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Research paper

Mapping Road Traffic Injury in India: Causes, Prevention, Economic Impact, and Role of Public Health Governance

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Abstract

Road Traffic Injuries (RTIs) represent the main reason for fatalities globally and are acknowledged as a significant national health problem. RTIs affect the victims and also have a profound impact on the family and relations. The socio-economic conditions of families, and consequently society and the nation, are negatively influenced by these incidents. A significant number of deaths on the roads involve cyclists, motorcyclists, and pedestrians. The prevalence of RTIs is particularly high in African and other middle-income countries, while developed nations experience comparatively fewer incidents. Each year, RTIs result in approximately 1.2 million deaths worldwide (WHO, 2018), marking them as a primary, preventable cause of mortality. Global attention has shifted towards the critical need for road safety, particularly with the endorsement of the 2030 Agenda for Sustainable Development Goals (SDGs). Implementing robust legal enforcement could lead to behavioural changes among road users. India ranks among the highest in the world for road accident-related fatalities. Adhering to safety measures such as using helmets, wearing seat belts, maintaining appropriate speeds, and following traffic regulations would significantly reduce Road Traffic Injuries. Stakeholders in road safety must be made aware of the economic costs, Disability Adjusted Life Year (DALY), and human losses associated with RTIs and their repercussions. This paper aims to outline the existing RTI situation, its causes, preventive strategies, magnitude of economic burden, costs involved in RTI, catastrophic health expenditure, Return on Investment (RoI) in Trauma Care Systems, Financing mechanisms, Governance, and the Health sector's role in addressing RTIs. The findings indicate that road accidents are the predominant reason for mortality in India (with many incidents being underreported or undocumented), and the state must take a proactive approach to tackle this issue by fostering strong connections among various stakeholders, while the health sector should implement a multifaceted strategy to manage RTIs.

Keywords: *Disability, Economic Burden, Mortality, Prevention, Public Health, Trauma Care, Road Traffic Injury*

1. Introduction

The World Report on RTI prevention (Peden, 2004) emphasizes that the productive population globally is more susceptible to hospitalization, permanent disability, and mortality due to RTIs compared to many other diseases. RTIs, categorized as unintentional injuries, account for the majority of fatalities among pedestrians, motorcyclists, and cyclists worldwide. Factors like globalization and liberalization, the growth of the motor vehicle industry, increasing purchasing power, easy access to vehicle financing, and media promotion have all contributed to the rise in the number of motor vehicles on roads in both developed and developing nations. RTI-related disabilities are rising notably in emerging economies and are directly linked to poverty and livelihood issues. The economic burden is substantial, stemming from direct costs such as prolonged medical care, property damage, vehicle repairs (especially without insurance), inadequate legal enforcement, and funeral expenses, along with indirect costs like depleted savings, job loss, decreased productivity, and various social and opportunity costs. A study by the World Bank has demonstrated that the economic advancement of regions and countries correlates with a rise in injuries and fatalities due to road accidents (Kopits, 2005).
WHO (2015) states that many individuals globally lose their lives due to RTIs during their productive years, specifically between 15 and 29 years, which adversely impacts both family and national economies. For many years, RTIs have not been adequately prioritized in the global health and geopolitical agenda, despite being both predictable and preventable. Geopolitical institutions have only recently begun

to make strategic efforts to eliminate preventable RTIs, initiating research related to these incidents.RTI creates a major economic burden as it costs heavily on the Gross Domestic Product in India and also affects the economic condition of the victim's family. It has both direct and indirect costs and causes the victims' families to have catastrophic health spending that affects their economic stability. This paper aims to examine the current situation of road traffic injuries (RTIs), identify their underlying causes, explore preventive strategies, assess the economic burden of RTI and Return on Investment (RoI) in trauma care, Financing mechanisms and Governance, and assess the role of the health sector in addressing RTIs.. Research into RTIs has considerable potential in India, as the country's high population numbers contribute to a greater incidence of injuries and fatalities resulting from RTIs.

2. Review Methods

A comprehensive literature and data search was conducted utilizing various online search engines. Additionally, information was gathered from national reports, including those from the National Crime Records Bureau of the Ministry of Home Affairs, Road Transport and Highways, the Ministry of Health and Family Welfare, the Ministry of Social Justice and Empowerment, as well as international reports from the World Health Organization. The author examined peer-reviewed articles published in reputable journals that pertain to the topic of Road Traffic Injury, its causes, preventive measures, and the health sector. The online search employed keywords such as road traffic injury, mortality, health policy, preventive measures, economic burden, Financial Governance, road accidents, fatal injury, and trauma.

2.1 Global Scenario

Global status report on Road safety 2023, published by WHO, states that globally 1.19 million lose their life in Road accidents, and the United Nations Decade of Action on Road Safety 2021-2030 plans and implements programmes to drastically reduce the number of deaths by 2030. (WHO,2023). Road traffic injuries (RTIs) are a harmful consequence of increased motorization and represent a significant global public health challenge that necessitates efforts to prevent, limit, or manage RTI-related illness and fatalities (Iris Borowy, 2013). RTIs result from the complex interactions among road users, vehicles, road infrastructure, legal and logistical traffic organization, and medical care systems. They predominantly occur due to issues such as a lack of self-control, improper behaviour by individuals, corporate negligence, insufficient administrative oversight, weak law enforcement, inadequate public maintenance and healthcare services, flawed transportation planning, and poverty (Iris Borowy, 2013). For many years, the World Health Organization (WHO) has worked to throw light on "Accidents and their Prevention." In 1962, only RTIs were officially recognized as a "public health problem of the highest significance" (Iris Borowy, 2013). Thanks to WHO initiatives, RTIs have begun to be viewed as a global epidemic synonymous with vehicular manslaughter and a war on roads. RTIs account for 90% of deaths in developing nations, significantly impacting individuals from lower socioeconomic backgrounds, even in developed countries. Individuals aged 15 to 44 years constitute 48% of global traffic fatalities. Males are highly affected by accidents when compared with women. The severity of injuries resulting from road crashes can range from immediate death to cases requiring only basic first aid. Predictions indicate that between 2000 and 2020, road traffic fatalities will rise in developing countries, and without suitable interventions, RTIs have become the third leading cause of global disease burden and injury (Murray, 1996).

2.2 Indian Scenario

Road Accidents in India 2023, published by the Ministry of Road Transport and Highways, states that in India, road accidents killed 1.73 lakh people and 4.63 lakh people in 2023. The majority of the people died in the age group of 15 – 49 years. The state of Tamil Nadu recorded the highest number of Road Accidents on National highways, and in Uttar Pradesh, the highest number of people killed. (GoI,2023). The International Road Federation's World Road Statistics 2015 indicates that India had the second-highest rate of road traffic fatalities, with 11 per 100,000 residents, while the Russian Federation ranked first. As the largest nation in South Asia, India has a high level of road traffic injuries (RTI) per 1,000 vehicles globally (Mohan, 1984). RTIs rank as the main reason for death in India, significantly impacting hospitalizations, fatalities, disabilities, and economic losses, particularly in young and middle-aged individuals (IDSP, 2004). India boasts one of the most extensive road networks, approximately 3.32 million km long, comprising national, state, district, and village roads. Predominantly, the road users in India are two-wheeler riders, cyclists, and pedestrians, who face a heightened risk of RTIs due to their direct involvement in road crashes. It is estimated that nearly 50%-60% of all road traffic fatalities in India occur at the accident scene or during the transfer to a hospital (first wave), 20%-30% happen during hospitalization (second wave), and 5%-10% after a patient is discharged (third wave) (Peden, 2004). In 2015, Indian roads, already the deadliest in the world, became even more perilous as the death toll rose nearly 5% to 146,000. This equates to 400 deaths daily or one life lost every 3.6 minutes, a situation termed a "daily massacre on our roads" by experts. The National Crime Records Bureau reported an average of 17 fatalities per hour from road accidents throughout 2015 and it has increased to 153,972 deaths in 2021 according to Road Safety in India – Status Report 2023(Tiwari, G., Goel, R., & Bhalla, K.,2023)More Indians lose their lives annually in road accidents than the total military casualties endured by the nation during all conflicts since independence. Data on RTIs is sourced from police records and hospitals, but due to factors such as fear of law enforcement, lengthy legal processes, and difficult access to medical facilities, many deaths and a significant number of injuries go unreported.
Union Minister of Road Transport and Highways, Mr. Nitin Gadkari, has stated in the Parliament that in 2024,1,78,000 people have lost their lives in road accidents, and 60 percent of the victims are in the age group of 18-34 years.

Table 1: Number of Road Accidents in India - 2024

State	Number of Road Accidents
Uttar Pradesh	23,652
Tamil Nadu	18,347
Maharashtra	15,366
Madhya Pradesh	13,798

Source: MoRTH as published by Hindustan Times (2024)

3. Causes for Traffic Accidents and Injuries

Rising speeds, lack of helmet usage, driving under the influence, distractions from cell phones, poor visibility, running red lights, inadequate enforcement of safety regulations, and insufficient trauma care are some contributors to road traffic injuries (RTI) in India (Ruikar,

2013). The significant issues in India that lead to fatalities related to RTI include the absence of first aid facilities, delays in transporting patients, extended travel times between the accident site and hospitals, and insufficient resources in public sector hospitals. An adult pedestrian has a 60% risk of death when struck by a vehicle traveling at 80 km/h (WHO, 2018). Vehicles operating at high speeds in neighborhood and school areas are more likely to be involved in RTIs. Drinking and driving pose a considerable risk, especially for young and inexperienced drivers, when blood alcohol concentration exceeds 0.04g/dl. Distracted driving caused by mobile phone usage and text messaging contributes to impaired driving. According to the Global Status Report on Road Safety by WHO (2015), 80% of vehicles sold across various countries do not meet essential safety standards. The WHO's Safe System approach emphasizes the need for behavioural changes among road users to minimize RTI. In New Delhi, one-third of motorized two-wheeler riders taken to hospitals reported riding under the influence of alcohol (Mishra BK, 1984). In India, Road Safety Week is observed during the second week of January each year to raise public awareness regarding the causes and effects of road safety issues. Despite various initiatives, including the enforcement of road safety laws, RTI remains a leading cause of accidental fatalities in India. Some key risk factors contributing to road traffic injuries on Indian roads include potholes, roads that are not pedestrian-friendly, inadequate visibility, poor road maintenance, flawed road designs, defective roadway conditions, and narrow streets, among others (Kelkar-Khambete, 2011).

PREVENTIVE MEASURES

A Decade of Action for Road Safety (2011-2020) was initiated by the UN in more than 110 countries with the goal of saving millions of lives by enhancing road and vehicle safety, improving road user behaviour, and upgrading emergency services. The WHO plays a crucial role in steering global initiatives by consistently advocating for road safety at top political levels; compiling and sharing best practices in prevention, data collection, and trauma care; educating the public about risks and ways to mitigate these risks; and highlighting the necessity for increased funding. The WHO has partnered with the Bloomberg Initiative for Global Road Safety (BIGRS) from 2015 to 2019, which aims to decrease deaths and injuries from road accidents in emerging economies and urban areas by bolstering national road safety legislation and executing effective road safety measures at the city level (WHO, 2016). The Government of India has a significant responsibility to tackle road safety comprehensively by involving sectors such as transport, police, health, and education. There is a need to raise public awareness regarding vehicle safety, user behaviour on the roads, and improving post-crash care for road accident victims. Countries that have successfully managed road traffic injuries (RTIs) and fatalities possess national agencies dedicated to data collection and analysis, formulation of safety policies, and promotion of research. A clear safety policy, a central coordinating agency, sufficient resource allocation, stringent enforcement of effective interventions, and trustworthy information are critically needed in India to lower RTIs (Gururaj, 2008). Essential preventive measures that must be rigorously enforced to diminish RTIs include wearing helmets and seat belts, refraining from drinking and driving, adhering to speed limits, not running red lights, and avoiding mobile phone use while driving. A fully digitalized system for issuing driver's licenses would eliminate opportunities for misuse, corruption, and manipulation in obtaining licenses. To curb RTIs, the government should enhance road quality, improve lighting, and ensure the presence of reflective signage in both English and local languages. All college and university students should be educated about responsible road use and could also participate in traffic regulation as part of their academic curriculum. An increased number of vehicles requires adequate surveillance cameras to monitor and identify traffic violators. Repeated offenders should face license suspension or revocation. Establishing trauma care units along National Highways could significantly mitigate RTIs.

Existing legal acts should be instrumental in mitigating RTIs. The Motor Vehicles Act of 1988 was amended in 2002 and subsequently updated in 2016 as The Motor Vehicles (Amendment) Bill, 2016, which sought to implement mechanisms aimed at reducing deaths and injuries on the road. Motor Vehicle Amendment Act 2019 made the licensing procedure very stringent, increased penalties for drunk driving and juvenile driving, and promoted the usage of technology to prevent accidents. It is the responsibility of both the Union and state governments to standardize, regulate, and enforce vehicle safety standards. Evidence-based decisions must be prioritized in making road safety-related choices.

3.1 Economic Burden Magnitude

Road traffic injuries (RTIs) impose one of the heaviest drains on India's economic resources and development potential. Estimates consistently show that RTIs cost the country between 3% and 5% of its Gross Domestic Product (GDP) every year (Jagnoor et al., 2015; Makkar et al., 2019; Jena et al., 2025). When placed on a global scale, India sits at the higher end of traffic injury–related economic losses. Comparisons between low- and middle-income countries (LMICs) and high-income countries reveal that RTIs account for about 2.35% of GDP in LMICs, compared with 1.43% in wealthier nations (Zakeri et al., 2017).

Behind these statistics is an alarming human cost. India alone contributes close to 10% of global road traffic deaths, with more than 150,000 deaths and 500,000 serious injuries annually (National Crime Records Bureau, 2023). This translates to nearly 400 fatalities every day, with metropolitan hubs such as New Delhi shouldering a disproportionate share of the burden (Venkataramanaiah et al., 2021).

Earlier estimates had placed the economic costs much lower, between 0.29% and 0.69% of GDP, but those studies were hampered by methodological limitations. They often focused narrowly on single regions, relied on small sample sizes, or only accounted for direct medical costs. By failing to capture the true systemic and societal costs, these assessments grossly underestimated the problem (Jagnoor et al., 2015). More recent comprehensive studies, which account for indirect costs, healthcare system expenditures, and broader societal losses, reveal the far more sobering figure of 3%–5% of GDP. This reflects a truer picture of the magnitude of the economic challenge RTIs represent for India. To consolidate the evidence, Table 2 presents key studies that have examined the economic burden of RTIs across India and comparable contexts.

Table 2: Selected Empirical Studies on the Economic Burden of RTIs

Author(s) & Year	Study Focus	Context	Key Emphasis
Jagnoor et al., 2015	Early estimates of burden	North India	Limited scope; focused on direct costs only
Makkar et al., 2019	Trauma service cost analysis	India (South Asia)	High costs at the Level 1 trauma center
Jena et al., 2025	Accident trends & patterns	Maharashtra, India	High fatalities and continuing burden
Zakeri & Nosratnejad, 2017	Systematic review of costs	LMICs vs. HICs	LMICs bear a higher GDP burden
Prinja et al., 2016	Hospitalization costs	North India	Household expenditure and financial stress
Pradhan et al., 2017	Household expenditure drivers	India (national)	Catastrophic spending linked to private care, low insurance
Kumar et al., 2012	Out-of-pocket costs	Bangalore, India	High costs; reliance on borrowing and distress financing

3.2 Direct and Indirect Costs

The economic consequences of road traffic injuries (RTIs) can be broadly categorized into direct and indirect costs, each carrying distinct implications for households and the health system. Direct costs are the most visible and immediate. They include expenses for emergency medical services, hospital stays, surgeries, medications, and long-term rehabilitation (Chandrasekharan et al., 2016; Fraisl et al., 2023; Mulwafu et al., 2017). In India's health system, where out-of-pocket expenditure is already high, these costs can devastate families (Goel et al., 2015). For instance, the average out-of-pocket expenditure per hospitalization is about USD 388, rising to USD 1,046 when including care up to 12 months post-discharge (Prinja et al., 2016). Road injuries rank as the fifth costliest health expenditure for Indian households, after cancer, cardiovascular disease, genitourinary conditions, and psychiatric/neurological disorders (Pradhan et al., 2017). The financial burden is heavily influenced by the choice of healthcare provider—private hospitals increase the odds of catastrophic health expenditure by sixteen times compared to public facilities (Pradhan et al., 2017).

Indirect costs, though less visible, often far exceed direct medical expenses. These include productivity losses from premature death or disability, lost income for family members providing care, and administrative costs tied to insurance claims and legal processes (Chandrasekharan et al., 2016; Goel et al., 2015). Studies suggest that indirect costs can make up as much as 90% of the total burden of RTIs (Sedain et al., 2020). In India, the disparity is even starker: productivity losses account for about 99% of the total RTI-related expenditure, while medical costs comprise only 1% (Prinja et al., 2016).

The demographic profile of RTI victims intensifies these losses. The majority of those affected are between 20 and 60 years old—the most economically productive age group (Lakmal et al., 2020). Losing individuals in their prime earning years not only disrupts family financial security but also undermines national productivity. Families often lose their primary breadwinners, which has cascading effects on long-term household stability and community well-being (Chandrasekharan et al., 2016). On a broader scale, this workforce depletion contributes to socioeconomic stagnation (Lakmal et al., 2020).

3.3 Out-of-Pocket Expenditure and Catastrophic Health Spending

The financial strain of road traffic injuries (RTIs) on Indian households extends well beyond the initial medical bills. For many families, these injuries trigger a cycle of catastrophic health spending that can permanently erode economic stability.

Out-of-pocket payments represent the most direct and painful impact. Evidence shows that households affected by RTIs spend significantly more on healthcare compared to unaffected families. On average, per-member expenditures rise by $0.75, with drug costs increasing by $0.30 and hospital spending by $0.29 in the four weeks preceding surveys (Alam et al., 2016).

Regional variations highlight the scale of the problem. Studies report average out-of-pocket expenditures of $100 in Chandigarh and $169 in Hyderabad, while Bangalore cases range much higher, between $380 and $780 (Alam et al., 2016; Kumar et al., 2012). When factoring in follow-up care for up to 12 months after discharge, costs soar to an average of $1,046 per case (Prinja et al., 2016). With this, RTI-related spending ranks as the fifth most expensive medical category for Indian households, after cancer, cardiovascular disease, genitourinary conditions, and psychiatric/neurological disorders (Pradhan et al., 2017).

Perhaps the most devastating outcome is the prevalence of catastrophic health expenditure, defined as healthcare spending that exceeds 25% of annual household income. Between 30% and 46% of RTI-affected households fall into this category (Prinja et al., 2016; Kumar et al., 2012). The risks are especially high for vulnerable families. Those in the lowest income quartile face 26.5 times higher odds of catastrophic expenditure, while hospital stays lasting more than seven days increase the risk by more than tenfold (Prinja et al., 2016).

The type of healthcare facility used further amplifies disparities. Treatment in private hospitals raises the odds of catastrophic spending by sixteen times, while insurance coverage reduces the odds by nearly 28% (Pradhan et al., 2017). Yet, insurance remains out of reach for most: only about 22% of RTI patients have any form of coverage (Kumar et al., 2012). This leaves families to rely on distress financing—borrowing money, selling assets, or taking high-interest loans. Alarmingly, nearly 69% of RTI-affected households report turning to such measures, with the burden falling heaviest on the poorest and the uninsured (Kumar et al., 2012).

These patterns reveal how RTIs act as a direct pathway into poverty. By forcing families into catastrophic expenditure and debt, road injuries create long-term economic vulnerability. This effect is most pronounced among disadvantaged groups, who are simultaneously at greater risk of traffic accidents and least able to absorb the associated costs (Zadey et al., 2024). The household-level implications of RTIs are synthesized in Table 3, which highlights selected studies documenting out-of-pocket spending, catastrophic health expenditure, and pathways into poverty.

Table 3: Household-Level Financial Impact of Road Traffic Injuries

Author(s) & Year	Focus Area	Key Emphasis	Household Impact Contribution
Alam & Mahal, 2016	Household expenditure in South Asia	Showed RTI households spend more than unaffected ones	Demonstrated persistent financial strain
Kumar et al., 2012	Out-of-pocket burden in urban India	Noted high treatment costs and reliance on distress financing	Exposed lack of insurance and debt dependence
Prinja et al., 2016	Hospitalization costs	Highlighted high expenditure and long-term financial impact	Positioned RTIs as a cause of catastrophic spending
Pradhan et al., 2017	Drivers of catastrophic spending	Found private hospitals and lack of insurance as risk factors	Linked healthcare choice to financial vulnerability
Jagnoor et al., 2015	Early RTI cost estimates	A narrow focus led to an underestimation of the household burden	Showed need for broader household-focused studies
Zadey et al., 2024	Poverty dynamics	Identified RTIs as structural drivers of poverty	Framed RTIs as a pathway into long-term vulnerability

3.4 Return on Investment in Trauma Care Systems

While prevention is the most effective way to reduce road traffic injuries (RTIs), investing in robust trauma care systems offers substantial economic and social returns. A well-functioning trauma network—spanning pre-hospital services, emergency departments, surgical units, and rehabilitation—can dramatically cut mortality and disability rates (Chandrasekharan et al., 2016; Mulwafu et al., 2017). Evidence from other low- and middle-income countries shows that strengthening trauma care can be both feasible and cost-effective (Mulwafu et al., 2017).

From an economic standpoint, the benefits of comprehensive trauma management are clear. Effective systems reduce long-term healthcare costs, prevent disability-adjusted life years (DALYs) from being lost, and enable survivors to return to work more quickly (Chandrasekharan et al., 2016; Goel et al., 2015). In doing so, trauma care safeguards human capital and eases the financial burden on families and society (Goel et al., 2015). These returns are particularly valuable in India, where RTIs disproportionately affect the working-age population, making every prevented disability or death a direct boost to national productivity.

Research identifies two key elements in effective trauma management. The first is strong injury surveillance systems, which allow timely data collection and response. The second is early, effective treatment, which prevents otherwise survivable injuries from resulting in permanent disability or death (Shah et al., 2018). Together, these interventions serve as major performance indicators for road safety, directly shaping both health and economic outcomes (Shah et al., 2018).

Investments in trauma care are thus not only a matter of saving lives but also of protecting economic growth. By ensuring that injured individuals receive timely, high-quality care, India can prevent avoidable deaths, reduce long-term dependence on healthcare, and preserve the economic contributions of its most productive citizens. In this way, trauma care investment generates a positive cycle—strengthening health systems, reducing household financial shocks, and enhancing national resilience to the economic burden of RTIs.

3.5 Financing Mechanisms and Governance

Reducing the enormous economic toll of road traffic injuries (RTIs) in India requires more than isolated interventions. It calls for predictable financing, innovative funding streams, and governance structures that ensure accountability and measurable results (Chandrasekharan et al., 2016; Goel et al., 2015). With RTIs consuming an estimated 3–5% of India's GDP annually, creating sustainable funding pathways is no longer optional—it is a necessity.

Diverse financing strategies can help build a comprehensive road safety framework. At the core lies direct government allocation, where both national and state governments earmark dedicated budgetary resources for road safety initiatives (Chandrasekharan et al., 2016). Supplementary mechanisms, such as a road safety cess or surcharges on fuel and vehicle sales, can create consistent, user-linked revenue streams that tie financial contributions directly to road safety improvements (Goel et al., 2015).

Beyond public funding, public–private partnerships (PPPs) can unlock both capital and expertise. These collaborations are particularly valuable for scaling trauma care infrastructure and deploying new technologies that reduce RTI-related losses (Chandrasekharan et al., 2016; Goel et al., 2015). Another promising model is insurance-linked financing, where a portion of motor vehicle insurance premiums is diverted into road safety funds. This aligns the financial interests of insurers with broader public safety goals. In addition, multilateral support from international development agencies can provide both funding and technical expertise, particularly for large-scale infrastructure and system-building projects.

Equally important are governance mechanisms that ensure resources are effectively deployed. Program-based budgeting, which directly links financial allocations to measurable safety objectives, enhances accountability and transparency (Chandrasekharan et al., 2016; Goel et al., 2015). Performance-based grants can further incentivize state and local governments to achieve specific safety benchmarks, encouraging innovation and competition in road safety programming.

Finally, transparency and stakeholder engagement are crucial. Public reporting on expenditures and outcomes helps build trust, while involving civil society, healthcare providers, law enforcement, and local communities ensures that diverse perspectives shape policy decisions (Chandrasekharan et al., 2016; Goel et al., 2015).

By combining sustainable financing with strong governance, India can create the foundation for a resilient, long-term road safety strategy. Such an approach not only reduces the human and economic costs of RTIs but also ensures that investments translate into measurable improvements in public health and economic productivity. Table 4 summarizes major financing and governance strategies identified in the literature as essential for sustainable road safety interventions in India.

Table 4: Key Financing and Governance Strategies for Road Safety in India

Mechanism	Description	Contribution
Government allocation	Dedicated national and state budgetary resources for road safety	Provides predictable and sustained funding
Road safety cess/surcharges	Levies on fuel or vehicle sales earmarked for safety initiatives	Generates sustainable, user-linked revenue
Public–private partnerships (PPPs)	Collaboration with the private sector for trauma care and infrastructure	Unlocks capital and technical expertise
Insurance-linked financing	Portion of motor vehicle insurance premiums directed to safety funds	Aligns insurer incentives with accident reduction
Program-based budgeting	Linking funds to measurable safety objectives and outcomes	Improves accountability and transparency
Stakeholder engagement	Involving civil society, providers, and communities in decisions	Builds trust and ensures inclusivity

3.6 Role of the Health Sector

The essential multi-stakeholders should be made aware of the issue of RTI. Advocacy efforts must be pursued at both the individual and community levels to enhance road safety. Changing attitudes and modifying behaviours are crucial for addressing the problem of road safety in India. A comprehensive strategy is required to deal with road accidents and the actions that follow them. The trauma care systems in hospitals need enhancement, and prompt rehabilitation should be provided to lessen both physical and psychological harm. Road safety must be examined from various perspectives, including the safety of pedestrians and cyclists, motorcyclists, vehicle occupants, promotion of best practices, and effective pre-hospital care, treatment, and rehabilitation. Aspects such as road design for safety, vehicle monitoring through intelligent transport systems, and safe vehicle design require urgent focus to guarantee road safety. Road traffic injuries (RTIs) have become a significant global health concern, leading to 1.2 million deaths annually, which amounts to 2.4% of all global fatalities. Ministries such as health, home, transport, and urban development need to recognize RTIs as a public health priority and enhance policy development, action-oriented information, services for the injured, preventative initiatives, capacity building, and advocacy efforts (WHO, 2007). A strategic public health approach to RTI incorporates insights from various fields, including biomedicine, biomechanics, epidemiology, sociology, behavioural sciences, criminology, education, economics, engineering, and social work. The health sector plays a critical role in preventing RTIs by systematically gathering data on the extent, scope, characteristics, and impacts of road traffic incidents, engaging in in-depth research on RTIs, identifying factors that may reduce or elevate RTIs, and seeking methods to lessen injury severity. By utilizing collected data, the health sector can influence policymakers and decision-makers to adopt enhanced strategies for road safety. A global

analysis of RTIs indicated that 30% to 80% of hospital admissions result from these incidents (Odero et al., 1997). A network of bystanders at the accident scene, emergency services, timely access to emergency care, trauma treatment, and rehabilitation is essential. RTIs impose a significant burden on the health system regarding pre-hospital and acute care, as well as rehabilitation (Gururaj, 2006). Research comparing road traffic fatalities across different countries showed that the majority of deaths in low and middle-income nations occur before victims reach a hospital, with the likelihood of death before hospital arrival increasing as socioeconomic status declines (Mock C N, 1998). Many unnecessary deaths and injuries could be avoided if victims received immediate hospital care. More emphasis should be placed on rehabilitation, where occupational therapists, neuropsychologists, speech therapists, and psychological counselors could reduce disability. Public-private partnerships (PPP), particularly involving NGOs, could help decrease the number of RTI fatalities.

In India, RTI poses a significant burden on the social and economic aspects of individuals, communities, and the nation as a whole. Unintentional injuries are a significant cause of both disability and death in India. The loss of life among those in their productive years profoundly impacts families and the nation. This issue is a destructive consequence of extensive vehicle usage, with road traffic injuries (RTI) arising from personal behavior, lack of administrative control, and inadequate transportation planning. Men are generally more likely to lose their lives in these incidents compared to women due to their higher rates of vehicle usage. Indian roads are known for high fatality rates, and Tamil Nadu has reported a particularly large number of accidents. Two-wheelers are particularly vulnerable to RTI in India, with common causes including visual distractions, poor visibility, delayed transport of victims to hospitals, and insufficient access to first aid, emergency, and trauma care. There is an urgent need for a clear strategy in India to prevent RTI through improving road conditions, enhancing lighting, installing reflective signage, and enforcing strict legal regulations. The lack of trauma care units along National Highways contributes significantly to the RTI burden. High-quality research on RTI should be conducted in India to find prevention strategies, and all stakeholders in road safety need to be made aware of the issue. A strong partnership and collaboration among all parties involved, such as the public, law enforcement, medical professionals, neuropsychologists, and therapists, are essential to effectively address RTI.

4. Conclusion

India, the largest country in South Asia, experiences the highest rate of mortality related to road traffic incidents (RTI). Worldwide, vulnerable road users such as pedestrians, cyclists, and motorcyclists face significant risks while using roadways. While implementing road safety regulations and penalties, along with adhering to basic safety practices, can mitigate the adverse effects of RTI, the attitudes and self-discipline of road users are crucial for substantially reducing RTI and making roads safer. As RTI is recognized as a public health concern, prioritizing research on RTI and establishing an effective RTI surveillance system by national and international funding organizations could lead to meaningful improvements in how RTI is managed. Public-Private Partnerships (PPP) and a robust network involving all road stakeholders can effectively tackle the issue of RTI. It is essential to regard RTI as a public health issue, and decision-makers must allocate sufficient attention to it. In addition to that, it is the need of the hour to focus on the economic burden caused by RTI and its impact on Gross Domestic Product, the need for the establishment of the Trauma Care system, the Financing mechanisms, and Governance related to RTI. A proper system should be enabled to collect accurate data on economic loss due to RTI in GDP, and at the community and household level. The government must take necessary actions to reduce the RTI-related health expenditure and create awareness about the availability of health insurance. Implementation of strict accident preventive measures would gradually decrease health care costs and safeguard the human capital of the nation. The state has to invest more in trauma care to enhance economic development, and also, necessary policy-level changes have to be made to reduce the economic costs associated with RTIs.Digital technology has to be applied to monitor road traffic and to identify the accident-prone spots, followed by appropriate interventions. Experts from diverse fields, including law enforcement, finance management, road engineering, legal affairs, transport, and other multi-stakeholders, should collaborate to create a framework aimed at ensuring road safety in India.

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