International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 03 | March - 2023 Impact Factor: 7.185 ISSN: 2582-3930

Road Accidents in India: Looking Through the Behavioral Lens

By Neeti Goutam
Strategic – Lead Communications, Sanrachana

Abstract

While connecting people and their lives, roads also have a cost on them. It is clear that one of the major causes of death worldwide is traffic-related fatalities. In 2016, 1.35 million persons worldwide lost their lives in traffic accidents, 90% of which occurred in poorer nations (World Health Organization, 2018). One of the top causes of death for children between the ages of 5 and 29 is traffic-related injuries. More people lose their lives as a result of automobile accidents than from diarrheal illnesses or tuberculosis. The government has made a lot of efforts and implemented many mitigation techniques both locally and globally, but infrastructure, enforcement, and behavioural understanding of road safety are still lacking.
The 50% reduction in the number of traffic accidents outlined in Sustainable Development Goal 3.6 is far from adequate. So, this study aims to provide an overview of road accidents at the global and national levels as well as behavioural attributions and changes in people's behaviour for road safety.

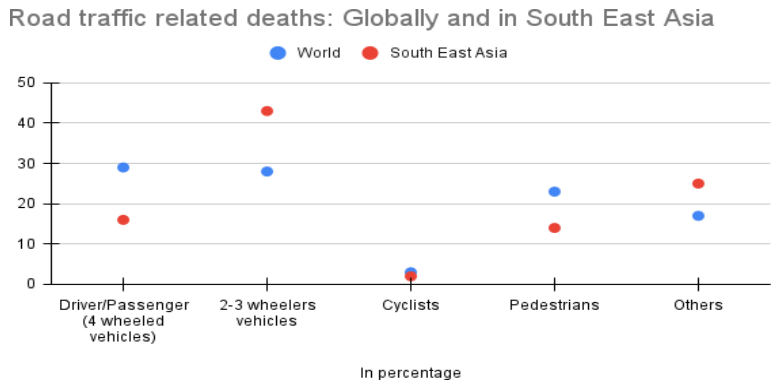
Key words: Road accidents; behavioural intervention; road safety; traffic accidents; SDG2030

Introduction

Global Incidence of Road Traffics and related deaths

The Global rate of road traffic deaths is 18.2 per 1,00,000 population. Some countries have managed to reduce the numbers; however, the progress is not uniform. The average rate of death in high income countries is 27. 5 per 1,00,000 population and 8.3 deaths per 1,00,000 population in low-middle respectively. The regional classification of death rates is; Africa (26.6), South-East Asia (20.7), East Mediterranean (18) and Western Pacific(16.9), America (15.6) and Europe (9.3) For South East Asia, the rate of road traffic death per 1,00,000 populationhas increased from 19.8 in 2013 to 20.7 in 2016. It has been pointed out that the share of population to road trafficaccidents to vehicles is the highest among middle income countries as compared to high income countries. Thesedifferences in estimates points towards the difficulty in fetching data and the real numbers and hence under estimate of nationally reported. (Pisharam, 2021)

Figure 1 below shows the share of road traffic related deaths by road user types globally and in South East Asia:



It shows the fatalities caused to the 2-3-wheeled vehicles among South East Asian countries is maximum as compared to the global numbers also refer appendix 1. Whereas, fatalities of drivers/ passengers of 4 wheeled vehicles are almost twice as high as compared to South East Asian countries.

India – a major contributor to global road accidents

Road accidents and the deaths they cause are a serious and urgent problem in India. It draws attention to a number of gaps between authorities, decision-makers, and users. The WHO study from 2018 indicated that India had the most traffic accidents. 2019 (Singh H.) India accounts for 12% of all road fatalities worldwide despite having only 3% of the world's vehicles. 2019 (Crouch) Almost 50% of road traffic fatalities in India are caused by pedestrians, cyclists, and motorcyclists, who typically originate from low- and middle-income strata. The 2018 Global Status Report on Road Safety Road safety programmes will continue to be ineffective and incomplete without sufficient financing for institutional structures and processes.

A recent official study states that there were 449,002 road accidents in India in 2019, and that 1,51,113 people died as a result of those accidents. (Transport Research Wing, Ministry of Road Transport and Highways, 2020). Only 2.03% of all road networks are National Highways, although they account for 35.7% of fatal traffic accidents in 2019. 24.8% of deaths occur on state highways, which account for 3.01% of all roads. 39% of deaths from traffic accidents occur on other roads, which make up the other 95% of all roadways. 58% of all traffic incidents in India's rural areas result in fatalities, which is 65%.

The use of two-wheeled vehicles and limited access to medical services may be the cause. It makes sense that 58% of accidents and 65% of traffic fatalities occur in rural India. (Azad, 2020)

For India and the states within India, there are a few models that can predict traffic fatalities and accidents. In accordance with one study model, there would be 5,28,522 traffic accidents by 2025 if adequate safety precautions are not adopted. 2019 (Arora and Kumar) Another prediction model (accident prediction models - APMs) addressing road safety planning and readiness is presented by Mor, Sood, and Goyal in their 2020 publication for the state of Punjab. In the ensuing 20 to 30 years, accidents in the United States will increase. The study's model for accident prediction showed the greatest promise compared to models for injury and mortality prediction.

Below are some highlighted facts from the 2019 Government Report on Road accidents:

- Road Traffic Deaths by age group, 2018 Over 1.5 lac people were killed in the year 2018. Age group with highest number of road accidents related deaths falls in 25-35 age group with 39,960 deaths followed by age group 18-25 with 32,777 deaths where 87% of them were males.

- Road Traffic Deaths by road type, 2018 Straight roads contribute the highest to mortality (over 96,831 thousand) followed by curved roads (19,996 thousand)

- Road Traffic Deaths by cause Over speeding is the main reason of mortality (97588) followed by drivingon the wrong side (8764) deaths.

- Road Traffic Deaths by place In India, the road accidents are majorly taking place on State Highways, National Highways and other roads. 54, 046 deaths in National highways followed by 40580 deaths in State highways in 2018.

Radar chart (Figure 1) below presents yearly distribution of road accidents in India from 1970 till 2017. (Road accidents, Open Government Data (OGD) Platform India, 2021)

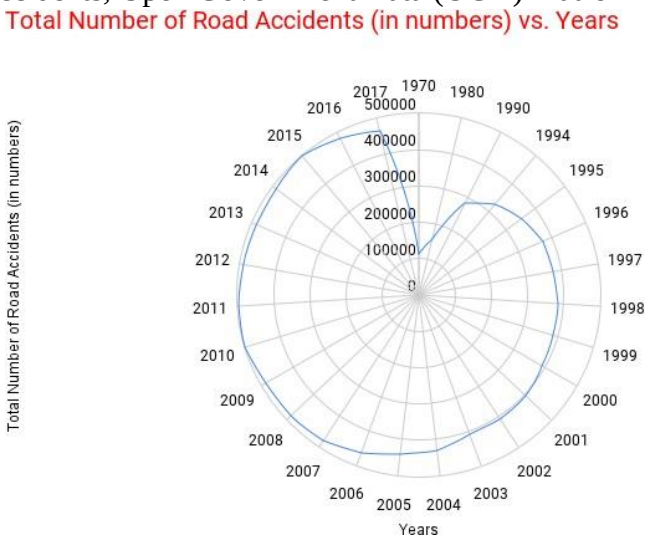


Figure 2 below shows the total number of road accidents and person killed from 1970-2017 (Road accidents, OpenGovernment Data (OGD) Platform India, 2021)

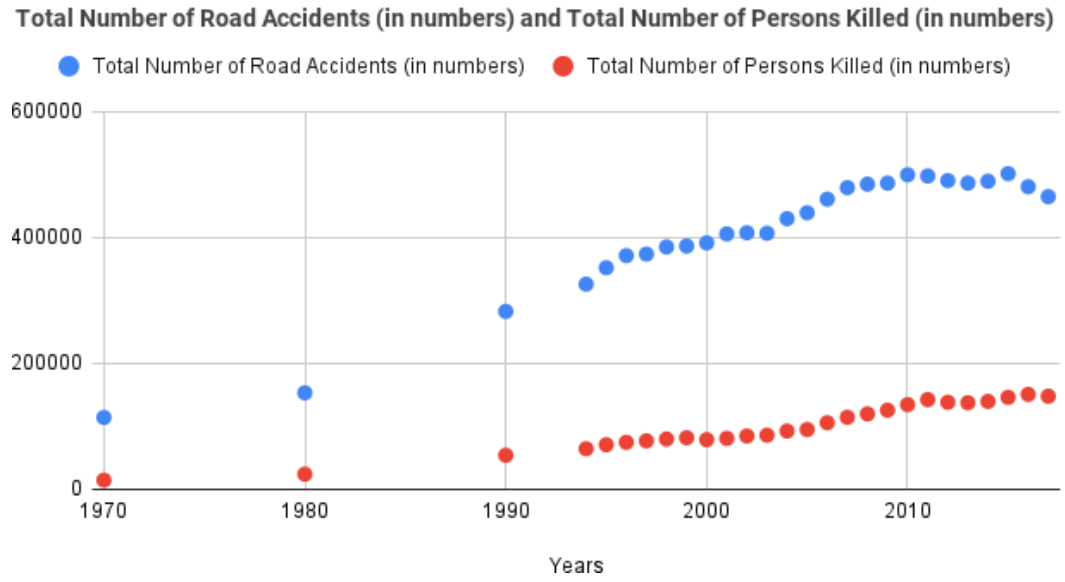


Figure 3 Number of road accidents per lakh population for years 2012, 2013 and 2016. We can see a declining trend from the year 2012 (40.4 road accidents per 1 lac population) to 2016 (37.9). (Visualization Engine v3.0,2021)

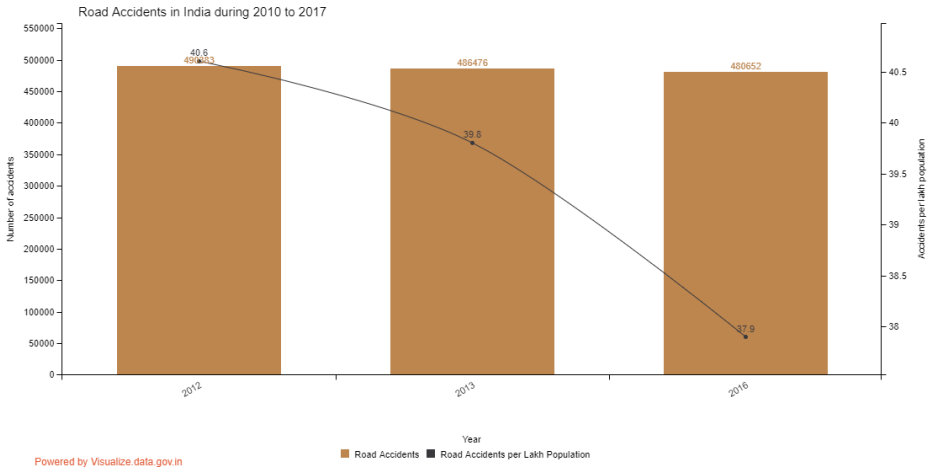
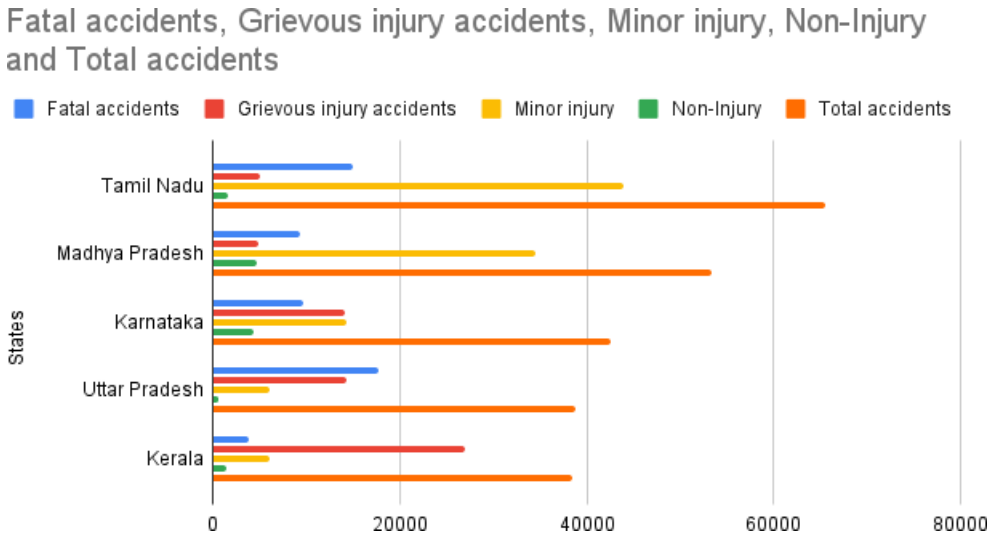


Figure 4 below presents the type of road accidents by top 5 states in India 2017. (Road accidents, Open Government Data (OGD) Platform India, 2021)



It is interesting to note that all 5 states have different numbers and scope for different type of accidents also referappendix 4). For example, highest number of fatal accidents cases were in Tamil Nadu but when it come to grievous injury accidents, it was only 5,005. Grievous injury accidents were highest in Kerala with 27,034 cases while there only 3,915 fatal accident cases in India. However, on 31st National Road Safety Week, 2020 Tamil Nadu was given the award for "Best performing state in reducing road accidents" during 2018 as compared to 2017. (Ministry of Road transport and Highways, GOI, New Delhi, 2021) More than half of the accident victimsare young, and in their most productive age.

Where the problem lies

Underreporting of cases & actual number of registered vehicles

India's road safety system has unique difficulties. Users are unable to view the true figures due to underreporting. (Indian Institute of Technology Delhi, Transportation Research & Injury Prevention Project, 2020) The Global Burden of Disease Study of 2017 and the National Burden Estimates Study show that 2,18876 and 2,75,000 road accident deaths respectively, which are much higher than our official Indian numbers (1,47,913). There are many instances where the accidents are unreported to the authorities.

According to WHO, India's data on traffic fatalities is of low quality and is not readily available or usable (Prachi Salve and Gokulananda Nandan, 2021) In addition, since outdated automobiles and two-wheelers are removed from records, the number of cars and motors registered overstates the figures. So, it's possible that the lower rate of accidents per registered car is not an indicator that the number of accidents has decreased as a whole. The level of automobile safety in India ranges from 2 to 6 international standards.

Problem of enforcement

As per Global Status Report, 2018 India has poor enforcement laws when it comes to national speed limit law, national drink-driving law, national motorcycle helmet law and national seat belt law as compared to other middle- income countries.

Laws	***Level of enforcement***
Speed limit enforcement	***3***
Drink-driving law enforcement	***4***
National motorcycle helmet law enforcement	***4***
National seat-belt law enforcement	***3***

Vehicle safety: New Motor Vehicles Act, 2019

Planning for road safety must include consideration of vehicle safety. The Government has started a transformational initiative to put international standards for safety and emission controls in transportation vehicles. The most effective pre-crash safety technologies among the studied pre-crash safety systems for decreasing injury crashes in India were discovered to be autonomous emergency braking (AEB) and electronic stability control (ESC) in vehicles, lorries, and buses. Although these technologies will contribute to less collisions in the future, there will be a rise in collisions between heavy vehicles and pedestrians and between heavy vehicles and Power two wheelers. 2021 (Pisharam)

The administration has also praised the much-needed updates to the Motor Vehicle Act (MVA) as a wise move. In order to upgrade the safety and emission characteristics in Indian cars, the Ministry of Road Transport and Highways has already announced a number of laws. They include the draught notifications for airbags, speed alert systems, reverse parking aid, anti-lock brake systems, crash standards, etc. Another positive move for the public would be to ensure that those who step forward to help the injured individual are not required to provide the police or medical staff access to their personal information. 2019 (Naharia) Yet, these rules are more prominent in large urban areas.

Initially, the majority of metro cities are the only ones who will be affected by the new law's enforcement.

Table below lists some of the sanctions (old and new):

Section	*Violation*	*Old Penalty*	*New Penalty*
181	*Driving w/o license*	*500*	*5000*
182	*Driving despite disqualification*	*500*	*10,000*
183	*Over speeding*	*400*	*1000 for LMV & LMV for medium passenger vehicle*
185	*Drink and drive*	*2000*	*10000*
189	*Speeding/racing*	*500*	*5000*
194D	*Without Helmets*	*100*	*1000 and 3 months without license*
194B	*Without seat belts*	*100*	*1000*

Lesser research studies

The lack of published research on statistical modelling in this field validates our ignorance. lack of a leading organisation for road safety in India. The National Road Safety Board, which is anticipated to serve as the country's leading organisation, just received clearance from the central government. absence of a central administration for road safety. Moreover, the development of split four-lane highways (without access control) does not appear to have decreased death rates, and vulnerable road users continue to be a major cause of fatalities.

Other Problems

The population to traffic policeman ratio is too low, municipalities lack the resources and expertise needed to regulate traffic, and the PWD and engineering departments are perennially short of money to fix roads. There isn't much room for traffic regulation without a road-width increase and an infrastructure update. Lack of political will to clear bazaars from major roadways, encroachments from walkways, and deteriorating road conditions hardly creates a situation that is favourable for levying steep fines on negligent drivers.

The Global New Car Assessment Program, a project of the United Kingdom's towards zero foundation, provides a platform for evaluating vehicles that meet the requirements of international crash tests, including those for frontal and side impacts, seat belts, electronic stability control, pedestrian protection, motorcycle anti-lock brakes, and autonomous emergency braking systems.

to reduce the number of traffic-related deaths and injuries. Global NCAP, 2021 (Details) Using crashworthiness and occupant protection tests, they started a project named "Safer Cars for India," and they gave the tested automobiles a star grade (Global NCAP, 2018). Even however, it has been made clear in the parliament that the NCAP assessment is optional and that there is no requirement for adherence to these procedures in the Central Motor Vehicle Regulations. (Global NCAP, 2021) "#SaferCarsForIndia"
In 2020, there were more than 330 advocacy programmes for driving safety. Sukhad yatra smartphone app for toll gate information. It gives the user an opportunity to report any accident and pothole, real time informationfor facilities on toll. Through this app one can also purchase FASTags.

So far, India does not have a national level database for road accidents, although the World Bank is supporting the development of one. Tamil Nadu and Himachal Pradesh have already developed their own crash data management systems, with support from the World Bank, while a few other states are in the process of doing so. From 2017 onward, all states and union territories have adopted a uniform traffic accident recording format developed by the Ministry of Road Transport and Highways (MoRTH).

Use of subways and foot bridges

Many persistently cling to outdated customs when crossing roads, risking their lives in the process. Subways and footbridges built for commuters sit idle. And to make matters worse, traffic signals encourage people to cross busy streets rather than requiring them to use footbridges and subways. If the police start fining people for jaywalking, the number of fatalities may decrease. In order to lower the number of fatalities on the roads, safety programmes must be created to instill discipline and order among the populace. Before an effective enforcement drive can be undertaken, these cities require a significant infusion of funding for the installation and repair of traffic lights, correct signage, zebra crossings, road repairs, the development of parking areas, and a strengthening of the traffic police and its equipment.

Highlighting behavioral flaw among many Wearing seat belt is necessary

It is important and paid a very little attention when it comes to behavioral understanding of people for their own and other's safety. Wearing seat belts is one such thing. People in India think that wearing seatbelts is not masculine enough. Nearly 40% of the surveyed population says that it is not good for their image to wear seatbelts and make them look timid. They also say that their co-passengers would consider them as a meek if they start using the seatbelts. A study was jointly conducted by Nissan Motor Private Limited and Safe life foundation in 2019 to understand the status of use of rear seat belts and the status of safety of children during commute. In 2017, 26,896 people died due to non-usage of seat-belts in India. This is an exponential increase over last years' number. In 2016, 5,6386 road crash deaths were reported due to non-use of seat-belts. This 377%increase implies underreporting of deaths due to non-usage of seat-belts until now. In 2017, 16,876 passengers were killed, and 61,942 passengers were injured due to non-use of seat-belts. (SaveLIFE Foundation, 2019)

Rear seat-belts are an important safety device. According to WHO, use of rear seatbelt reduces the probability ofbeing killed by 25% and injuries by 75%. West Delhi Traffic Police announced its campaign to ensure people sitting in the rear seat wear seat belts as well from13 Jan 2021 to 23rd Jan. (Rear seat belt challan in Delhi: Here'show much you will pay for non-compliance, 2021) It should be noted that the Motor Vehicle Act, which was recently amended and enforced already has a provision to book the occupants for not wearing the seatbelts in the rear seats of the car. (Nag, 2021) Along with drinking and driving, using a cell phone or indulging in other activities while driving can have fatal consequences and is referred to be "recognition error." 2018 Holzwarth A human being cannot handle many things at once. Because drivers don't base their speed decisions on speed limit signs, regular speed limit signs are useless at urging cars to slow down. Instead, vehicles merely follow traffic patterns and the width, smoothness, and condition of the road.

Conclusion

Road safety institutional structures and processes would remain inefficient and unfinished without sufficient financing. In addition, India's goal of halving the death toll by 2030 is a difficult one. It is crucial to institutionalise more effective evidence-based road safety regulations tailored to India. More statistically based studies on traffic safety and accidents are required. In the Indian environment, where infrastructure turmoil is intense, behaviour is crucial in preventing accidents. However it is evident from our study across projects that there are a variety of environmental, behavioural, and emotional aspects that non-consciously affect our decisions to do a possible risky action. (Investigating the Behavioral Causes of Accidents on Indian Highways, 2021)

Appendix

1.

In percentage	Driver/Passenger (4 wheeledvehicles)	2-3 wheelersvehicles	Cyclists	Pedestrians	Others
World	29	28	3	23	17
South East Asia	16	43	2	14	25

2.

Years	Total Number of Road Accidents (in numbers)
1970	114100
1980	153200
1990	282600
1994	325864
1995	351999
1996	371204
1997	373671
1998	385018
1999	386456
2000	391449
2001	405637
2002	407497
2003	406726
2004	429910
2005	439255
2006	460920
2007	479216
2008	484704
2009	486384
2010	499628

2011	497686
2012	490383
2013	486476
2014	489400
2015	501423
2016	480652
2017	464910

Years	Total Number of Road Accidents (in numbers)	Total Number of Persons Killed (in numbers)
1970	114100	14500
1980	153200	24000
1990	282600	54100
1994	325864	64463
1995	351999	70781
1996	371204	74665
1997	373671	76977
1998	385018	79919
1999	386456	81966
2000	391449	78911
2001	405637	80888
2002	407497	84674
2003	406726	85998
2004	429910	92618
2005	439255	94968
2006	460920	105749
2007	479216	114444
2008	484704	119860
2009	486384	125660
2010	499628	134513
2011	497686	142485
2012	490383	138258
2013	486476	137572
2014	489400	139671
2015	501423	146133
2016	480652	150785
2017	464910	147913

4.

States	Fatal accidents	Grievous injury accidents	Minor injury	Non-Injury	Total accidents
Tamil Nadu	15061	5005	43856	1640	65562
Madhya Pradesh	9258	4863	34493	4785	53399
Karnataka	9739	14191	14247	4365	42542
Uttar Pradesh	17706	14363	6044	670	38783
Kerala	3915	27034	5994	1527	38470

References

1. World Health Organization, 2018. *Global status report on road safety 2018: summary*. [online] Geneva:World Health Organization. Available at: <http://apps.who.int/iris/bitstream/handle/10665/277370/WHO-NMH-NVI-18.20-eng.pdf?ua=1> [Accessed 22 October 2021].
2. KNOWLEDGE, G., Singh, H., 2021. *Motor Vehicles (Amendment) Act 2019: Key Features and Penalties*. [online] Jagranjosh.com. Available at: <https://www.jagranjosh.com/general-knowledge/features-of-motor-vehicles-amendment-bill-2019-1567410462-1> [Accessed 22 October 2021].
3. Crouch, G., 2019. Helping India reduce its Road Fatalities by Half through a Central Road Safety Strategy. [Blog] *The World Bank - Speeches & Transcripts*, Available at: <https://www.worldbank.org/en/news/speech/2019/10/06/national-road-safety-strategy-india-accidents-death-behavior-change-safe-roads> [Accessed 22 October 2021].
4. Morth.nic.in. 2021. *About Road Safety | Ministry of Road Transport & Highways, Government of India*.[online] Available at: <https://morth.nic.in/about-road-safety> [Accessed 22 October 2021].
5. Ministry of Road Transport and Highways Transport Research Wing, 2020. *ROAD ACCIDENTS IN INDIA – 2019*. [online] New Delhi: MORTH, GOI. Available at: <https://morth.nic.in/sites/default/files/RA_Uploading.pdf> [Accessed 22 October 2021].
6. Azad, Y., 2020. *The Motor Vehicles Act is a good first step. Now, bring in more reforms | Analysis*. [online] Hindustan Times. Available at: <https://www.hindustantimes.com/analysis/the-motor-vehicles- act-is-a-good-first-step-now-bring-in-more-reforms/story-elaetuCv6f2oTC8Nq4P2uJ.html> [Accessed 22 October 2021].
7. Arora, Y. and Kumar, S., 2019. Statistical Approach to Predict Road Accidents in India. *Advances in Intelligent Systems and Computing*, [online] pp.189-196. Available at: <https://link.springer.com/chapter/10.1007%2F978-981-32-9515-5_18#citeas> [Accessed 22 October 2021].
8. Mor, N., Sood, H. and Goyal, T., 2020. A statistical model for prediction of road accidents in the State of Punjab. *Journal of Interdisciplinary Mathematics*, [online] 23(1), pp.229-236. Available at: <https://www.tandfonline.com/doi/abs/10.1080/09720502.2020.1721715> [Accessed 22 October 2021].
9. Prachi Salve, I. and Gokulananda Nandan, I., 2021. *Why India's data on road crash deaths is*

unreliable. [online] Scroll.in. Available at: <https://scroll.in/article/1007963/why-indias-data-on-road-crash-deaths-is-unreliable> [Accessed 22 October 2021].

10. PISHARAM, P., 2021. *Forecasting Indian Road Traffic Casualties: Guidance to Prioritise Road SafetyTechnologies and Regulations*. CHALMERS UNIVERSITY OF TECHNOLOGY.
11. Transportation Research & Injury Prevention Programme Indian Institute of Technology Delhi, 2020. *Road Safety in India: Status Report 2020*. [online] New Delhi: Transportation Research & Injury Prevention Programme (TRIPP) Indian Institute of Technology Delhi. Available at: <http://tripp.iitd.ac.in/assets/publication/Road_Safety_in_India2018.pdf> [Accessed 29 October 2021].
12. SaveLIFE Foundation, 2019. *STUDY ON REAR SEAT-BELT USAGE AND CHILD ROAD SAFETY IN INDIA*. [online] SaveLIFE Foundation. Available at: <https://savelifefoundation.org/pdfs/Study-on-Rear-Seat-Belt-Usage-and-Child-Road-Safety-In-India.pdf> [Accessed 29 October 2021].
13. Nag, S., 2021. *Rear seat passengers not wearing seatbelt? Pay Rs. 1,000 FINE!*. [online] CarToq - India's #1 auto content site. Available at: <https://www.cartoq.com/rear-seat-seatbelt-fine/> [Accessed 29 October 2021].
14. Global NCAP. 2021. *About — Global NCAP*. [online] Available at: <https://www.globalncap.org/about/> [Accessed 29 October 2021].
15. Global NCAP. 2021. *#SaferCarsForIndia — Global NCAP*. [online] Available at: <https://www.globalncap.org/safercarsforindia> [Accessed 29 October 2021].
16. Behaviouraldesign.com. 2021. *Behavioural solutions for road safety (Mint) – Behavioural Design*. [online] Available at: <http://www.behaviouraldesign.com/2017/03/27/behavioural-solutions-for-road-safety- mint/> [Accessed 29 October 2021].
17. Medium. 2021. *Exploring The Behavioural Reasons For Accidents On Indian Roads*. [online] Available at: <https://medium.com/behavioural-design-insomanywords/exploring-the-behavioural-reasons-for-accidents-on-indian-roads-e1a140f5314b> [Accessed 29 October2021].
18. Open Government Data (OGD) Platform India. 2021. *Road accidents, Open Government Data (OGD) Platform India*. [online] Available at: <https://data.gov.in/dataset-group-name/road-accidents> [Accessed 29 October 2021].
19. Visualize.data.gov.in. 2021. *Visualization Engine v3.0*. [online] Available at: <https://visualize.data.gov.in/> [Accessed 29 October 2021].
20. Ministry of Road transport and Highways, GOI, New Delhi, 2021. *Annual Report Bharatmala Road to Prosperity*. [online] New Delhi: Ministry of Road Transport & Highways, GOI, NewDelhi. Available at: <https://morth.nic.in/sites/default/files/Annual%20Report%20-%202021%20(English)_compressed.pdf> [Accessed 29 October 2021].
21. Naharia, A., 2019. *Analysis of the Motor Vehicles Amendment Act, 2019. - Indian Legal Solution*. [online] Indian Legal Solution. Available at: <https://indianlegalsolution.com/analysis-of- the-motor-

vehicles-amendment-act-2019/> [Accessed 29 October 2021].

22. Tvgssshrk, P., 2018. Building safer roads through better design and better contracts. [Blog] *World Bank Blogs*, Available at: <https://blogs.worldbank.org/transport/building- safer-roads-through-better-design-and-better-contracts> [Accessed 29 October 2021].
23. Health and Safety Authority, 2021. *BEHAVIOUR BASED SAFETY GUIDE, DOING WHAT WE DO BETTER, SMARTER, SAFER*. [online] Health and Safety Authority. Available at: <https://www.hsa.ie/eng/Publications_and_Forms/Publications/Safety_and_Health_Management/behaviour_based_safety_guide.pdf> [Accessed 29 October 2021].
24. Holzwarth, A., 2018. *The Real Reason You Shouldn't Text While Driving*. [online] Behavioral scientist. Available at: <https://behavioralscientist.org/> [Accessed 29 October 2021].