Original Article

Burden, Pattern, and Causes of Road Traffic Accidents in South India: Estimate of Years of Life Lost

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Abstract

Context: Road traffic accident (RTA) is one of the major preventable public health problems and is on the rise. **Aims:** The aims of this study were to estimate the burden of RTA in Andhra Pradesh calculating years of life lost (YLL) and age-standardized YLL rates and to evaluate sex- and age-related differences in premature mortality. **Subjects and Materials:** The data were obtained from State Crime Record Bureau of Andhra Pradesh and Census of India 2011 for age-specific population to calculate YLL and mortality rates were calculated based on the age of the person involved in the accident. **Results:** A total of 24,258 RTA cases were reported from January 2015 to December 2015. Rural areas reported most of the cases 16,995. The time slot with the highest rate of road accidents in the morning was 09:00 am–12:00 pm and in the evening was 06:00 pm–09:00 pm. The age group 25–34 years were the most vulnerable toward road accidental death of which male and female died in RTA were 929 (26.57%) and 101 (28.06%), respectively. Most of the RTA occurred at T-Junctions causing 5548 accidents with a share of 31.52% the total RTA on Junctions, the total YLL was 89,557, and highest YLL was 25,486 in 25–34 years of age group. **Conclusions:** We conclude that there is high fatal mortality and YLL in young age group in Andhra Pradesh. These are preventable events, and efforts to reduce the associated economic and social burden must be made.

Keywords: *Andhra Pradesh, burden, mortality, road traffic accident*

Introduction

Road traffic accidents (RTAs) are a leading cause of premature mortality, mainly in low- and middle-income countries.[1] An increase in the fatal road accidents has been observed worldwide, and pedestrians, cyclists, and two-wheeled motorcycle riders are the most vulnerable populations that contribute to the observed mortality.[2,3] In India, the overall RTA mortality has increased since 2000; furthermore, an increase in fatal motorcycle mortality has been observed, and RTA are still a leading cause of death.[4]

India has 1% of the world's vehicles; it accounts for as high as 6% of world's RTAs. Seventy-three percent of deaths due to RTAs from the South-East Asia Region is in India.[5] As per the ministry of road transport highway of India 2015 report, Andhra Pradesh and Tamil Nadu contribute 16% of the death due to RTA in India.[6]

Traditional mortality rates have been used to evaluate the RTA burden in India, which fail to highlight the premature deaths.[7] In 2015, the country adopted the United Nations Sustainable Development Goal 3 on health, and its aim is a 40% reduction of premature deaths by the year 2030. RTA is one of the targeted causes of premature death.[8] A cost-effectiveness approach is needed to reach the proposed objective and the estimation of standard expected years of life lost (YLL) may be feasible and beneficial.[9] The YLL measure was developed by the global burden of disease (GBD) study and is a useful analytical tool, from an economic and health policy perspective, for measuring the preventable loss of life. This health measure incorporates strategies (i.e., time-based discounting) used in cost-effectiveness analyses. Furthermore, the age-standardized YLL has been used to compare goals across populations and is a valid measure for identifying demographic or regional subgroups (i.e., the states of a country or districts of the states) with the highest premature mortality rate.[10]

This study aims to evaluate premature mortality due to traffic accidents in Andhra Pradesh and to estimate the burden

How to cite this article: Panda P, Boyanagari VK, Ayyanar R. Burden, pattern, and causes of road traffic accidents in South India: Estimate of years of life lost. CHRISMED J Health Res 2018;XX:XX-XX.

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Access this article online

Website: www.cjhr.org

DOI: 10.4103/cjhr.cjhr_62_18

Quick Response Code:

of RTIs through YLL in individuals of Andhra Pradesh; furthermore, sex- and age-related differences were evaluated. This approach may be useful to identify high-risk subgroups where particular interventions focused on the prevention of premature loss of life may be beneficial.

Subjects and Methods

A descriptive cross-sectional study was done in the state of Andhra Pradesh using retrospective data of RTAs occurred in January 2015 to December 2015. The records of all RTAs in Andhra Pradesh were acquired from the State Crime Record Bureau, at the Mangalagiri. Variables such as age and sex of the victims who were injured or who died due to RTA, type of vehicle involved, collision, place, and fault, were used for data analysis. The causes and factors of RTAs, age, and sex distribution of those injured and died were summarized in frequencies and percentages using Microsoft office. Furthermore, we analyzed YLL among people involved in RTA in South India using YLL formula adopted by WHO in a study on the GBD,[10] as described in the following formula:

$$YLL = N \times L$$

where N refers to the number of deaths in a given age, L the standard life expectancy at the age of death in a year, furthermore, the population at different age group was obtained from Office of the Registrar General and Census Commissioner, India Ministry of Home Affairs, Government of India.[11]

Results

A total of 24,258 RTA cases were reported from January 2015 to December 2015. Rural areas reported most of the cases 16,995 (70%). The time slot with the highest rate of road accidents in the morning was 09:00–12:00 h and in the evening was 06:00 pm–09:00 pm [Table 1].

The gender-wise comparison in respect of male and female in accidental deaths revealed that a total number of the male and female died during the calendar year 2015 were 3496 and 360, respectively, in total road accidents. The age group 25–34 years were the most vulnerable toward road accidental and a total number of persons died were 929 (26.57%) and 101 (28.062%), respectively [Table 2].

The highest number of accidents occurred at T-Junctions during the calendar year 2015 was 5548 with a share of 31.52% the total road accidents on Junctions. It may be seen that the maximum number of crashes occurred in uncontrolled areas which were 17,601 accidents with a share of 72.5% in total road accidents. The details regarding road accidents at Traffic Controlled/Police controlled areas indicating the total accidents; persons killed and injured are given in Table 3.

Majority of the accidents resulted in minor injury (43.65%), followed by fatal injury (31.02%) which means that the half of the total accidents happening in Andhra Pradesh were fatal [Figure 1].

Among the fatal cases, the majority were due to head on collision (15.68%) followed by rear-end collision (12.98%) and overturning (10.27%). These three types of accidents contribute to 40% of the total fatality cases [Figure 2]. The YLL among the age group of 25–34 was 25,486 which are highest among all the age group [Table 4].

In Andhra Pradesh, toward the achievement of Universal Health Coverage to Below Poverty Line (BPL) families, Government of Andhra Pradesh started a state-sponsored health scheme for BPL and state Government employees to offer high quality, end-to-end cashless free treatment under 29 categories covering 1044 procedures. The RTAs cases were treated under polytrauma category with the coverage of 2.5 lakh per family per year. To cater services across the state, the Dr. NTR Vaidya Seva Trust has empanelled 285 public and private hospitals offering treatment under polytrauma category [Table 5].

Discussion and Conclusion

The world is witnessing rapid changes in economic development with massive industrialization and increase in road communication. Recent trends in population growth, industrialization and urbanization are putting heavy

Table 1: Accidents classified according to the type of area and time (*n*=24,258)

Timing	Urban (%)	Rural (%)
6 am-9 am	693 (9.54)	1642 (9.66)
9 am-12 pm	987 (13.59)	2075 (12.21)
12 pm-3 pm	976 (13.44)	2282 (13.43)
3 pm-6 pm	1139 (15.68)	2812 (16.55)
6 pm-9 pm	1352 (18.61)	3091 (18.19)
9 pm-12 pm	1018 (14.02)	2160 (12.71)
12 pm-3 am	579 (7.97)	1565 (9.21)
3 am-6 am	519 (7.15)	1368 (8.05)
Total	7263 (100)	16,995 (100)

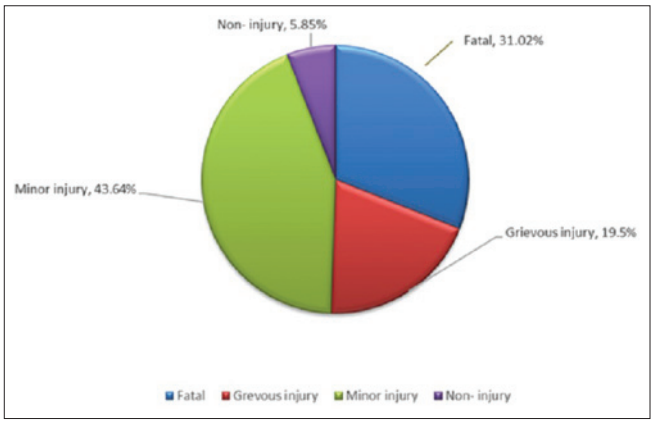

Figure 1: Classification of accidents based on fatal, grievous, minor, and noninjury

Table 2: Age of the driver and pedestrian involved in road traffic accident

Age	Male, *n* (%)	Female, *n* (%)	No of male killed, *n* (%)	No of female killed, *n* (%)
<5 years	66 (0.47)	11 (0.74)	49 (1.40)	5 (1.39)
6-9 years	94 (0.68)	24 (1.62)	18 (0.51)	5 (1.39)
10-14 years	153 (1.10)	34 (2.29)	22 (0.63)	7 (1.94)
15-20 years	1688 (12.13)	163 (11)	309 (8.84)	42 (11.67)
21-24 years	21,889 (15.73)	166 (11.20)	469 (13.42)	30 (8.33)
25-34 years	3732 (26.83)	394 (26.59)	929 (26.57)	101 (28.06)
35-44 years	2924 (21.02)	304 (20.51)	793 (22.68)	72 (20)
45-54 years	1670 (12)	177 (11.94)	477 (13.64)	48 (13.33)
55-64 years	828 (5.95)	109 (7.35)	230 (6.58)	24 (6.67)
65 and above	314 (2.26)	53 (3.58)	109 (3.12)	17 (4.72)
Unknown age	255 (1.83)	47 (3.17)	91 (2.60)	9 (2.50)
Total	13,912 (100)	1482 (100)	3496 (100)	360 (100)

Table 3: Accidents classified according to junction type and traffic control

Type of junction/traffic control	Number of accidents				Number of persons		
	Fatal	Grievous injury	Minor injury	Noninjury	Total number of accidents, *n* (%)	Killed, *n* (%)	Injured, *n* (%)
Type of junction							
T-junctions	1801	1204	2198	345	5548 (31.52)	1970 (33.51)	5666 (29.43)
Y-junctions	915	596	1301	165	2977 (16.91)	967 (16.45)	3221 (16.73)
Four-arm junction	583	418	831	182	2014 (11.44)	655 (11.14)	2292 (11.90)
Staggered junction	1474	1058	1756	145	4433 (25.19)	1571 (26.72)	5251 (27.27)
Junction with more than four arms	237	196	585	99	1117 (6.35)	263 (4.47)	1160 (6.02)
Round about junction	268	303	404	101	1076 (6.11)	339 (5.77)	1145 (5.95)
Manned rail crossing	6	8	5	1	20 (0.11)	7 (0.12)	23 (0.12)
Unmanned rail crossing	83	138	192	3	416 (2.36)	107 (1.82)	496 (2.58)
Total	5367	3921	7272	1041	17,601 (100)	5879 (100)	19,254 (100)
Type of traffic control							
Traffic light signal	711	389	859	189	2148 (12.20)	740 (12.59)	2186 (11.35)
Police controlled	378	373	668	124	1543 (8.77)	407 (6.92)	1586 (8.24)
Stop sign	407	255	342	108	1112 (6.32)	423 (7.20)	945 (4.91)
Flashing signals/blinker	438	196	591	37	1262 (7.17)	483 (8.22)	1272 (6.61)
Uncontrolled	3433	2708	4812	583	11536 (65.54)	3826 (65.08)	13,265 (68.89)
Total	5367	3921	7272	1041	17,601 (100)	5879 (100)	19,254 (100)

Table 4: Road traffic accidents deaths and years of lost life among different age group in Andhra Pradesh

Age	Population	Deaths in given age (N), *n* (%)	Standard life expectancy (L)	YLLs=N*L	YLL per 100,000
<5 years	7,725,898	54 (1.43)	70.29	1582	20
6-9 years	5,863,299	23 (0.61)	66.45	662	11
10-14 years	8,201,595	29 (0.77)	61.61	814	10
15-20 years	10,273,053	351 (9.35)	56.76	9569	93
21-24 years	5,952,788	499 (13.29)	52.08	13,146	221
25-34 years	14,383,407	1030 (27.42)	45.2	25,486	177
35-44 years	11,906,812	865 (23.03)	36.3	19,129	161
45-54 years	8,314,655	525 (13.98)	55.8	14,219	171
55-64 years	6,109,435	254 (6.76)	20.1	3834	63
65 and above	5,078,454	126 (3.35)	10.3	1116	22
Total	83,809,396	3756 (100)	474.89	89,558	949

AQ2,3 **YLL=N*L. YLL: Year of life lost, N: Number of deaths in given age, L: Life expectancy

pressure on transport networks, particularly on the road systems in the developing countries. Because of this, deaths due to RTAs are steadily increasing in the developing nations. Reliable with other research comparing crashes in rural and urban environments, in our study, we found that fatal crash incidence density is more than two times

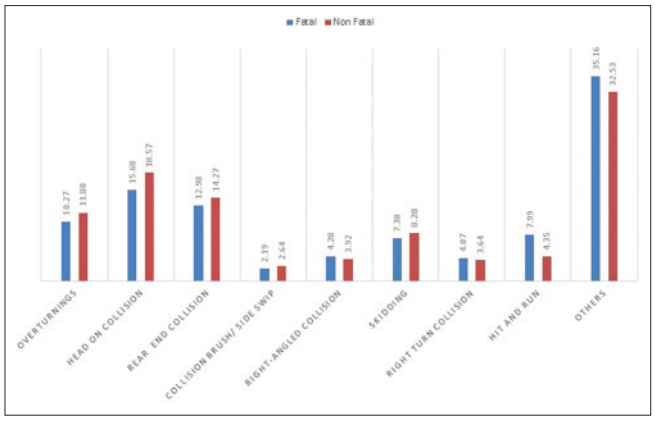

Figure 2: Associated fatality and type of accidents in Andhra Pradesh

Table 5: List of Government and Private hospitals that provide trauma care in all 13 districts of Andhra Pradesh (empanelled with Dr NTRVST)

District	Corporate	Government	Grand total
Guntur	38	2	40
East Godavari	34	2	36
Vishakhapatnam	32	1	33
Krishna	28	2	30
Chittoor	21	3	24
Anantapur	22	1	23
Kurnool	21	2	23
Nellore	15	0	16
Prakasam	14	1	15
West Godavari	14	1	15
YSR Kadapa	13	1	14
Vizianagaram	8	1	9
Srikakulam	6	1	7
Grand total	266	18	285

higher in rural than urban roads. The increased risk for the fatality on a rural road is linked with factors associated with the crash and after the crash rather than with driving exposure.[12,13] The severity on rural roads may be due to crash characteristics that are different on rural than urban roads. Lack of road dividers and guardrails was significant reasons for head crashes and single vehicle collision with stationary objects in the rural area. These two types of crashes have an increased likelihood of producing fatal injuries than rear-end or broadside collisions.[14]

In our present study, males are primarily involved in the accidents with a male-to-female ratio of 9:1. This is in concurrence with other studies of Seid *et al*.[5] Higher mortality in male compared with a female can be possibly justified because of the males, as householders are more likely to expose themselves to traffic accidents due to socioeconomic and cultural features. In our study, 25–34 years were the most common with 25,486 YLL and those above 70 years were the least common age group with YLL account for 1116 involved in accidents which correspond to study conducted by Sharma.[15] The young and middle-aged groups who are economically active group mostly consist of students and working people in various jobs, who usually travel by either own vehicles, buses, or walk. This results in the involvement of young adults more commonly in RTAs who are an economically active group.

Most of the accidents in our study have occurred in the morning (09.00 am–12.00 pm) followed by evening hours (06.00 pm–09:00 pm), which is in concurrence with the study of Jha *et al*.[16] Whereas, findings of Sharma[15] shown that accidents were more between 09.00 and 21.00 h. This may be because in the afternoon and evening hours working people usually get strained physically and mentally by the end of the day. This results in the decreased reflex action of the person due to fatigue, which may lead to accidents.

Most of the accidents happened at police control junction (31.52%) which is in concurrence with the study of Mohan 2015,[6] whereas the accidents were more common in T, Y, and Staggered junction which is because signal jumper crosses the intersection with higher speed to avoid crash and challan, but it hampers his ability to judge the ongoing traffic and quite often crashes.[17]

Since the value shown in this study that is based on data from National Crime Records Bureau (NCRB) (India). NCRB register the reported case only, and the "actual figure of the unreported case could be very high," and there is not enough information about the exact number of vehicles in Andhra Pradesh. Furthermore, we could not find the number of trauma center near the hotspot area and what would be the average time required to reach trauma center during the golden hour as a limitation of the current study.

Conclusions

Our findings provide quantitative evidence of the burden of RTA in Andhra Pradesh. These are preventable events, and efforts to reduce the associated economic and social burden must be made. Sex- and age-related patterns were highlighted in our study, and they may be useful in improving the impact of public policies focused on the prevention of premature loss of life secondary to traffic injuries.

Recommendation

Strategies to reduce these RTA's must be multi-faceted and must include awareness, education, and improved retrieval.

Acknowledgment

The authors wish to thank the officials of the NCRB India, SCRB, Director of Dr. NTRVST province for their cooperation and support. Furthermore, we are grateful to the Director of Dr. NTR Vaidya Seva Trust for providing the data.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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