

Evaluation of reduction of accidents in different regions of India

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Abstract. Road accidents and fatalities are leading causes of death, which is leading the burden to the public health in India. This study aims at understanding the road accidents and reduction in road accidents in different regions of India. It has been found that Tamil Nadu has the highest number of road accidents followed by Kerala, Madhya Pradesh and others. Furthermore, the major factors like poor condition of roads, lack of use of safety equipments and poor traffic rules lead to increasing the number of road accidents. The government initiatives like awareness campaigns, identifying and rectifying black spots, vehicle engineering has contributed to improving road safety in India.

1 Introduction

Road accidents have become a leading cause of death all across the globe with the highest burden of death in lower and middle-income countries. The study of Dandonaet al., (2020) has highlighted that reducing the number of deaths from road accidents has remained one of the "United Nations (UN) Sustainable Development Goals (SDGs)". Accordingly, the rise in road safety has become one of the essential factors in dealing with the burden of deaths from road accidents. The epidemiology of deaths from road accidents has shown a significant rise since 2005 when the death rate from road injuries reached "26.2 per 100 000 male population" and "5.7 per 100 000 female population" (Dandonaet al., 2020). In addition, the rise in road accidents in India has been projected to rise due to inaccurate safety procedures, drunk driving, and distracted driving along with reckless driving. Thus, road accidents have become a major reason behind increasing the burden of death within the developing country India.

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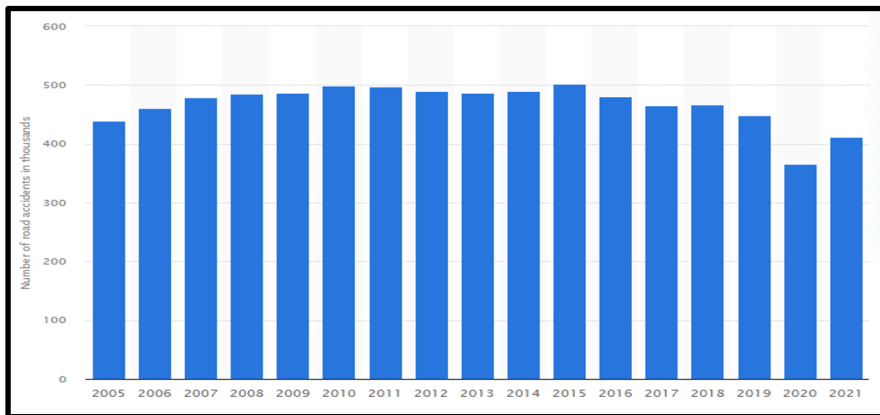


Fig. 1. Number of road accidents in India from 2005 to 2021 (Source: STATISTA, 2023)

Figure 1 shows the number of road accidents, which have shown rapid difficulties from 2005 to 2021. It can be seen that the number of road accidents in India has reached **412** thousand in 2021 and 70% of the people involved in road accidents are young Indians (STATISTA, 2023). Furthermore, the number of road accidents was at its peak in the year 2015, which was about 500 thousand. However, about **3% to 5%** of the GDP of India is invested in road accidents to secure the life of the population (STATISTA, 2023). The investment in improving the road conditions or rules and regulations associated with road accidents has helped reduce the number of fatal accidents since 2015. In contrast, a higher number of road accidents on national highways has been reported in the Indian state of Tamil Nadu with a number of about **64,105 accidents** in 2022 (MORTH.NIC.IN, 2022). Besides, states like Madhya Pradesh and Uttar Pradesh have also topped the number of road accidents. Therefore, this research has investigated the approaches for reducing this rising number of road accidents in different Indian regions along with improving the well-being of the population.

1.1. Objectives

- To analyse the causes behind road accidents in different regions of India
- To investigate the approaches for reducing the number of road accidents and deaths in Indian states

1.2. Data source

“**Secondary data collection**” has been adopted for this study, which has helped in gathering relevant information associated with the incidents of road accidents and deaths in Indian states. As per the opinion of Ruggiano& Perry (2019), “secondary data collection” comes with the opportunity of delivering a huge amount of information with little investment in cost and time. Accordingly, it has become possible to gather a large amount of information reflecting road accidents occurrence and the major factors behind them with the use of secondary sources. In addition, it has become possible to generate new insights by studying the previously published source. Therefore, secondary data associated with road accidents in India is collected from government websites and peer-reviewed articles and journals available over authentic databases like Google Scholar.

1.3. Period of study

This study has selected secondary sources that consist of information from the last six years (2018 to 2023) regarding the issues of road accidents in India

2 Result and Discussion

Factors influencing road accidents and deaths in India

Traffic rules violations

Violation of traffic rules and regulations has become a leading cause of road accidents in India. It can be seen in Figure 2 that the number of accidents due to over-speeding has reached 1,10,027 in 2021 (MORTH.NIC.IN, 2022). Moreover, accidents from drunk driving in India were about 10,080 in the year 2021 which is a significant rise compared to the previous year. As illustrated by Balasubramanian&Sivasankaran (2021) injuries and deaths due to speeding and maintaining inappropriate speed have been identified as a significant public health issue all across the globe. Similarly, accidents from violation of traffic rules have been majorly observed within the metropolitan cities of India.

Category	2021			2022			% Change in 2022 over 2021		
	Accidents	Fatalities	Injured	Accidents	Fatalities	Injured	Accidents	Fatalities	Injured
Over-speeding	2,95,522	1,07,236	2,80,285	3,33,323	1,19,904	3,22,795	12.8	11.8	15.2
% share of total	71.7	69.6	72.9	72.3	71.2	72.8			
Drunken driving/ consumption of alcohol & drug	9,150	3,314	7,509	10,080	4,201	8,809	10.2	26.8	17.3
% share of total	2.2	2.2	2.0	2.2	2.5	2.0			
Driving on wrong side/Lane indiscipline	21,491	8,122	20,351	22,586	9,094	21,745	5.1	12.0	6.8
% share of total	5.2	5.3	5.3	4.9	5.4	4.9			
Jumping red light	2,203	679	1,905	4,021	1,462	3,450	82.5	115.3	81.1
% share of total	0.5	0.4	0.5	0.9	0.9	0.8			
Use of mobile phone	6,530	2,982	5,394	7,558	3,395	6,255	15.7	13.8	16.0
% share of total	1.6	1.9	1.4	1.6	2.0	1.4			
Others	77,536	31,639	69,004	83,744	30,435	80,312	8.0	-3.8	16.4
% share of total	18.8	20.5	17.9	18.2	18.1	18.1			
All India	4,12,432	1,53,972	3,84,448	4,61,312	1,68,491	4,43,366	11.9	9.4	15.3

Fig. 2. Road accidents due to the violation of traffic rules (Source: MORTH.NIC.IN, 2022)

A number of **5254** accidents occurred within metropolitan cities like **Chennai** in the last two years due to the violation of traffic rules (Balasubramanian&Sivasankaran, 2021). Therefore, violating traffic rules, drunk driving, using mobile phones at the time of driving, overspending and jumping red lights are significant contributors to increasing the number of deaths from accidents in India.

(ii) Lack of safety equipment

Category	Non-wearing of Helmet		Non-wearing of Seat Belt	
	Killed	Injured	Killed	Injured
Drivers	35,692	63,584	8,384	17,216
% Share in Total	71.3	62.4	50.2	40.7
Passenger	14,337	38,307	8,331	25,087
% Share in Total	28.7	37.6	49.8	59.3
Total	50,029	1,01,891	16,715	42,303

Fig. 4. Road accidents due to bad weather conditions (Source: MORTH.NIC.IN, 2022)

Weather conditions are an influential factor in increasing the number of road accidents by affecting the road surface condition along with the visibility of drivers. It can be seen that the total number of people killed in road accidents in India due to weather conditions is 1,53,972 in 2021 and 1,68,491 in 2022(MORTH.NIC.IN, 2022). The majority of the accidents are observed within the Northern part of India. Besides, rapid urbanisation within countries like India has also contributed to creating unintended risks of road accidents. As stated by Pal et al., (2019) unfavourable weather conditions like heavy rainfall and snowfall lead to increased road accidents specifically on roads that are slippery and wet.

(iii) Socio-economic factors

Status		Scheduled Caste (SC)	Scheduled Tribe (ST)	Other Backward Community (OBC)	Forward Community	Total
Death	Count	259	102	724	213	1298
	%	19.9%	7.9%	55.8%	16.4%	100.0%
Injured	Count	519	206	1560	408	2693
	%	19.3%	7.7%	57.9%	15.1%	100.0%
Total	Count	778	308	2284	621	3991 ^a
	%	19.4%	7.7%	57.3%	15.6%	100.0%

Fig. 5. Caste-wise road accidents and deaths (Source: Nanjunda, 2021)

Socioeconomic factors such as education and occupations have also contributed to increasing the number of deaths from road accidents in India. As per the opinion of Nanjunda (2021), the risk of road accidents among the underprivileged section of India is higher due to social exclusion, deprivation and distinct social disparities. Accordingly, long-standing deprivation leads to increasing identity crises among college-going adult riders in India, which further increases the risks of accidents. It can be observed from Figure 5 that the number of road injuries among the forward community is about 408 whereas in the case of the backward community, it is 1560 in South India (Nanjunda, 2021). In addition, the number of deaths from road accidents is also higher among backward communities in comparison to forward communities. Therefore, lower socioeconomic status is one of the major contributors to the rising death burdens from road accidents in India.

(iv) Accidents on National Highways in different Indian regions

S.No	States/UTs	2018	2019	2020	2021	2022
1	Tamil Nadu	22,961	21,489	18,372	16,869	18,972
	% Share in Total	13.9	12.9	13.1	13.1	12.5
2	Kerala	9,161	9,459	6,594	8,048	17,627
	% Share in Total	6.5	6.9	5.7	6.2	11.6
3	Uttar Pradesh	16,198	16,181	13,695	14,540	14,990
	% Share in Total	11.5	11.8	11.8	11.3	9.9
4	Madhya Pradesh	9,967	10,440	9,866	11,030	13,860
	% Share in Total	7.1	7.6	8.5	8.6	9.1
5	Karnataka	13,638	13,363	11,230	11,462	13,384
	% Share in Total	9.7	9.7	9.6	8.9	8.8
6	Maharashtra	9,355	8,360	6,501	7,501	9,417
	% Share in Total	6.6	6.1	5.6	5.8	6.2
7	Andhra Pradesh	8,122	7,682	7,167	8,241	8,650
	% Share in Total	5.8	5.6	6.2	6.4	5.7
8	Telangana	6,487	7,352	6,820	7,214	7,505
	% Share in Total	4.6	5.4	5.9	5.6	4.9
9	Rajasthan	6,726	6,883	5,764	6,424	7,093
	% Share in Total	4.8	5.0	4.9	5.0	4.7
10	Bihar	4,016	4,526	4,101	4,349	4,601
	% Share in Total	2.9	3.3	3.5	3.4	3.0
Total (Top 10)		1,06,631	1,05,735	90,110	95,678	1,16,099
		73.9	75.0	75.3	74.3	76.4
Total (NH)		1,44,221	1,41,057	1,19,615	1,28,825	1,51,997

Fig. 6. Road accidents in different Indian regions (Source: MORTH.NIC.IN, 2022)

Figure 6 shows the number of fatalities on National Highways in the top 10 states of India. It can be seen from Figure 6 that Tamil Nadu tops in terms of road accidents in India on National Highways in 2022 followed by Kerala, Uttar Pradesh, Madhya Pradesh, Karnataka and Maharashtra. The total number of deaths on National Highways in Tamil Nadu has reached 18,972 in 2022, which is a significant rise from the previous two years (MORTH.NIC.IN, 2022). Furthermore, the accident rate in major cities like Bangalore has increased to 13 accidents per day with two fatalities (HINDUSTANTIMES, 2023). Accordingly, the lack of presence of road safety has been considered as a significant factor leading to increasing fatalities within the Indian state of Tamil Nadu. However, over speeding is a leading cause of road injury in Tamil Nadu due to the lack of flyover or underpass within road junctions (THEHINDU, 2023). Moreover, the National Highways Authority of India has been continuously criticised for collecting a higher amount of toll in the name of improving road safety infrastructure. Additionally, no specific measures have been taken by the government for mitigating the issues and there are still no facilities for pedestrians within the country (THEHINDU, 2023). Therefore, poor infrastructure of the roads, lack of over bridges at junctions and violation of traffic rules have contributed to the public health issue of deaths from road accidents in Tamil Nadu.

(v) Demographics of road accidents

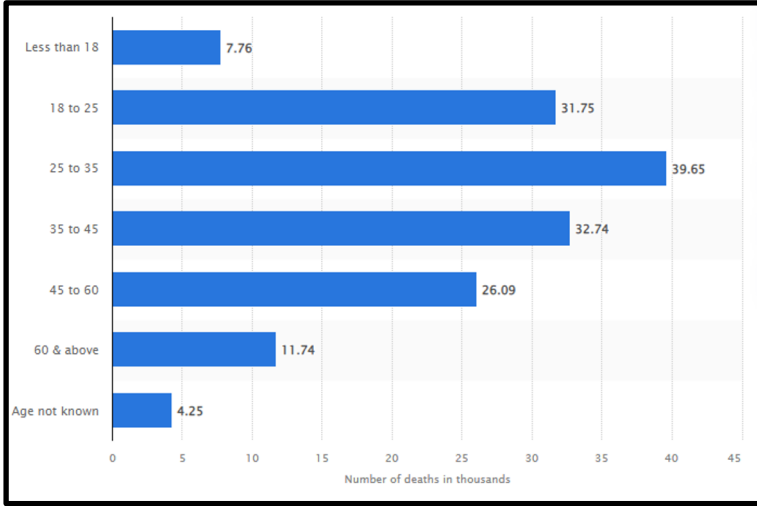


Fig. 7. Demographics of victims of road accidents in India (Source: STATISTA, 2023)

Figure 7 shows the age of the victims of the road accidents in India. It can be seen that the majority of the deaths from road accidents fall within the age group of 25 to 35 and the total number of deaths in this age group was 39.6 thousand in 2021 (STATISTA, 2023). In addition, the Indian subcontinent has been found to rank first in terms of deaths associated with road accidents according to "World Road Statistics" among 199 countries. Besides, the majority of the victims of road accidents are recognised as two-wheeler commuters. Furthermore, pedestrians also share a higher portion of the victims due to the lack of infrastructure, negligence to traffic rules, lack of foot-over bridges and improper footpaths. On a contrary note, Jagnoor et al., (2020) have mentioned that the poor structure of the rules and regulations regarding riding in India has continued to raise the number of accidents and fatalities. Thus, poor enforcement of fines, corruption and mild punishment have worked on encouraging drivers to rash driving, which increases the risks of fatal accidents.

(vi) Road accidents in rural vs urban India

Rural India

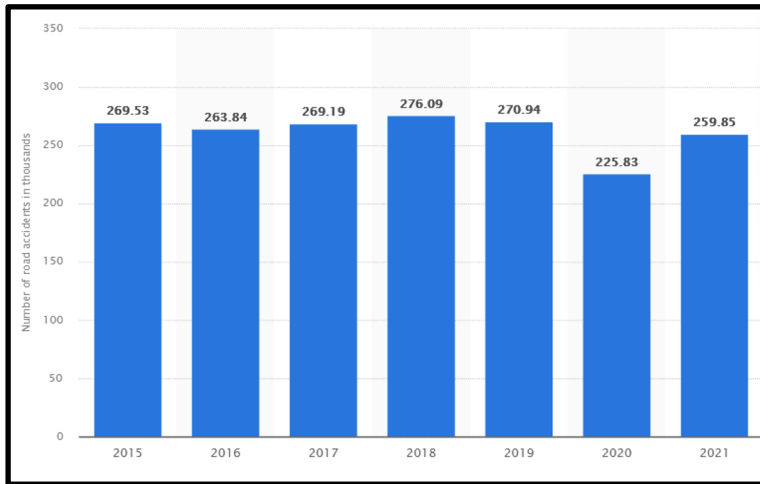


Fig. 8. Number of road accidents in rural India (Source: STATISTA, 2023)

Figure 8 shows the rise in the number of road accident-related phenomena in rural India. As per the opinion of Mohammed et al., (2019), road accidents and killing from road accidents both are rural phenomena. Accordingly, the large share of the population of India living in the rural areas of the country has contributed to making road accidents a rural phenomenon. The main reasons behind rural road accidents are the poor condition of roads, merging of rural roads with highways, eroded roads, illegal speed breakers and diversions. It can be seen that about *260 thousand* road accidents have occurred within the rural parts of India, which has formed about *63%* of the total road accidents within the country (STATISTA, 2023). Therefore, it is important to improve the conditions of the roads along with strengthening traffic rules within the country to contribute to the well-being of public health and reduce the number of rural accidents

Urban India

Figure 9 represents the declining number of urban road accidents and deaths from accidents in India. The study by Cabrera-Arnau, PrietoCuriel& Bishop (2020) has highlighted the occurrence of minor or serious accidents in the rural areas of the countries in comparison to the fatal accidents in rural parts. Accordingly, the lower population along with a higher degree of education and awareness among the urban population has contributed to reducing the number of fatal accidents in urban India. It can be seen that the number of road accidents in urban India was about *152 thousand*, which were near the residential areas (STATISTA, 2023). However, road accidents have become a major concern for the Indian government as they continuously threaten the healthy living of the urban population. Therefore, adequate government initiatives along with the development of road infrastructure can help lead to a reduction in urban road accidents in India

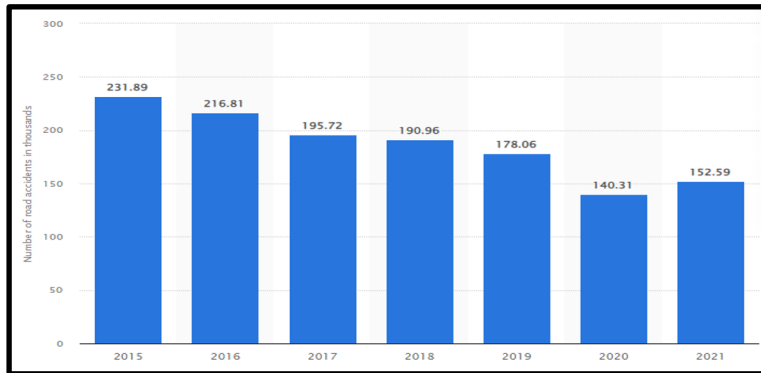


Fig. 9. Number of road accidents in urban India (Source: STATISTA, 2023)

(vii) Ways for reducing road accidents

Initiatives taken by the Indian government to reduce road accidents

(i) Central road safety strategy

World Bank support has helped India in reducing its road safety policies along with reducing the number of road accidents within the country. The Government of India has received active support from the World Bank in developing new road safety legislation along with a fund of about \$200 million for 12 national and state highway projects (WORLD BANK, 2019). In addition, the “Ministry of Road Transport and Highways (MoRTH)” has received support from the World Bank for revising the road safety “Code of Practice” along with developing accident analysing and monitoring systems. As a result, it has become beneficial for MoRTH to pilot the “National Highway Safety System” with the aim of improving road safety along with better traffic management. Furthermore, the Indian government has taken the initiative to introduce the “Motor Vehicles (Amendment) Act, 2019” which is committed to the improvement of road safety infrastructure in the country (MORTH.NIC.IN, 2022). This has supported the country in working toward achieving the SDGs of halving the number of road accidents and fatalities by 2025.

(ii) Government initiatives in reducing and preventing road accidents

A multi-pronged strategy has been developed by MoRTH for addressing the issues of road safety through education, enforcement, engineering and emergency care. As illustrated by Ziakopoulos&Yannis (2020) education is one of the significant parts of improving road safety by creating awareness among the population. Accordingly, the presence of appropriate driver education programmes can help new drivers learn about safe driving practices, defensive driving techniques and traffic laws. In this context, the Ministry has implemented an awareness campaign through print media, electronic media and NGOs that can help educate drivers and passengers about road safety guidance. The government of India is highly concerned about the rising issues of deaths from road accidents, which increase the aim of the government in reducing road accidents by 50% by the end of 2030 (INDIANEXPRESS, 2023). On the other hand, road engineering and vehicle engineering are also adopted by the Ministry for prioritising road safety and improving public health and wellbeing (PIB.GOV.IN, 2021). Thus, MoRTH has taken the initiative to identify and rectify the black spot present within the National Highways. In addition, safety standards

for vehicles have also been improved within the country with respect to "Anti-Breaking System (ABS)", Airbags, "Whole Vehicle Safety Conformity of Production (WVSCoP)" and Crash Test (PIB.GOV.IN, 2021). Therefore, these activities of the Indian government have positively worked toward reducing the number of road accidents within the country.

(iii) National Road Safety Policy

"National Road Safety Policy" of India has focused on outlining the policies and initiatives undertaken by the Indian government to improve road safety activities within the country. In this context, the policy statements have highlighted the importance of raising awareness among the Indian population. Besides, the policy statement of the "National Road Safety Policy" has highlighted that it is the responsibility of the government to increase the effect on promoting different aspects of road safety including the economic and social implications of road accidents (MORTH.NIC.IN, 2023). The government of India can work on delivering adequate assistance to the local bodies, union territories and states for improving the quality of data collection and crash investigation, transmission and analysis. Therefore, a "National Road Safety Information System" can be established by the Indian government to deliver continuity along with policy guidelines in the activity of fostering road safety.

(viii) Further initiatives need to be taken to improve road safety

(i) Spreading awareness reading road safety

Awareness campaigns can help in educating people about speed limits, the importance of protective equipment, and seat belts at the time of driving. The Indian government can focus on collaborating with NGOs like "The SaveLIFE Foundation (SLF)" to further accelerate awareness campaigns in educating people about road safety practices.

(ii) Making the roads safer

Road safety management practices can be performed to improve the safety on the road. Iqbal et al., (2020) have highlighted that accident blackspots are considered as the places where road accidents generally occur. Accordingly, black spots mainly consist of sharp curves and corners in a straight road where oncoming traffic is not clearly visible. Therefore, the Indian government can work on further improving its activities in identifying and rectifying the blackspots to reduce the number of accidents.

(iii) Enforcing strong traffic rules

Strong enforcement of traffic laws with the inclusion of technology can play a significant role in reducing the number of accidents. The installation of speed-tracking cameras at road intersections can help in tracking the speed of vehicles (Premachandra, Ueda & Suzuki, 2020). Along with that, it can work on creating a barrier to the activities like overspending which is a major cause of accidents on National Highways. Henceforth, the Indian government can increase investment in such technologies in tracking speed to ensure traffic laws are in place.

(iv) Delivering better emergency care

The Indian government has made an allocation of cashless treatment of the victims of road accidents in Golden hour. Emergency care can be beneficial in saving the lives of the victims of road accidents (Naboureh et al., 2019). Accordingly, the Indian government has taken initiatives like availing ambulances in toll plazas and National Highways. The

number of ambulances can be further increased to deliver basic life support to the victims at the golden hour to save lives.

3 Conclusions

This study concludes the issue of road accidents in India along with the approaches for reducing the number of road accidents and fatalities. It has been found that the lack of use of safety equipment, poor road infrastructure and bad weather conditions are responsible for an increasing number of road accidents and fatalities in India. The socio-economic condition of the population has also contributed to raising the number of deaths after fatal accidents. It has been identified that the government of India have undertaken different initiatives like installing road safety rules and regulations to limit the number of death burden from road accidents. Public awareness campaigns along with government interventions in vehicle or road engineering are found to be supportive of improving road safety.

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