. Despite witnessing growth in their road networks, there remains an urgent need for further investments to meet the growing demands of transportation. Road injuries pose a significant public health challenge, leading to preventable fatalities and disabilities, causing social and economic costs for both nations. The comparative study on road transportation and safety practices in Nepal and India revealed several important findings. In terms of road safety measures, India has a more comprehensive framework, with a higher level of regulations and standards across the five pillars of road safety, compared to Nepal. Both countries need to continue working towards strengthening their road safety practices reducing accidents and fatalities on the roads. Key legislative factors related to road safety also need improvement in both countries to ensure the safety of road users. The study highlighted the risks faced by road users in both Nepal and India, emphasizing the need for effective road safety measures to reduce fatalities and improve overall safety on the roads. To effectively combat road safety challenges in Nepal and India, a comprehensive and collaborative approach involving multiple stakeholders is essential. This approach should focus on modifying road user behaviors, improving road planning and maintenance practices, and strengthening governance and enforcement mechanisms. Additionally, fostering mutual understanding and communication among stakeholders from different countries and organizations can lead to harmonization of standards, resource sharing, and the development of effective policies and advocacy. By incorporating multi-faceted approaches and strong political commitment, both

Nepal and India can create a safer road environment, reduce road traffic accidents, and protect the well-being of their citizens. Continuous efforts to enhance road safety will lead to improved economic progress, reduced healthcare costs, and an overall improvement in the quality of life for the people of both nations.

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