Road Traffic Safety Management in India – Analysis - Exploring Solutions

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ABSTRACT

The increasing frequency and severity of recent Road Traffic Accidents (RTAs) in India involving modern vehicles have caused grave concern for road safety, posing serious challenge to transport policy makers, planners, regulators, police, engineers and civil society alike. With just 1% of world’s vehicles, India leads with 10% of world’s total Road Traffic Fatalities (RTFs) of 1.3 million, resulting in untold misery to lakhs of people, the nation losing about 3% of its GDP. Data with the Transport Research Wing (TRW) of the Ministry of Road Transport and Highways (MORTH) and the National Crime Records Bureau (NCRB) of India indicate an alarming rising trend during 2002-2011 in the number of RTAs, the leading cause of unnatural death in India. RTAs constitute the 8th leading cause of deaths in the world[1] in 2011, 77% of them being men. The UN General Assembly Resolution 64/255 of 2010 declared 2011-20 as the ‘Decade of Action for Road Safety’[2]. Less than 35% of low and middle income countries have policies in place to protect the road users. Road safety was recognized in global environmental policy deliberations at the recent Rio+20 UN Conference on Sustainable Development. Sustainable transport policy has to include promoting Public Transport and making Non-Motorized Transport (NMT) options accessible and safe, signifying the need to expand alternate transport systems like railways and inland waterways. In this backdrop, an analysis of the RTA related issues and the underlying causes is made, and possible way forward is attempted.

Key words: Road accidents, fatalities, causes, safety, railways, waterways.

1. INTRODUCTION

1.1 VOLVO BUS ACCIDENT ON 30TH OCTOBER 2013 AT PALEM NEAR MAHBUBNAGAR, ANDHRA PRADESH

A Volvo 9400 bus, producing 290 BHP against 180 BHP by a normal bus, carrying 52 people including driver and cleaner against the permitted 45, and travelling from Bangalore to Hyderabad on National Highway (NH)-44, made a high-speed collision with a protruding culvert wall located on a curve at Palem (v) near Mahbubnagar in Andhra Pradesh at about 5 AM on 30th October 2013, killing 45 passengers on the spot. The ascribed reasons for the accident and high fatalities are over-speeding, lack of speed governors, overstressed driver, fire crackers inside the vehicle, overloaded, faulty road geometry, leaking diesel from damaged fuel tank catching fire at ambient temperature, Carbon Monoxide poisoning through AC ducts, jamming of central locking system of emergency doors and windows making emergency escape impossible, non-availability of hammer to break them, driver’s irresponsibility and permit violations.

1.2 VOLVO BUS ACCIDENT ON 14TH NOVEMBER 2013 AT HAVERI, KARNATAKA

Another accident, again involving a Volvo bus on Bangalore-Mumbai NH occurred on 14th November 2013 at Haveri in Karnataka, killing 7 passengers including standby driver and injuries to 40 passengers, reportedly due to over-speeding when the bus brushed past the road median on the bridge across Vardha River leading to leakage of fuel tank and the diesel catching fire and engulfing the bus. The other passengers escaped by breaking open the emergency exit. The bus design was reportedly altered by the operator by providing unauthorized seat next to the driver blocking the passenger escape route.

In two other serious accidents in Maharashtra, on 8th December 2013, one on Sangavi-Madgaon road, a school bus was hit by a private travels bus killing 6 children on the spot; the other on Manmad-Malegaon road, a Scorpio vehicle carrying pilgrims from Madhya Pradesh bound to Shirdi was hit by a container truck, killing 8 of them on the spot.

The reasons for such fatal accidents and high fatalities relate to all the players like driver, operator, regulator/governments, vehicle manufacturer, road engineering and condition, the passengers and the public as detailed under 3.1 to 3.7 below.

2. CURRENT STATUS OF ROAD TRAFFIC ACCIDENTS, FATALITIES AND INJURIES

2.1 AT THE GLOBAL LEVEL – 2011

As per Global Status Report on Road Safety [1](GSRRS) 2013, about 3400 people died per day due to RTAs in the world during 2010, nearly 700 of them being children. Nearly 1.3 million people die on the world’s roads every year and about 20 to 50 million suffer grievous injuries, making them often disabled. Half of those dying are vulnerable road users viz., 22% pedestrians, 5% cyclists and 23% motorcyclists. Young adults between 15 and 44 years constitute 59% of global RTFs.

2.1.1 Low and Middle Income Countries - Status: Low and middle income countries with 84% of world population and with only 53% of total registered vehicles suffer 92% of the total 1.3 million RTFs, and they have higher RTF rates of
21.5 and 19.5 per 1 lakh population respectively. In contrast, the RTFs in high income countries are 10.3 per 1 lakh. More than a third of the RTFs in low and middle income countries are among pedestrians and cyclists. RTFs are highest in the African region at 24.1 per 1 lakh population; in South Asian region, they vary from 1.9 in Maldives to 38.1 in Thailand, compared to 8.7 in high-income countries. In fact, in 87 countries mostly in Africa and South Asia, RTFs increased during 2007-10. Still, less than 35% of low and middle income countries have policies in place to protect the vulnerable road users. Only 7% of the world’s population (28 countries covering 449 million people) has comprehensive laws on the five key risk factors (excessive speed, drink-driving, non-use of helmets and seat-belts, and child restraints).

If no concerted efforts are made by all stakeholders concerned, RTFs may go up to 1.9 million/annum by 2020, RTAs becoming the fifth leading cause of deaths.

2.1.2 Accident Burden: RTAs are the leading cause of death among young people aged 15-29 years and cost the nations about 1-3% of their GDP[1] i.e., $518 billion[2] in the year 2000. In addition, there are phenomenal public health, social, economic and quality of life costs to the injured, to the kin of those killed or injured, and to the Governments, the countries losing their productive manpower and the families losing their bread winners driving their families into a poverty trap, causing severe trauma to the relatives of the diseased and injured, and severe stress on the nations’ health systems.

2.1.3 The Initiatives: Some 88 nations covering 1.6 billion people have reduced the number of RTFs during 2007-10 due to their concerted efforts, despite a 15% per annum global increase in the registered vehicles. Among them 42 are high-income countries, 41 middle-income, and five low-income. Countries like Australia, Canada, France, Netherlands, Sweden and Britain have brought down RTAs, RTFs and road injuries through coordinated responses like attention to the legal and regulatory environment, public education, enforcement of laws by addressing the safety of road user, vehicle safety, road environment and post-crash care also.

Hence, to prevent about 5 million deaths due to RTAs by 2020, the World Health Organization (WHO) has declared 2011-2020 as the United Nations ‘Decade of Action for Road Safety’[2] in line with the UN Resolution 64/255. In addition, the Global Road Safety Partnership, 1999 (RS10 Project)[3] is being implemented by a consortium of WHO and 8 other agencies from 2010-14 in 10 nations (Brazil, Cambodia, China, India, Kenya, Mexico, Russian Federation, Turkey and Vietnam) which among them are responsible for 48% of all RTFs and road injuries in the world. Among them, India suffers the highest RTFs at 196000[4] as per their study, above China.

2.1.4 The Way Forward: The GSRRS 2013[1] recommends to the Governments to identify gaps in legal and regulatory framework, pass comprehensive legislation that meets best practices on all five key risk factors, invest financial and human resources in their strict enforcement, raise public awareness, put in concerted and coordinated efforts to make road infrastructure safer for pedestrians and cyclists considering their needs while making road safety policy, transport planning and land use decisions, and consider how NMT can be integrated into more sustainable and safer transport systems.

The above mentioned best practices and recommendations are worthy of serious study and urgent implementation by the low and middle income countries with high RTFs like India, in view of the colossal loss of life and untold agony.

2.2 INDIA – A COMPARISON

In India, one RTA occurs every minute, and one Indian loses his/her life every 3.7 minutes. RTFs account for about 2% of the total annual deaths in India. Following table shows the status of RTAs and level of safety compliance among nations.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>India</th>
<th>China</th>
<th>Brazil</th>
<th>USA</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (Million)</td>
<td>1225</td>
<td>1349</td>
<td>195</td>
<td>310</td>
<td>50</td>
</tr>
<tr>
<td>No. of vehicles (Million)</td>
<td>115</td>
<td>207</td>
<td>65</td>
<td>259</td>
<td>9.6</td>
</tr>
<tr>
<td>Institutional Framework:</td>
<td>NRSC[7] established.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead Agency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle standards applied</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Total No. of Fatalities (WHO: as reported by country)</td>
<td>231027; 130037↑</td>
<td>275983; 70134↓</td>
<td>43869; 36499</td>
<td>35490; 32885</td>
<td>15995; 14804</td>
</tr>
<tr>
<td>Road accident Deaths per 1 lakh population</td>
<td>18.9 [1] 11.35[7]↑</td>
<td>20.5 ↓</td>
<td>22.5↑</td>
<td>11.4↓</td>
<td>31.9↓</td>
</tr>
<tr>
<td>Road accident Injuries per 1 lakh population[7]</td>
<td>36.58 (WHO) 41.68</td>
<td>17.90</td>
<td>31.48</td>
<td>504.16</td>
<td>304.15</td>
</tr>
<tr>
<td>Deaths per 10000 vehicles</td>
<td>20.09 (WHO)</td>
<td>13.33</td>
<td>6.74</td>
<td>1.37</td>
<td>16.66</td>
</tr>
</tbody>
</table>
As seen from Table 1, India has established the lead agency and approved National Road Safety Strategy. It has also announced the National Road Safety Policy, launched National Road Safety Commission (NRSC), National Highway Trauma Care Project and National Highway Accident Relief Services Scheme (NHARSS)\[7\].

2.2.1 The Issues: But, India has not set any target for reduction of road fatalities. The Motor Vehicles Act Amendment Bill 2007 also awaits the approval of Lok Sabha\[7\]. The there are huge variations in the no. of registered vehicles and the no. actually on the roads\[31\] making RTA analysis inaccurate, the high RTFs per 1 lakh population (Fig.1) and those for 10000 vehicles (Fig.4), reported by MORTH and those estimated by GSRRS (WHO), the higher RTFs in pedestrians, cyclists and the injured\[5\] than those reported\[7\] by TRW, MORTH, under-reporting due to lack of follow-up by traffic authorities\[1\]. They underline the need for significant improvement in the reliability of reporting. Although standards for most of the key risk factors are in place, enforcement is shown to be very low for the 5 key risk factors. Less than 49% of the injured are transported by ambulance to nearest health facility in India. The Road Safety Fund (RSF)\[25\] is yet to be
established and operationalized by most states in India. Lack of civic sense in road users is also a factor. The human and GDP loss due to RTAs is one of the highest in India highlighting the urgent need to drastically reduce the RTAs and RTFs.

2.2.2 The Four Major killers[7]: In India, out of the total RTFs of 142,485 in 2012, the RTFs due to over-speeding are 59,932 (42%), due to over-loading 33,604 (23.58%), due to drink-driving 10,553 (7.4%) and due to load protruding 10,841 (7.66%), altogether occupying a whopping 80.64% of the total road fatalities. Again, over-speeding is believed, to a large extent, to have a link with drink-driving and they together occupy 68.7% (70,485 out of 102,620) of the driver related fatalities[7].

2.2.3 Steep Rise in Normalized Indicators[7]: During 2002-2011, per 1 lakh population, the total number of RTAs rose by 7.3% to 35.1, the no. killed from 104 to 10 and in the no. injured from 500 to 36. Though the above rates are lower than those in other countries, they don’t indicate improved road safety, since the decline may be due to the large population with comparatively less vehicles, over-reporting of actual vehicles on the roads due to one-time life tax on vehicles. It may perhaps not be due to improvement in vehicle crashworthiness, occupant protection and better enforcement as surmised by the MORTH[7]. In fact, the indicators are very high compared to the countries compared, and seem to be in accordance with Smeed’s Law (D=0.0003(np^2)^(1/3) where ‘D’ is annual road deaths, ‘n’ is number of registered vehicles, and ‘p’ is population), which states that increasing traffic volume leads to an increase in fatalities per capita, but to a decrease in fatalities per vehicle.

![Fig. 2: No. of accidents, persons killed, and those injured per 10000 vehicles: 1970-2011](32)

However, between 1970 to 2011(Fig.3), per 10000 km of road length, the no. of accidents from 960 to 1061, the no. of RTFs from 122 to 304, and those injured from 590 to 1090, showing a rising trend. The no. of persons injured is given to be about 3.6 times the no. of fatalities, but actually may be far higher[1], needing further study. In India, about 54.7% of RTAs and 64.5% of RTFs occur on National Highways (NH) and State Highways (SH) together which constitute only 7% of the total road network. NHs alone contribute to about 40% of the total RTFs.

![Fig. 3: No. of RTAs, RTFs and injured per 10000 km of Road Length 1970-2011](32)

2.2.4 Rural Vs Urban: In 2011, the number of RTAs and RTFs in rural areas at 53.5% (266,231) and 63.4% respectively were more than those in the urban areas at 46.5% (231,455) and 36.6% respectively. This may be due to the NHs and SHs passing through rural areas. There is a shift in the pattern of accidents from head-on collision in case of undivided
2-lane Highway to front-rear collision for divided 4-lane Highway. This signifies the need for in-depth crash data investigations\(^9\) on highways to arrive at leads towards reducing RTAs substantially.

2.2.5 The Profile of RTA Victims: About 72% of the vehicles are ‘vulnerable’ two-wheeler riders, who occupy 19.2% (Fig.4) of total RTFs; pedestrians and cyclists are included under ‘other vehicles/objects’ comprising 10.3%. Out of the total RTFs, 51.9% are in the productive age group of 25 to 65 years\(^{[7]}\). However, a nation-wide study\(^{[8]}\) indicates that pedestrian RTFs occupy 37%, other vulnerable road users (cyclists etc.) 10.9%, motorcyclists 19.6%, altogether constituting 68% of the total RTFs. The RTFs due to head injuries occupied 62% of the total RTFs. 55% of the RTFs occurred within minutes of the accidents. About 65% of the RTFs are in the productive age group of 15 to 59 years. Rushing the RTFs to hospital in ambulance within minutes of RTA and providing trauma care might reduce the RTFs by more than one-third\(^{[9]}\).

The increased RTFs may be mainly due to over-speeding and drink-driving by drivers, increased speeds of modern vehicles, poor highway maintenance, lack of Highway Patrol Vehicles, ambulances, trauma care etc.

2.2.6 The Trends: From Fig.5, between 1970 and 2011, the increase in the road network was by 4 times to 4.69 million km, in the number of vehicles by 100 times to 142 million, in the road accidents by 4.36 times, in the RTFs by 9.83 times, and in the no. of injured by 7.30 times\(^{[10]}\). Fatal traumatic brain injuries were seen in 68.73%\(^{[11]}\) of the cases. In China, the total number of RTFs are in falling, while in India they are on the rise.

2.2.7 The Increasing Severity: The high proportion of fatal accidents and the high fatalities / 100 accidents compared to previous years implies increasing severity. This may be due to high vehicle density, high speeds of modern vehicles, coupled

with drink-driving responsible for 70% of RTFs in Mumbai and Delhi\(^{[12]}\), non-wearing of helmets increasing the risk of fatality by about 40% and the risk of severe injury by 70%, non-wearing of seat belts increasing the risk of fatality by 25-75%\(^{[13]}\), weak regulation, poor driving skills, fatigue, faulty road geometry, poor road condition, lack of pedestrian and bicycle friendly road design and lack of civic sense.

**Table 2: No. of road accidents, persons and accident severity\(^{[7]}\)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of accidents</th>
<th>Number of persons</th>
<th>Accident severity*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Fatal</td>
<td>Killed</td>
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</tbody>
</table>

**P:** Provisional, Source: Information supplied by States/UTs (Police Departments), Figures within parentheses indicate share of fatal accidents to total accidents *Accident Severity: No. of Persons killed per 100 accidents*
2.2.8 The Initiatives: A National Highway Accident Relief Service Scheme (NHARSS) has been taken up by the MORTH to reduce the RTFs on National Highways. The existing excellent PPP initiative of ‘108 GVK EMRI-State Government Emergency Response Service’ being run on PPP model by 14 states (including AP) and 2 Union Territories is of immense value reaching 372 million people with 5460 ambulances saved 355126 lives since 2005 up to October 2011 due to their 18 minute average response time to reach 13 million emergencies, i.e., within the golden hour[28]. It is pathetic that about 80% of bystanders would hesitate to take the RTA victim to the hospital, for fear of lack of supportive legal environment and possible police harassment[27].

2.2.9 The Accident Burden: The no. of RTFs and road injuries are reported as 142485 and 511394 respectively indicating their proportion as 1:3.6. But epidemiological evidence suggests the realistic ratio much higher at about 1:85. About 52% of the RTA victims are in the age group 25-65 years for India, the Disability Adjusted Life Years (DALY’s, accounting for quality of life reduced due to a disability, and lifetime lost due to premature mortality) due to RTAs are 7.34 million in 2002 as per WHO. RTA losses cost India about 3% of its GDP, i.e., about $20 billion. In addition, there are phenomenal socio economic costs and decline in quality of life of the dependents of the accident victims. RTAs are leading to 70 million injuries and 20 million hospitalizations and occupy more than 30% of the country’s hospital beds[17],[12], a crippling burden on the country’s already overburdened health system.

The utility of allocating resources for health care interventions based on Quality Adjusted Life Years (one QALY- one year of life in perfect health that would be added) may need debate. A judicious combination of DALY’s for assessing the loss of potential benefits to the family and nation had a person been not injured/dead, and QALY’s to assess the cost/benefit ratio of a resource allocation for reduction/prevention of injury related morbidity/death etc. to himself and his kin will make it an interesting research study.

2.3 ANDHRA PRADESH (AP) – A COMPARISON

<table>
<thead>
<tr>
<th>Table 3: RTA status in 5 high risk states in India[7]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State/UT</strong></td>
</tr>
<tr>
<td>Share of 5 States</td>
</tr>
<tr>
<td>1. Maharashtra</td>
</tr>
<tr>
<td>2. Tamil Nadu</td>
</tr>
<tr>
<td>3. Madhya Pradesh</td>
</tr>
<tr>
<td>4. Karnataka</td>
</tr>
<tr>
<td>5. Andhra Pradesh</td>
</tr>
<tr>
<td>Share of the above 5 States in total Registered Vehicles</td>
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<tr>
<td>Top 5 States: Share in Total Number Killed in Road Accidents (in %)</td>
</tr>
<tr>
<td>Share of 5 States</td>
</tr>
<tr>
<td>1. Uttar Pradesh</td>
</tr>
<tr>
<td>2. Tamil Nadu</td>
</tr>
<tr>
<td>3. Andhra Pradesh</td>
</tr>
<tr>
<td>4. Maharashtra</td>
</tr>
<tr>
<td>5. Rajasthan</td>
</tr>
<tr>
<td>Share of the above 5 States in total Registered Vehicles</td>
</tr>
<tr>
<td>Top 5 States: Share in Total Number of Injuries in Road Accidents (in %)</td>
</tr>
<tr>
<td>Share of 5 States</td>
</tr>
<tr>
<td>1. Rajasthan</td>
</tr>
<tr>
<td>2. Karnataka</td>
</tr>
<tr>
<td>3. Andhra Pradesh</td>
</tr>
<tr>
<td>4. Madhya Pradesh</td>
</tr>
<tr>
<td>Share of the above 5 States in total Registered Vehicles</td>
</tr>
</tbody>
</table>

* Top 5 according to their respective shares in 2011
P: Provisional

It is seen from the above table, AP stands 5th in India in RTAs at 8.9%, 3rd in fatalities at 10.6%, 3rd in injured at 10.9%, despite only 7.05% of India’s population. In India, projects co-funded by Bloomberg Philanthropies and the Global Road Safety Facility[11] are focused on NHs and SHs across the four states of Andhra Pradesh, Assam, Gujarat and Karnataka under the International Road Assessment Programme (iRAP), which involve risk mapping of selected roads and Star Rating them from 1 to 5 (increasing safety) considering 50 road attributes.

The following Table gives the normative indicators for the RTAs and RTFs in 3 states in India for analysis.
Table 4: Road accident data in Andhra Pradesh and Tamil Nadu-2011[7]

<table>
<thead>
<tr>
<th>State</th>
<th>No. of accidents</th>
<th>No. of road fatalities</th>
<th>No.killed/1 lakh popn.</th>
<th>No. killed/10000 vehicles</th>
<th>No.killed/10000 km of Roads</th>
<th>No.killed/100 accidents (Severity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>44165</td>
<td>15165†</td>
<td>17.9</td>
<td>14.9</td>
<td>637.2</td>
<td>34.3</td>
</tr>
<tr>
<td>Karnataka</td>
<td>44731</td>
<td>8971†</td>
<td>14.7</td>
<td>9.0</td>
<td>318.4</td>
<td>20.1</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>65873</td>
<td>15422†</td>
<td>21.4</td>
<td>9.9</td>
<td>801.8</td>
<td>23.4</td>
</tr>
<tr>
<td>India</td>
<td>497686</td>
<td>142485</td>
<td>11.8</td>
<td>10.0</td>
<td>383.2</td>
<td>28.6</td>
</tr>
</tbody>
</table>

The above Table indicates RTFs in AP are high compared to Karnataka and all-India, but lesser compared to those of Tamil Nadu. The RTF rate per 10,000 vehicles and the accident severity in AP is very high compared to that in Karnataka, Tamil Nadu and all-India. The no. of persons killed per lakh population is also very high at 17.9 against 11.8 for India. The lengths[18] of NHs and SHs in AP is 4537 km and 10491 km constituting only 1.9% and 4.4% of total road network in AP respectively, but they account for 33.7% and 27.4% of the total RTFs in AP, against 37.1% and 27.4% for India. This signifies the crucial importance of improving safety on Highways through coordinated, multi-sectoral interventions. Tamil Nadu has announced its Road Safety Policy in 2007, followed it up with a Road Safety Action Plan, set up a Road Safety Fund and deployed a GIS based Road Accident Data Management System (RADMS) in 2009 in 1400 police stations and identified 3000 accident prone spots.

2.4 INDIAN CITIES – A COMPARISON

The following Table indicates a comparison of the RTA and RTFs in a few cities of India.

Table 5: Road accident data in 5 cities of India

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Delhi</th>
<th>Hyderabad</th>
<th>Visakhapatnam</th>
<th>Vijayawada</th>
<th>Chennai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical extent</td>
<td>1484 sq.km.</td>
<td>625 sq.km.</td>
<td>544 sq.km.</td>
<td>61.88 sq.km.</td>
<td>426 sq.km</td>
</tr>
<tr>
<td>No. of vehicles</td>
<td>7.5 million</td>
<td>3.5 million</td>
<td>0.7 million</td>
<td>0.5 million (approx.)</td>
<td>3.64 million</td>
</tr>
<tr>
<td>Roads space as % of city area</td>
<td>21</td>
<td>9.5</td>
<td>7.88</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>No. of deaths; deaths per one lakh population</td>
<td>1866 (2012); 15↓</td>
<td>1472 (2012); 18.3↓</td>
<td>378 (in 2012); 18.6↓</td>
<td>300 (in 2011) 28.6↓</td>
<td>1399 (2011) 21.5↑</td>
</tr>
<tr>
<td>Accident Severity</td>
<td>28.4</td>
<td>16.6</td>
<td>26.7</td>
<td>20.53</td>
<td>14.21</td>
</tr>
<tr>
<td>No. of injured</td>
<td>5454 (2012); ↓</td>
<td>1139; ↓</td>
<td>1449(2011)↑</td>
<td>7898 (2011)</td>
<td></td>
</tr>
<tr>
<td>Share of urban transport[29]</td>
<td>43%</td>
<td>32%</td>
<td>42%</td>
<td>34%</td>
<td>31%</td>
</tr>
</tbody>
</table>

(Source: City Traffic police websites, News Paper reports, wikipedia)
The higher fatality rates in these cities vis-à-vis national rates may be due to modern high speed vehicles unsuitable for city roads, improper road geometry, tardy enforcement of traffic rules, public apathy for 5 key risk factors, and lack of zebra crossings/pelical signals at junctions. Wayanad district in Kerala decided to conduct a road safety audit focusing attention on the reasons for accident, vulnerable locations, analysis on reasons for past accidents and measures to prevent accidents.

Enhancing the share of people using Public Transport, which is presently between 31 to 43% in the above cities compared to the desired 70%[30] as also envisaged in the National Urban Transport Policy (NUTP)[19] of the Govt. of India which emphasizes ‘moving people – not vehicles’ and NMT.

3. PRIME CAUSES OF ACCIDENTS, FATALITIES AND INJURIES

From the above figure, it is seen that the fault of the driver contributes to an overwhelming 77.5% of the RTAs in India and there is a general lack of sensitivity to the value of life of a fellow being in our country compared to others.

3.1 Driver Related – Over-speeding[7], drink-driving[7],[12],[13],[14], over-loading[7], overtaking on bridges/culverts, mobile phone use, fatigue, neglect of traffic signals, negligence, disregard to road signage and value of life, inadequate training, old age, improper eye-site[22] etc.

3.2 Vehicle Related – High vehicle density, lack of speed locks, overloading and overcrowding, unsafe vehicle design, poor operating and maintenance condition, defective/lack of automatic door locks and emergency windows, non-availability of breaking hammer near windows, non-display of safety instructions, lack of reflective signage on rear and sides of vehicles etc.

3.3 Operator Related - Lack of safety vision, mission and implementation, proper permits, owner/lease agreements, insurance, pollution certificates, load protruding, maintenance management, vehicle safety auditing, proper training and sensitization to drivers, cleaners and mechanics in emergency management like response, reporting and coordination with regulators, provision of necessary GPS, RFID systems for real-time tracking of the vehicles, flouting of safety norms like lack of second driver in long distance travels, provision of fire extinguishers, public address system, awareness video, lack of established systems or communication with public regarding safety in Private or Public Transport Operators displaying passenger safety provisions/Safety Manual/Safety Plan/Citizen’s Charter in their websites.

3.4 Vehicle Manufacturer - Non-adaptation of modern high speed vehicle design to suit Indian road and traffic conditions, passenger behavior, operation and maintenance systems and practices, software, sensors and hardware, lack of speed governors, faulty central locking system, lack of GPS enablement, occasional flames etc. though Volvo company claims installation of Electronically-controlled Brake System in its Volvo 9400 bus.

3.5 Road Engineering and Signage Related – Lack of road signage (indicating speed limits, blind curves, sudden change in carriageway/alignment), reflective sticking at bridges, culverts, dividers/medians, speed breakers/rumble strips, service roads, junction improvement, cat eyes, crash barriers, guide stones proper signaling at junctions in cities and rural areas on Highways, load limits, lay-byes, road and culvert alignments, direction and diversion boards etc., poor maintenance of road infrastructure, damaged shoulders and even base course on some NHs, old/damaged bridges etc.

3.6 Regulator/ Government Related – Non-enforcement of rules relating to issue of vehicle permits, fitness certificates, driving licenses, speed limits, drink-driving, helmets, seat belts, child restraints, safety provisions, overloading, load protruding, road geometry, road maintenance, highway patrolling, ambulance services, trauma care, liquor shops, vehicle testing centres, drivers’ training and refreshment rooms, benchmarking safety levels, road safety audit, certification systems, vehicle record maintenance at toll gates, creation of awareness, legal and police apathy to good samaritans, rating of operators, public disclosure, non-availability of Highway Patrol Vehicles, Highway Ambulances and Trauma Care supposed to be available every 50 KM of Highway, low flash point of Indian diesel at 35°C enabling diesel from fuel...
tank to catch fire even at ambient temperatures. The proposed Road Safety Authority (RSA) is awaiting a legal shape by the AP Government.

3.7 Public Related – Lack of civic sense, diligence, enquiry, sensitivity to safety of self and other road users, compliance to speed limits, traffic regulations and road signage, drink-driving, mobile phone use, rash driving, overtaking, overloading etc.

4. CONCLUSIONS AND RECOMMENDATIONS

In the light of the above facts and the discussion that followed, the conclusions and recommendations for improvement of road safety and reduction of road traffic fatalities, stake holder-wise, are given below.

4.1 Transport Operator

1. Every driver should be sensitized intensively on the value of a person’s life and what it means to his family and friends, through visuals, videos of case studies of RTA victims and their dependents and their agony. Driver shouldn’t be over-stressed, vehicle shouldn’t be overloaded, nor explosive materials loaded as luggage.

2. The operator should get itself accredited after fulfilling the vehicle registration, permit, insurance, and other safety requirements of the regulator.

3. The operator should establish a Safety Management System under which it would prepare a Safety Management Plan.

4. Annually, the operator should mandatorily disclose the measures taken by it for passenger safety, its safety score card, evacuation, relief, rehabilitation, insurance etc. to the regulators - RSA, Transport, Roads & Buildings, Traffic police and Fire departments and to the District Collector, duly displaying the same on their website and announce in the media.

5. Vehicles should be painted in bright colours like yellow/orange and reflective paint should be applied at their rear to prevent front-rear collisions.

4.2 Vehicle Manufacturer

1. The design of modern high speed buses like that of Volvo, Isuzu, Mercedes Benz etc. must be customized to suit Indian roads, operating and maintenance systems, the passenger behavior, attitudes etc.

2. Additional safety provisions and protocols like sensors and alarms to identify vehicles stopping on road-side in the night, over-speeding, drink-driving, sleepiness, speed breakers, culverts etc. should be installed.

3. GPS enabled RFID system with alarm to enable the bus operator to track the vehicle, inform the police, ambulance and district administration for rushing necessary relief, rescue and medical teams to the accident spot on emergency basis.

4.3 A) Regulators (Transport/Roads & Buildings/Traffic Police/Fire Departments)/Government – Operational Level

1. An intensive and continuous traffic safety awareness campaign involving all sections of society, particularly the operators, the drivers, school and college students, and on the need for strict compliance to traffic regulations should be initiated and a suitable communication strategy needs to be evolved. It should be made a part of school curriculum and co-curricular projects.

2. There should be continuous monitoring, verification and enforcement of rules under the Motor Vehicles Act (MV Act) like issue of vehicle permits, driving licenses, testing, insurance, on 5 key risk factors (like over-speeding and drink-driving), mobile phone use, first-aid-boxes, driver fitness, vehicle fitness and its operation and maintenance condition, inflammable materials, safety protocols/provisions, their implementation, public disclosure on safety, follow-up on public feedback, and grievance redressal mechanism etc.

3. There should be clear responsibilities assigned and accountability fixed for various offences of the operator or his staff, the officers and stringent penalties including imprisonment imposed for violations.

4. The operator should be required to establish Safety Management Systems (including the electronic instruments/software in the vehicle to the prescribed Safety Integrity Level), prepare a Safety Management Plan and documentation of its implementation, and get them audited annually by a Safety Auditor/Quality Assessor accredited by the regulator.

5. The Accredited Safety Auditor should conduct Annual Safety Audit of the operator and furnish its report to the regulator regarding the operator’s compliance to rules prescribed by the regulator following the standard protocols. The salient features of the Audit Report should be kept on the regulator’s website and disseminated to public and to Transport Operator Rating Agencies, who should invariably display the safety criteria for their ratings.

6. Accident Black Spots should be identified and rectified in a time-bound manner, and Intelligent Transport System (ITS) should be provided in critical stretches to ensure foolproof safety with redundancies.
7. Ensure that fire tenders with necessary trained men and equipment like hose pipes, protective gear, ladders etc. reaches the accident spot within 15 minutes of call.

8. Since defective road geometry, non-functional signals, poor road maintenance, lack of reflective stickers at bridges/culverts are also considered to be some of the reasons for RTAs, the concerned regulators should take necessary time bound measures towards their improvement.

9. The regulator should insist the operators to go for safer model buses like Volvo 9700 being supplied to USA and Canada duly adapting the technology to Indian conditions to ensure safety of passengers.

10. The regulator should verify all papers and ensure that no bus plies as a stage carrier against the original tourist permit, as this is leading to overloading of the bus.

11. Strict enforcement of speed limit is a dire necessity even on expressways, Ring Roads etc. where the traffic signaling, Intelligent Transport System, other safety measures and junction development are not taken up.

12. To reduce the RTFs in rural areas, service roads, proper road geometry, junction improvement, signaling, zebra crossings, pelican signals, speed breakers, transition lanes etc. should be provided, regulating driving/cycling in wrong route, provide road signage and speed limits.

13. To reduce the unacceptably high RTF rates in most Cities, strict enforcement of traffic regulations is essential for the 5 key risk factors (like over-speeding), mobile use, junction improvement, traffic signaling and road signage, provision of zebra crossings and pelican crossings for pedestrians at junctions, proper road geometry at critical points is essential.

14. The public, Resident Associations and Civil Society Organizations should be sensitized and trained intensively, to offer their services as volunteers in promoting road safety and facilitating emergency Medicare to the injured, duly recognizing their services.

15. The State Level Road Safety Council and the District Level Road Safety Councils should be established and operationalized urgently and the multi-pronged strategy adopted by the MORTH to tackle road safety based on four ‘E’s of Road Safety should be implemented in a Mission Mode, duly ensuring active participation of local self governments.

16. Traffic accident data collection methodologies, sampling criteria, survey fields and formats should be standardized to enable easy comparison and remedial action, in consultation with all stakeholders. Additional fields may be incorporated to capture the profiles of drivers, occupants and other road users such as age, sex and other relevant data.

17. Necessary steps should be taken to provide emergency medical care to the RTA victims within the ‘golden hour’ so that 50% of the injured can be saved by bystanders’ initiative.

4.3 B) Governments – Policy Level

1. The national / state goal for reduction of RTAs and RTFs should be set, time-bound action plans prepared with funding, institutional arrangements, task force responsibilities, accountability and delegation to achieve the goals.

2. Evolve a policy and strategy for removal of all wine shops from the National and State Highways, since more than half the total road fatalities directly or indirectly related to drink-driving and over-speeding.

3. Road Safety Audits should be made mandatory not only for the new Highways being constructed, but for all the other existing National Highways also, in a time bound manner, at specified time intervals, in a representative manner.

4. Availability of Highway Patrol Vehicle with equipment like breath analyzers, mobile speed guns, CC video cameras, ambulance with life support systems, towing vehicles, Trauma care facilities etc. should be mandatory every 50 km of Highways. Necessary institutional arrangements for their proper functioning should also be ensured.

5. National Accident Sampling System and Fatality Analysis Reporting System similar to those implemented by the National Highway Traffic Safety Administration (NHTSA) of the USA or the GIS enabled Road Accident Data Management System (RADMS) of Tamil Nadu may be adapted by other states also to institutionalize accurate data acquisition on RTAs and assist in proper diagnosis of the accidents for prompt corrective action.

6. The approved National Accident Relief Policy should be implemented in right earnest in all its aspects at the earliest to enable reduction and prevention of RTAs, RTFs and injuries.

7. Installation of a system similar to black box in an aircraft should be made mandatory in all modern high speed buses like Volvo to log the crash data, to enable accurate diagnosis of accidents and subsequent preventive and corrective actions.

8. Enact a ‘Good Samaritan Law’ to protect the bystander willing to take the RTA victim to hospital from lengthy legal process and possible police harassment.

9. Evolve a policy for assured funding for the existing PPP initiative ‘108 EMRI Emergency Response Service’ for improving the operation and maintenance of the vehicles, provision of life saving equipment like oxygen cylinders, and other teething problems in view of its proven effectiveness in drastically reducing RTFs.

10. The flash point of Indian diesel may be raised to above 65°C as in fixed cold countries, in view of the recent incidents of diesel catching fire at ambient temperatures.

11. In line with the NUTP, encourage Public Transport by making it accessible, affordable and comfortable to all sections, discourage personalized transport by limiting the registration of cars and motorcycles, restrictions on
parking and high parking fee, fiscal disincentives, and by providing pedestrian/bicycle friendly infrastructure to promote NMT.

12. Maximum speeds of all vehicles on all roads may be limited to 120 kmph and bright colours like yellow/orange may be prescribed for all vehicles. In pedestrian, school and market zones, speeds may be limited to 30 about kmph to enable pedestrians to and cyclists to easily cross the roads.

13. The recommendations of NALSAR University of Law, entrusted with the task of preparing the statute for empowering the RSA duly studying the road safety enforcement laws, should be obtained to make the RSA a legal entity.

14. Make the Road Safety Authority (RSA) a legal entity headed by a high ranking officer and representatives from line departments and civil society, road users, consumer associations and domain experts, draw up a strategy, prepare a plan and necessary protocols to ensure safety, establish systems for RTA data acquisition, analysis and follow-up, monitoring, obtaining feedback from road users and for corrective action.

15. The RSA should ensure organization of Road Safety Weeks every six months by the regulators in view of the high rate of RTAs and RTFs and injuries duly involving Resident Associations, Self Help Groups, students, parents and other road users and enable sharing experiences to deter over-speeding, drink-driving, mobile use etc. through videos etc.

16. The Bureau of Indian Standards (BIS) doesn’t make any specific mention of ‘Road Traffic Safety Management (RTSM)’ in its functions of the Standards Formulation Department (vide BIS Office Manual-Volume III [Functions, Roles & Responsibilities of Officers & Staff, 2004]). Standards similar to BS ISO 39001 may be brought out expeditiously.

17. The Institution of Engineers (India) may also be requested to publish a separate Journal for Transportation Engineering.

18. In view of the United Nations declaring the decade 2011-20 as the ‘UN Decade for Action for Road Safety’ to save 5 million lives, the Government may network with the UNO, Road Traffic Safety experts, companies, other national/foreign Governments with a view to benchmark the safety levels and services to the consumer, and encourage the operators to achieve excellence in safety and service. Professionalism should be brought into RTSM, clearly making the concerned agencies and people responsible and accountable, to prevent recurrence of fatal RTAs.

19. In view of the scanty research into RTAs and RTFs[13], for their prevention and reduction, the Government need to establish permanent systems to initiate coordinated, on-site, in-depth research studies and analysis of representative RTAs on a continual basis to identify the causes, learn lessons, explore solutions and to implement them for improving road safety in future duly collaborating with reputed Institutions like IITs, IIMs, CRRI, Highway Research Board IRC, Central Institute of Road Transport, The College of Traffic Management, and associating with WHO, UNESCAP etc. India also needs to become a signatory to the UN Convention on Road Traffic 1968 in order to reap the concomitant benefits.

20. The Amendment Bill to the MV Act of 1988, stressing on higher fines as well as action against drink-driving and mobile phone use awaits passing by the Lok Sabha. The Rules of Road Regulations and other important Rules of the Central Motor Vehicles Act which primarily deal with safety and discipline of road traffic also await amendment.

21. A major national control scheme should be initiated, comparable to those of tuberculosis, malaria, polio, kala-azar, dengue and HIV/AIDS in view of the unacceptably heavy death toll due to RTAs, and free the RTFs and road injuries from criminal angle, as recommended in 2007 by the Sundar Committee on Road Safety [23].

22. The state governments should also actively coordinate and cooperate with the consortium partners of the Global Road Safety Partnership [11] to reduce the RTFs in India.

23. There seem to be far lesser variables involved in traffic safety in Rail and Waterways based transport systems compared to road traffic systems, particularly in geographically bigger countries. They are safer, cost effective, energy efficient and environment friendly, and a balanced modal mix for road, rail and waterways may be evolved by setting up an expert committee and the road network can be effectively linked to the other modes.

24. The Indian Railways comprises about 65000 route-km with nearly 9549 locomotives and running 10000 trains, handling 24 Million Passengers and 2.8 Million Tonnes of freight daily (source: wikipedia). As per the Report of the High Level Safety Review Committee (HLSRC)[6], the number of accidents and fatalities at 141 and 381 (excluding the unaccounted fatalities on sub-urban train systems like Mumbai) respectively in the year 2010-11 is very much less, compared to Roadways.

25. Investment in strengthening and expanding the trunk routes with railway system may be explored since the sub-grade soils generally enable trains at much higher speeds in a cost-effective manner and thus reduce the number of RTAs and RTFs, instead of taking up large scale highway projects. The train accidents per million train km came down from 0.23 in 2006-07 to 0.15 in 2010-11. But, the severity of accidents went up, highlighting the need to improve rail safety[6].

26. About 95% of the Railway accidents and 93% of the deaths are due to collisions, derailments, and at manned and unmanned level crossings, the Railways need strengthening with stronger track formation, modern LHB coaches, modern continuous track circuiting and cab signaling on the entire trunk route of 19000 km, elimination of all level
crossings, infusing dual-fuel energy efficient modern engine technology, commissioning of a statutory Railway Safety Authority, improving reliability of assets, ensuring redundancies in track circuiting, to cater to higher speeds of about 200 kmph to save precious time, human resources, operation and maintenance costs and boost economy.

27. As these initiatives demand massive investments of about Rs.1 lakh crores which can’t be mobilized by the Government alone, in addition to the safety fund generated with a graded safety cess on railway passengers as suggested by the HLSRCC, other innovative financial instruments like targeted FDIs, private/NRI investments, Public Private Partnerships, etc. may be invited, and procured in a transparent manner with generous fiscal incentives over a 10-20 year period. The projects need to be implemented in a mission mode with an empowered task force of dedicated officers. This will not only lead to overall transport safety and sustainable transport, but will also trigger the engine of economic growth and create massive employment to educated and uneducated alike, faster.

28. Investments in Transit Oriented Development may be encouraged in metro cities/cities where Metrorail/Bus Rapid Transit System (BRTS) runs, with suitable fiscal incentives, duly integrating the MMTS, Monorail, Light Rail, suburban trains, public transport, and intermediate public transport with the Metrorail/BRTS stations with supporting infrastructure and housing, to minimize personal transport and road fatalities, promote efficiency, economy, and lead to faster economic growth with employment.

29. Development of inland waterways also will help reduce the RTFs due to the cost-effective and environment friendly nature of this system similar to the Railways. Expediting interlinking of peninsular rivers may be explored to enable this at a much faster rate. Promoting and expanding Railways and Inland waterways will also reduce the environmental degradation in view of saving in fuel and of existing trees while road widening or new road formation.

30. The proposed scheme of the Ministry of Health and Family Welfare (MHFW) for ‘Establishment of integrated network of Trauma Centers’ along the Golden Quadrilateral, North-South and East-West Corridors of NHs by upgrading the trauma care facilities in the 140 identified State Government hospitals, and the ‘NHRSS’ proposed by MORTH under which further 70 ambulances are to be provided, and the National Ambulance Code, all need to be speeded up in coordination and enforced by the central and state governments, on top priority, in a time-bound manner.

31. It is imperative to amend the MV Act so that annual vehicle tax is levied rather than life time tax, as the no. of actual vehicles on road varies widely compared to no. of registered vehicles, resulting in misleading analysis of RTA data.

32. The Road Safety Fund needs to be operationalized urgently by the Central and State Governments with 50% as one-time seed capital by MORTH as envisaged and the rest through 50% of the fines for traffic violations.

33. There should be a system of accreditation of the operator duly satisfying the rules and regulations relating to registration, permits, licenses, insurance, safety of vehicle, driver, passengers and third party, safety audit etc.

34. The regulator should ensure accreditation of every Safety Auditor under a Bus Operator Accreditation Scheme (BOAS) for BS ISO 39001/OHSAS (Occupational Health and Safety Assessment Series) 18001, similar to the process and norms followed by Delhi Metro Rail Corporation.

35. The regulator should initiate certification/accreditation of rating agencies and display it in its website.

36. Urgent policy measures to close down all the liquor shops on highways since consumption of liquor by the driver is considered to be one of the main causes of RTAs and RTFs.

37. It may be highly desirable to involve the potent Self Help Groups mobilized under the aegis of SERP (rural) and MEPMA (urban) in the fight for Road Safety and against high RTFs and improve the local road safety related skills through the newly launched National Skill Development Programme of the Government of India so that the trained youth can be utilized as soldiers for reducing the intolerably high RTAs and RTFs.

4.4 Public and Passengers
1. The public should also be diligent in selecting the operator duly verifying their safety record, the safety provisions made, its certifications, and look for safety ratings by authorized rating agencies.

2. They should also follow traffic rules and promote civic sense among themselves to which end, the Resident Welfare Associations and civil society organizations can play a pivotal role.

3. They also take initiative to spread awareness on traffic safety to others, particularly youth and students.

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