

How Safe Are Nepal's Roads? A Study of Road Safety Legislation and WHO Standards

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ABSTRACT

Around the world, traffic accidents result in significant catastrophes. The consequences of traffic accidents go far beyond the immediate suffering of the individuals involved. This paper aims to examine the road safety legislation and WHO standards adopted in Nepal. The paper is based on secondary data and policy documents related to road safety and WHO standards in the context of Nepal. It presents Nepal's road network, significant improvements in road safety indicators, and encouraging advancements in road safety. The study finds five major areas for improvement in road safety laws in Nepal: seat-belt regulations, helmet laws, speed laws, child restraint laws, and drinking and driving laws. The study also reveals that Nepal's current regulatory framework needs to be improved by monitoring actual appropriate helmet fastening and standardization. There is a lack of precise BAC restrictions for drivers and insufficient speed limits under WHO recommendations. Nepal's child restraint rules also need to be expanded to include seat belt usage in all cars and forbid children from sitting in the front seats. To close those regulatory gaps and protect Nepalese citizens' safety on the roads, it ends by providing a strict set of recommendations, such as increased enforcement, public awareness campaigns, and changes to road design and concrete making plans. Policymakers, researchers, and stakeholders working to promote street safety measures in Nepal and abroad would find great assistance from this article, which offers a detailed examination and smart recommendations.

Keywords: Road safety, Child restraint laws, Drinking and driving, Helmet laws, Seat-belt regulations, Speed laws, WHO standards

53

Introduction

Around the world, traffic accidents result in significant catastrophes, with an estimated 11.9 million fatalities and 20 to 50 million non-fatal injuries annually. The fact that traffic injuries are the primary cause of death for children and adolescents is especially concerning for ages 5–29 are the most common, making about two-thirds of deaths in the 18–59 age range. Although over 60% of vehicles worldwide are found in low-income and middle-income nations, which also bear the majority of the issue as nine out of ten fatalities (WHO, 2024).

The consequences of traffic accidents go far beyond the immediate suffering of the individuals involved. They also have a substantial financial impact on victims, their households, and the economies of entire countries. The cost of medical care for the wounded and the lost production of the deceased or crippled contribute to the predicted 3% decline in the gross domestic product of countries. This complex effect highlights the urgent need for all-encompassing avenue protection initiatives, including infrastructure improvements, education, and strict adherence to visiting laws to lessen the catastrophic effects of road traffic accidents (RTA) globally (WHO, 2023).

The World Health Organization's (WHO) most recent figures demonstrate the main obstacles that road traffic fatalities face worldwide. A staggering 28% of these deaths take place in the Southeast Asia region, with the West Pacific and Africa following at 25% and 19%, respectively. This shows that there are global problems with road safety that affect vulnerable users like cyclists (6%), pedestrians (23%), motorcyclists (21%), and e-scooters. Overall, 53% of traffic deaths can be attributed to the 3% of micromobility device users. Despite these concerning numbers, the range of pedestrian fatalities increased by 3% between 2010 and 2021, reaching 274,000, while the range of bicycle fatalities increased by nearly 20% at some point over the same period, reaching 71,000. Inadequate safety measures exacerbate these concerns; just 0.2% of roads have designated bike lanes, and 80% of roads worldwide do not meet pedestrian safety standards, placing vulnerable users of the road at a disproportionate risk. Moreover, 25% of states want to pass laws that promote walking, bicycling, and public transportation, despite the fact that 90% of people consider themselves to be pedestrians. This highlights the critical need for a comprehensive global road safety strategy.

Objective

This research paper aims to examine the current state of road safety legislation and its alignment with World Health Organization (WHO) standards in Nepal. The study seeks to assess the comprehensiveness and effectiveness of Nepal's road safety laws, regulations, and enforcement mechanisms in promoting safer roads and reducing traffic-related fatalities and injuries.

Literature Review

It is essential to understand the theoretical underpinnings of traffic safety to effectively avoid and reduce accidents. Haddon matrix and the Swiss cheese model offer important insights into the multifaceted nature of accidents and associated management approaches. William Haddon Jr. created the Haddon Matrix, which illustrates the interactions between people, cars, and the environment before, during, and following an accident. This helps identify what has to be done to prevent accidents and lessen their effects (Rustagi et al., 2018). The Swiss Cheese Model by James Reason emphasizes the need for a few safety measures to prevent dangers from aligning and causing injuries by equating mishaps to gaps in layers of defense (Larouzee & Le Coze, 2020).

Numerous studies have demonstrated that the primary cause of traffic accidents is human error. These include infractions for driving while intoxicated, exhaustion, tiredness, and distractions (Manandhar, 2022). Errors that lead to traffic accidents can happen to drivers, passengers, and vulnerable road users like motorcyclists, cyclists, and pedestrians (Olszewski et al., 2016; WHO, 2024). Extreme speeding (Islam & Mannering, 2020), emotional driving (Zhang et al., 2022), inexperienced drivers (Stipdonk, 2017), alcohol consumption (Manandhar, 2022), and long-distance driving (Longman et al., 2020) are the most frequent driving faults. Furthermore, by diverting other drivers' attention, passengers may raise the chance of traffic accidents (Khan et al., 2020). Pedestrianrelated traffic accidents include walking on the road, swerving in front of oncoming traffic, and crossing roadways away from crosswalks to approach points (Ojha, 2021).

Riding at a faster pace will increase the probability of an accident and the impact of it. For every 1% increase in suggested speed, there is a 4% increase in the likelihood of a fatal crash (Doecke et al., 2020). Driving while intoxicated or under the influence of several psychiatric medications increases the risk of serious traffic accidents. A rise in blood alcohol content (BAC) significantly raises the risk of getting into an accident when driving under the influence (Ferreira et al., 2021).

For the safety of drivers and passengers, it is crucial to ensure adherence to vehicle safety standards (Bhalla & Gleason, 2020; WHO, 2019). Characteristics like overloading, improper handling or modification of vehicles used for training or public transportation, mismatched tires, weak brakes, bad lighting, and poor maintenance are responsible for RTAs (Wen et al., 2022).

Research on motorcycle accidents involving two riders shows that wearing a helmet reduces the risk of fatality by 34% (Dee, 2009). In addition, studies comparing states across the US demonstrate that those with helmet laws had fewer fatalities overall than those without emphasizing the importance of helmet laws in reducing roadside deaths (Brockhus et al., 2024). Seat belts are necessary safety equipment since they significantly reduce the number of fatal motor vehicle accidents and catastrophic brain injuries. Wearing seat belts lowers the risk of internal brain injuries from traffic accidents and increases the number of fatalities. Wearing a seat belt has been associated with a 51% decrease in RTA-related in-hospital mortality (Siegel et al., 1993).

Enforcing and implementing legislation concerning critical risk factors such as speeding, intoxication, wearing a motorcycle helmet, using a seat belt, and using child restraint systems are essential components of a holistic approach to reducing road traffic fatalities in countries. For legislation to be effective, it must be coordinated with enforcement actions, public awareness campaigns, and, in some cases, in-vehicle measures like seat belt availability and functionality. Regulations and oversight mechanisms for driver and rider licensing and disqualification must also be coordinated. To increase the perceived risk of being discovered and punished, police enforcement measures should be swift, frequent, and prolonged. To increase the chance of being caught, they should also be widely dispersed and random (WHO, 2019).

Methodology

This research employs a secondary data analysis approach, utilizing existing data sourced policy documents. These documents from include government reports, official statistics, and legislative text studies from the WHO, Ministry of Finance, Ministry of Health and Population, and Traffic Police. The data extracted from these sources provide a comprehensive overview of the policies under review. This study adopts a descriptive and analytical research design. The descriptive aspect involves a systematic presentation of the policies, their objectives, and their outcomes. This is followed by an analytical review, which assesses the effectiveness, efficiency, and equity of the policies.

Results and Discussion

Status of Road Safety in Nepal

By mid-March 2023, Nepal's improvements in road safety and infrastructure could be widely recognized. The nation's dedication to enhancing access to those areas is seen in the 34,100 km of roads, 7,956 km of gravel roads, 8,664 km of muddy roads, and 17,480 km of blacktopped roads (Ministry of Finance, 2023). Road safety precautions have been enhanced in addition to this strategy goal. RTA mortality in Nepal fell dramatically between 2013 and 2022; the mortality rate varies between 34 and 9.4 deaths per 100,000 people (Ministry of Health and Population, 2023). This encouraging trend highlights how successful continuous efforts to enforce traffic laws and put preventative measures in place have been. As it proceeds along this path, Nepal's development objective continues to be centered on protecting lives and promoting safe mobility.

Vehicle involved in RTA

Understanding the function of cars involved in road traffic accidents (RTAs) is crucial for road safety and accident research. over the fiscal years (FY) 2019/20 and 2021/22 is depicted in the Source: Compiled by author (Nepal Police, 2020, 2022).

Figure 2. There have been amazing changes in the types of cars that cause injuries over this timeframe. The percentage of motorbikes involved increased significantly, from 42.14% to 50.72%, suggesting a higher risk of motorbike-related injuries.

Table 1

Number of Vehicles Involved in RTA

Type of vehicles involved in RTA	FY 2019/20	FY 2021/22
Motorbikes	10,867	19,974
Jeep, Cars	7,564	8,975
Buses and Microbuses	2,937	3,170
Trucks and Trippers	2,635	3,248
Others	1,785	4,012

Note. Compiled by author (Nepal Police, 2020, 2022).

Figure 1

Percentage of Vehicles Involved in RTA



Note. Compiled by author (Nepal Police, 2020, 2022).

The distribution of vehicles involved in RTA On the other hand, the proportion of injuries caused by jeeps and cars decreased, falling from approximately 29.33% to 22.79%. In addition, the percentage of trucks and trippers, as well as buses

and microbuses that participated in RTA decreased; the former went from roughly 11.39% to 8.05%, while the latter fell from 10.22% to 8.25%. It's important to note, too, that class others, such as tempos, had an increase in excavator accidents from 6.92% to 10.19%, suggesting a spike in injuries associated with less specifically classified vehicle types.

To assess the mortality and social impact of RTAs, it is crucial to consider the severity and consequences of these incidents, with a particular focus on deaths, serious injuries, and minor injuries.

Deaths, Major Injuries, and Minor Injuries

Table 2

Trend of Road Accident Data

Accident Details	2018/19	2019/20	2020/21	2021/22
Death	2,789	2,255	2,500	2,883
Major Injuries	4,376	4,617	6,448	7,282
Minor Injuries	10,360	11,225	18,600	25,722

Note. Compiled by author (Nepal Police, 2020, 2022).

Figure 2

Percentage of Vehicles Involved in RTA



Note. Compiled by author (Nepal Police, 2020, 2022).

The percentage of deaths due to accidents has consistently decreased, from roughly 15.91 percent in 2018/19 to about 8.03% in 2021/22, presented on Source: Compiled by author (Nepal Police, 2020, 2022).

Figure 2, indicating improvements in emergency response systems or safety measures intended to lower mortality. On the other hand, while the percentage of primary injuries has continued to rise spectacularly, from roughly 24.97% to roughly 20.29%, the percentage of child accidents has consistently increased, rising from about 59.12% to roughly 71.67%.

Fine Against Drink and Drive

One of the biggest issues in emerging nations is drunk driving. The fine amount accumulated demonstrates the rule breach and likelihood of RTAs.

Table 3

Status of Fine against Drink and Drive

FY	2019/20	2020/21	2021/22
NPRs. (in million)	11.0831	20.803	27.572
NPRs. (in million)	11.0831	20.803	27.572

Note. Compiled by author (Nepal Police, 2020, 2022).

Represents there were thousands of Nepalese Rupees (NPRs.) in fines for alcohol riding in the FY 2019/20, 2020/21, and 2022–2022. The amount

of fines has increased significantly over time, rising from NPRs. 11.0831 million in 2019–20 to NPRs. 27.572 million in 2021/22.

Figure 3

Fine against Drink and Drive



Note. Compiled by author (Nepal Police, 2020, 2022)

Understanding the time of road crashes provides insight into the intensity of traffic flow and the behaviour of road users. Figure 4 offers insights into the temporal distribution of street crashes over the course of three consecutive FYs: 2019/20, and 2020/21 in different time frames. First off, the range of collisions from 00:00 to 06:00 reveals a rather high number of avenue crashes, ranging just slightly between roughly 4.31% and 5.37%. This consistency suggests that there is a consistency in street crashes during the early hours of the day, which is likely due to factors like improved driver weariness and a drop in the number of site visits.

Table 4

Number of Cras	hes DURING	Different	Timeframes
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Time of Road Crash	2019/20	2020/21	2021/22
00:00-06:00	835	889	1,117
06:00-12:00	4,268	4,979	5,796
12:00-18:00	5,965	8,194	9,643
18:00-00:00	4,486	6,578	7,970

Note. Compiled by author (Nepal Police, 2020, 2022).

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Note. Compiled by author (Nepal Police, 2020, 2022).

Figure 4

Table 5

Percentage of Crashes During Different Timeframes



Note. Compiled by author (Nepal Police, 2020, 2022).

Conversely, during the three FYs, there has been a downward trend in the likelihood of street crashes during the early hours of 06:00 to 12:00. The percentages decreased from roughly 27.44% in 2019/20 to roughly 23.63% in 2021/22, suggesting a decline in the number of traffic accidents during the late morning hours. Increased awareness efforts aimed toward early commuters or improved avenue infrastructure could be the cause of this reduction.

The percentage of traffic accidents during the afternoon hours of 12:00 to 18:00 is remarkably consistent, rising between approximately 38.35% and 39.70% across the years under study. This balance demonstrates a continuous level of street accident activity throughout the afternoon, which is most likely caused by elements such as rush-hour site visitors or increased industrial activity during daylight hours.

Finally, there is a little increase in the percentage of traffic crashes during the evening and midnight hours of 18:00 to 00:00, from roughly 28.84% in 2019/20 to almost 32.50% in 2021/22. This increase indicates a growing trend in nighttime road crash incidents, which is probably fueled by factors like decreased visibility or an increase in drunk driving incidents. Overall, even if there are variations in the likelihood of street crashes across different periods, the data shows particularly strong trends with minor variations in the frequency of avenue crashes at certain points during the day.

Legal Framework and Policies Related to Road Safety

Road safety legal frameworks and policies encompass regulations and strategies to promote safe practices, reduce accidents, and protect road users through enforcement, infrastructure

improvements, and awareness campaigns. An effective lead agency responsible for implementing a comprehensive safety program and supervising the national road safety program is essential to this endeavor. This particular one is managed by the Ministry of Physical Infrastructure and Transport in Nepal. The department is responsible for managing and evaluating essential services such as law enforcement, communication, and road safety preventive measures. Moreover, the Department of Roads, Traffic Police, and other governmental and non-governmental groups comprise Nepal's network of avenue protection tracking agencies. These authorities work together to guarantee the effective implementation and enforcement of street protection measures throughout the nation. This deliberate effort demonstrates Nepal's dedication to raising the bar for avenue protection and preserving people' lives on the roads.

Figure 5



Figure 5 Number of Countries Meeting WHO Guidelines for Road Safety

Drink and Driving Laws

The WHO 2022 report provides an insightful account of the dynamic global road safety landscape, highlighting the fact that only a small number of countries have adopted complete legislation that is in line with WHO's gold standard for addressing critical risk factors. Remarkably, only 6 nations have developed legal frameworks that effectively address each of the five major risk factors,21 more countries have remarkably passed legislation that satisfies WHO standards for four of them, demonstrating a laudable commitment to protecting road users. But there are still issues: 25 countries deal with three of the five risk factors, 35 deal with legislation that covers two, and 53 concentrate on just one of the most important risk factors. What is most troubling

is that 54 nations do not have regulations for any of the major risk factors that have been identified that comply with WHO best practice guidelines. This urgent plea highlights the need for coordinated global efforts to close this legal gap and open the door to safer roads everywhere (WHO, 2024).

The WHO uses specific standards to assess laws on drunk driving, with a focus on BAC levels for both the public and younger or inexperienced drivers. An excellent drink-driving rule, as defined by the WHO, places a maximum BAC limit of 0.05 g/dl on the public and a minimum limit of 0.02 g/dl on younger or inexperienced drivers. A nation that satisfies both requirements shows initiative in combating alcohol consumption and enhancing traffic safety protocols.

Note. (WHO, 2024).

Nepal's Status in Drink and Driving Law		
WHO standard law	Nepal status	
BAC limit, general (g/dl)	No	
BAC limit, young/novice drivers (g/dl)	No	

Note. (Global Road Safety Statistics).

Legal guidelines about drunk driving exist in Nepal, a sign that the dangers of driving while intoxicated are acknowledged. Nevertheless, there are no specific BAC limitations in the regulations for the public, young drivers, or amateur drivers. Although regulations specifically targeting drunk driving are a great start, the lack of BAC limits presents challenges for effectively controlling and discouraging this risky behavior on the roadways.

Table 7

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WHO standard law	Nepal status
Speed limit on urban roads (km/h)	40 km/h
Speed limits on rural main roads (km/h)	80 km/h
Speed limits on motorways (km/h)	80 km/h
Urban limits can be locally modified	Yes

Note. (Global Road Safety Statistics).

The fact that speeding accounts for half of all road fatalities, particularly in low- and middle-income nations, emphasizes the necessity for enforcement. In contrast, speed limits are responsible for roughly 30% of road fatalities in high-income nations or regions. This is because of speed. Studies have indicated that a mere 5%

Helmet Laws

Table 8

Nepal's Status on Helmet Laws

WHO Standard Law	Nepal status
Helmets required by all riders	Yes
Helmets required on all roads, all engine types	Yes
Helmets must be properly fastened	No
Urban limits can be locally modified	Yes

Note. (Global Road Safety Statistics).

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Over Speeding Laws

Two key components of the WHO evaluation criteria for speed legislation are national speed limits that are subject to adjustment by local governments and maximum speed restrictions of no more than 50 km/h in urban areas. Remarkably, just 46 nations in the globe currently fulfill those standards, necessitating the widespread adoption of faster speed restrictions to implement global car safety regulations.

decrease in mean velocity can result in a 30% decrease in fatalities, underscoring the noteworthy influence of speed control strategies on traffic safety consequences. In the context of Nepal, the speed limits set in urban areas align with WHO's criteria, as they do not exceed 50 km/h, and local authorities have the authority to modify these limits.

According to the WHO, wearing a wellknown motorcycle helmet can significantly reduce the risk of fatalities by more than 40% and serious injuries by around 70%. Nevertheless, even with those obvious advantages, only a small number of countries worldwide have helmet regulations that adhere to best practices. WHO assesses laws pertaining to the use of bike helmets based on specific criteria, stressing that an excellent rule should require all riders—drivers and passengers to wear helmets on all roads and with all types of engines. In addition, the regulation should specify that the helmet must be properly fastened and adhere to a specified helmet standard.

In order to comply with WHO standards, Nepal mandates that all motorcyclists wear helmets on all highways and while using any kind of machinery. However, Nepal's helmet rules do not match WHO standards for adequate helmet fastening or quality standards. There is an opportunity for improvement to bring national regulations into line with international best practices and ensure the highest level of protection for riders and passengers. To make helmet laws even more effective in lowering the risk of motorcycle fatalities and serious injuries, they must meet all of those requirements.

Seat-belt Laws

The WHO adopts standard criteria to assess if a nation's seat belt laws meet ideal norms while evaluating national laws. The influence of required seat belt laws on rear passengers has been extensively studied; according to well-practice criteria for belt wearing, seats can reduce the number of seat belts worn by up to 50% for front seat occupants and 25% for back car occupants. Following WHO recommendations for effective seat-belt regulation, 105 countries have comprehensive laws promoting the use of seat belts for both front and rear seat occupants. As a result, road safety has improved for all occupants and demonstrates significant global efforts.

Table 9

Nepal's Status on Seat-belt Law

WHO Standard Law	Nepal status
Good seat-belt laws	No
Seat-belts required for drivers and front passengers	Yes
Seat-belts required for rear passengers	No

Note. (Global Road Safety Statistics).

In Nepal, rear passengers are exempt from the law requiring seat belt use, even if drivers and front passengers are. Because of this, Nepal's seat belt laws do not satisfy the WHO's standards for "good" seat belt legislation. While mandating seat belt use for drivers and front passengers is a positive start in the right direction, it is imperative to expand this requirement to rear passengers to guarantee that all automobile occupants are wearing safety belts.

Child Restraint Laws

Table 10

Nepal's Status on Seat-belt Law

WHO standard law	Nepal status
Good child restraint laws	No
Child restraint required up to 10 yrs/135 cm	No
Restrictions on children sitting in front	Not restricted

Note. (Global Road Safety Statistics).

The WHO has established standards for "good" child restraint laws, and Nepal's infant restraint laws do not fulfill these requirements. The guidelines established by the WHO for evaluating laws pertaining to infant restraints include requirements that children use a child seat until they are at least 10 years old or 135 cm tall, affiliation with a reputable brand for baby restraints, and prohibitions on children under a specific age or height from using the front seat. According to data compiled by the WHO, 33 nations have adopted laws that meet the highest criteria of good practices for baby restraints.

Table 11

Nepal's	Status	on	Child	Restraint	Law
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WHO Standard Law	Nepal status
Good child restraint laws	No
Child restraint required up to 10 yrs/135 cm	No
Restrictions on children sitting in front	Not restricted
Urban limits can be locally modified	Yes
Laws refer to a standard for child restraints	No

Note. (Global Road Safety Statistics).

According to Nepal's law, there are no newborn restraint requirements, and toddler seats are not necessary for the child. They also do not address the issue of toddler restraints in general. Furthermore, there are no rules prohibiting children under a certain age or taller from using the front seat. Consequently, Nepal's toddler restraint law no longer complies with the WHO's standards for strong infant restraint laws.

Discussion

To combat drink and driving, Nepal urgently needs a comprehensive road safety plan that includes increased police presence, stringent adherence to seat belt and helmet laws, and high BAC restrictions for drivers (Atreya et al., 2021). Legislative bodies must be made more aware of the critical importance of street safety measures, and they must be given evidence-based guidelines derived from global best practices. To ensure that strong regulations are enacted to reduce injuries and fatalities, stakeholders must communicate with lawmakers. Universal road protection effects can also be further enhanced by integrating land-use planning and route layout to emphasize accessibility to essential services and pedestrian safety (Pandey et al., 2022). A combination of correctional system reforms and public awareness campaigns is necessary to achieve long-term compliance and significantly reduce the incidence of street injuries.

Authorities must give land-use planning and pedestrian-friendly road design a priority in addition to the previously outlined actions. This strategy currently enhances pedestrian safety while also facilitating more access to vital community services like stores, schools, hospitals, farms, public transportation hubs, and community events. In addition to fostering more sustainable and healthy settings, this integrated approach to urban planning lowers accident risks and strengthens social cohesiveness (Ojha, 2021; Whitelegg J., 2012). Road safety legislation in Nepal has been evolving to address the critical challenges posed by increasing traffic fatalities and injuries. Recent efforts have focused on aligning national laws with international standards, particularly those set by the World Health Organization (WHO). The Nepal Road Safety Action Plan (2021-2030) aims to enhance road safety governance by revising key legislative frameworks, including the Motor Vehicle and Transport Management Act and the Public Roads Act (Yadav et al., 2024). Despite these advancements, significant gaps remain in the implementation and enforcement of these laws,

primarily due to the limited capacity of the National Road Safety Council (NRSC) to coordinate and regulate road safety initiatives effectively. Moreover, the lack of a dedicated Road Safety Fund and insufficient resources hinder the development of a comprehensive road safety strategy (Gain & Mishra, 2021:2022). As road traffic accidents continue to impose substantial socioeconomic burdens on the country, it is imperative for Nepal to strengthen its legislative framework and institutional capacity to ensure safer roads for all users.

Conclusion

The study finds five major areas for improvement in road safety laws in Nepal: seat-belt regulations, helmet laws, speed laws, child restraint laws, and drinking and driving laws. The study also reveals that Nepal's current regulatory framework needs to be improved by monitoring actual appropriate helmet fastening and standardization. There is a lack of precise BAC restrictions for drivers and insufficient speed limits under WHO recommendations. Nepal's child restraint rules also need to be expanded to include seat belt usage in all cars and forbid children from sitting in the front seats.

The socio-cultural factors influencing road safety practices in Nepal should be evaluated with the efficacy of public awareness campaigns, enforcement strategies, and the financial impact of accidents on the roads. Based on Nepal's current road safety laws and WHO recommendations, the government and policymaker may concentrate their efforts on improving road safety practices in Nepal.

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