



**Research Article**

**ROAD SAFETY FEATURES NEAR SCHOOLS OF BANGALORE URBAN AND RURAL DISTRICTS**

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**ABSTRACT**

**Introduction:** Children use the roads as pedestrians, bicyclists, motorcyclists and occupants of vehicles during their regular school commute and they are vulnerable to Road traffic injuries. The total number of persons injured in India during 2015 near schools/colleges/educational institutions due to road traffic accidents are 13,270 in urban areas (NCRB) which is quite alarming. Road safety features near school premises act as risk factors for Road traffic injuries among school children. **Objective:** To assess Road safety environment around schools. **Materials and Methods:** A cross sectional study was conducted using representative sample of schools in Bangalore urban and rural districts by direct observational survey. Data was analysed using SPSS version 20. **Results:** Road safety features around schools in Bangalore urban and rural districts were inadequate. Safety features were less around premises of Government schools compared to private schools. **Conclusion:** Road safety features around schools were inadequate, which probably make school children vulnerable to road traffic injuries.

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**INTRODUCTION**

According to the WHO Global Burden of Disease project, in 2004 nearly 1.3 million people of all ages were killed in road traffic crashes around the world and up to 50 million more were injured or disabled. Road traffic injuries accounted for approximately 262 000 child deaths among children and youth aged 0–19 years – almost 30% of all injury deaths among children (1). Road traffic injuries occupied 6th place in the top 10 leading causes of death in India in the year 2013 in the age group between 5 to 15 years (5). In India, the total number of road accidents increased by 2.5 per cent from 4,89,400 in 2014 to 5,01,423 in 2015. Road accident injuries have also increased by 1.4 per cent from 4,93,474 in 2014 to 5,00,279 in 2015 (2). The number of persons injured near schools/colleges/educational institutions due to road traffic accidents are 13,270 in urban areas, which is quite alarming (4).

In Karnataka more than 10,000 persons die every year due to road accidents (3). A comparison of 13 States in our country during the calendar year 2015 reveals that Karnataka stood fourth with 10,856 (7.4%) fatalities and stood in second place for number of people injured in road accidents with 56,971 (11.4%), (2). Children, though use the roads as pedestrians, bicyclists, motorcyclists and occupants of

vehicles, in many places the road network is constructed without considering children. They may live close to a road, play on a road, or even work on the roads. All these interactions with roads together with a range of other risk factors associated with childhood increase the susceptibility of children to road traffic injury (1).

Hence, current study was planned to assess the Road safety environment around schools.

**MATERIALS AND METHODS**

**Study area**

Study was done in Karnataka, one of the 29 states in India which is divided into 30 districts. Study was conducted in two such districts i.e, Bangalore urban and rural districts having a population of over 10 million (12). Nearly 642 people were killed and 4256 were injured in the year 2017 due to Road traffic accidents in the city (13). A population survey covering 20,000 households and 96,000 individuals from urban and rural Bangalore reported an annual RTI mortality rate of 240 per million population, much higher than the figures reported by police statistics (14).

Bangalore has been divided into urban and rural districts comprising of 7,159 schools, which were distributed under three divisions by Department of Education for administrative reasons - Bangalore urban North, Bangalore urban South and Bangalore rural. Bangalore urban North and Bangalore urban

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South divisions represented Bangalore urban district. Bangalore rural division represented Bangalore rural district. Bangalore urban North division constituted of 2,295 schools, urban South division constituted of 3322 schools and Bangalore rural division constituted of 1542 schools. Bangalore urban North was further divided into four sub-divisions(North 1, North 2, North 3, and North 4). Bangalore urban South was divided into five sub-divisions(South 1, South 2, South 3, South 4 and Anekal). Bangalore rural district was divided into four sub-divisions (Devanahalli, Doddaballapura, Hoskote and Nelamangala). From each division, one subdivision was randomly chosen using a lottery method i.e, North 1 sub-division, South 3 sub-division and Hoskote sub-divisions were randomly chosen from urban North, urban South and rural divisions respectively. There were 133 Government schools and 523 Private schools in North 1 sub-division, 160 Government schools and 629 Private schools in South 3 sub-division and 285 Government schools and 94 Private schools in rural sub-division. From each subdivision two government and two private schools i.e, 12 schools were randomly selected by a lottery method. Further details of schools and necessary permissions were obtained from The Office of Commissioner of Public instructions(CPI), Deputy Directors of Public instructions(DDPI's) and Block Education officers(BEO's) of the sub-divisions of Bangalore urban North, Bangalore urban South and Bangalore rural divisions. Schools of Bangalore urban and rural districts, Karnataka, India were selected for the study.

The study was conducted for a duration of five months.

**MATERIALS AND METHODS**

A cross-sectional study was done for a period of five months from 25/07/2017 to 31/12/2017. Twelve schools of Bangalore districts were selected using simple random sampling method. Among twelve schools 6 were managed by state government and 6 were managed by private organizations.

Authorities of each selected schools were met and briefed about the purpose of study and necessary permissions were obtained to collect data

Road safety environment around schools was assessed by a direct observation using an observational checklist developed by review of literature(6)(7)(10)(11), which was pretested and validated by doing a pilot study. Information was collected regarding location of school, road signs, speed limit signs, traffic calming devices, warden helping children during road crossing, sign boards, pedestrian pavement/sidewalk, parking space and overgrown trees obscuring the child's vision.

**Statistical Analysis**

Data was analysed using SPSS version 20. Descriptive variables were presented in the form of frequency and percentages. Fisher exact test was used to test significance of the association.

**Ethical Clearance**

Ethical clearance was obtained from Institutional Ethical Committee of Rajiv Gandhi Institute of Public Health and Centre for Disease control, Rajiv Gandhi University of Health Sciences, Karnataka.

**RESULTS**

In this study, it was observed that more than 70 % of schools in rural district did not have entrance facing the side road, instead they were facing the main road and lacked a sign board showing the presence of school or school children crossing. Hardly 25% of schools in Bangalore urban and rural district had displayed Speed limit sign in the roads close to schools. More than half of the schools lacked Traffic calming devices. Irrespective of schools in rural or urban hardly half of the schools provided crossing guard to assist children in crossing the roads. Nearly 75% of schools in rural district compared to 38% in urban district did not have any Pedestrian pavement/sidewalk. All the observed differences in road safety features among schools in Bangalore urban and rural districts were found to be statistically not significant[Table 1].

**Table 1** Urban and rural schools comparison for Road safety features in the school premises

Sl No	Road safety features		Number of schools			Fisher's Exact Test p – value
			Division		Total	
			Urban n = 8	Rural n = 4		
1	Situation of school entrance on a side road	Yes	6(75)	1(25)	7(58.3)	0.222
		No	2(25)	3(75)	5(41.7)	
2	Presence of road sign showing that a school was close by or that children are crossing	Yes	4(50)	1(25)	5(41.7)	0.576
		No	4(50)	3(75)	7(58.3)	
3	Presence of a speed limit sign	Yes	2(25)	1(25)	3(25)	1.000
		No	6(75)	3(75)	9(75)	
4	Presence of traffic calming devices(road bumps or zebra crossing)	Yes	3(37.5)	0(0)	3(25)	0.491
		No	5(62.5)	4(100)	9(75)	
5	Presence of a road crossing guard assisting children to cross the road	Yes	4(50)	2(50)	6(50)	1.000
		No	4(50)	2(50)	6(50)	
6	Presence of No stopping sign board in front of the school	Yes	2(25)	0(0)	2(16.7)	0.515
		No	6(75)	4(100)	10(83.3)	
7	Presence of overgreen trees close to the school entrance which could obscure vision	Yes	0(0)	1(25)	1(8.3)	0.333
		No	8(100)	3(75)	11(91.7)	
8	Presence of school compound/gate	Yes	8(100)	4(100)	12(100)	-
		No	0(0)	0(0)	0(0)	
9	Presence of designated parking space for vehicles coming into the school	Yes	3(37.5)	2(50)	5(41.7)	1.000
		No	5(62.5)	2(50)	7(58.3)	
10	Presence of a pedestrian pavement/sidewalk	Yes	5(62.5)	1(25)	6(50)	0.545
		No	3(37.5)	3(75)	6(50)	

Figures in parenthesis indicate percentage

Government schools did not provide a road crossing guard to assist school children in crossing the roads. However, in all of the private schools a road crossing guard was provided by the schools to assist children in crossing the roads. Government schools did not have designated parking space for vehicles coming into the school, whereas 83.3% of the private schools, had designated parking space for vehicles entering the school premises. The observed differences pertaining to presence of a road crossing guard to assist children crossing road and presence of designated parking space, were found to be statistically significant[Table 2].

In this study it was observed that, 50% and 66.7% of Government and Private schools respectively had an entrance on a side road. Less than half of the Government and Private schools had a sign board showing that a school was close by or that children are crossing. Less than one third of schools had a Speed limit sign. Traffic calming devices were not present in any of the Government schools, whereas 50% of the Private schools had traffic calming devices. No stopping sign board in front of the schools was not displayed in any of the Government schools, whereas nearly 33.3% of the Private schools displayed no stopping sign board. None of the Government schools had designated parking space for vehicles coming into the school. Pedestrian pavement or sidewalk was present in nearly 33.3% of the Government schools and 66.7% of the Private schools respectively. The observed differences among Government and Private schools, pertaining to all the road safety features mentioned in this paragraph were found to be statistically not significant[Table 2].

sample giving not only comparison of rural versus urban district but also private schools versus government schools.

All schools should have speed breakers and appropriate traffic signs on either sides of the road to ensure safety of children(15), where as in the current study only half of the schools had a board on sides of the road showing the school existence, but only 25% of schools had any traffic calming measures/road bumps or boards showing speed limit, which is still more than the number of schools reported by a study conducted in Dharwad, where only one or two schools had any of the mentioned safety features(7), the difference may be because of the Metro status of Bangalore but in a study conducted in Delhi, the country capital, none of the schools had any safe crossings, traffic calming mechanisms near to schools and also lacked pavements to walk(8). Similar study done in Nigeria, five (14%) of the schools were located on major roads and eight (23%) had road signs indicating that a school was nearby. Seven (20%) had road bumps close to the school, 15 (43%) had a warden who assisted children to cross, and none had a zebra crossing. Five (14%) schools had pedestrian sidewalks (6).

Study conducted in a developed country like Canada showed that the majority (85%) of roads located near schools were local roads, with only a small percentage being highways or expressways. Approximately 63% of the schools had a speed reduction sign posted on the roads surrounding to the school property and 85% of the schools had complete sidewalk coverage.

**Table 2** Government and Private schools comparison for Road safety features in the school premises

Sl No	Road safety features		Number of schools			Fisher's Exact Test p- value
			Division		Total	
			Govt. n = 6	Pvt. n = 6		
1	School properly situated with entrance on a side road	Yes	3(50.0)	4(66.7)	7(58.3)	1.000
		No	3(50.0)	2(33.3)	5(41.7)	
2	Presence of road sign showing that a school was close by or that children are crossing	Yes	3(50.0)	2(33.3)	5(41.7)	1.000
		No	3(50.0)	4(66.7)	7(58.3)	
3	Presence of a speed limit sign	Yes	1(16.7)	2(33.3)	3(25.0)	1.000
		No	5(83.3)	4(66.7)	9(75.0)	
4	Presence of traffic calming devices(road bumps or zebra crossing)	Yes	0(0)	3(50.0)	3(25.0)	0.182
		No	6(100)	3(50)	9(75.0)	
5	Presence of a road crossing guard assisting children to cross the road	Yes	0(0)	6(100)	6(50.0)	0.002*
		No	6(100)	0(0)	6(50.0)	
6	Presence of No stopping sign board in front of the school	Yes	0(0)	2(33.3)	2(16.7)	0.455
		No	6(100)	4(66.7)	10(83.3)	
7	Presence of overgreen trees close to the school entrance which could obscure vision	Yes	1(16.7)	0(0)	1(8.3)	1.000
		No	5(83.3)	6(100)	6(91.7)	
8	Presence of school compound/gate	Yes	6(100)	6(100)	12(100)	-
		No	0(0)	0(0)	0(0)	
9	Presence of designated parking space for vehicles coming into the school	Yes	0(0)	5(83.3)	5(41.7)	0.015*
		No	6(100)	1(16.7)	7(58.3)	
10	Presence of a pedestrian pavement/sidewalk	Yes	2(33.3)	4(66.7)	6(50)	0.567
		No	4(66.7)	2(33.3)	6(50)	

Figures in parenthesis indicate percentage  
\*p< 0.05, significant

## DISCUSSION

Not many studies have been done in India assessing the road safety features around schools. This is one of the first study conducted in entire Bangalore district with a representative

Most schools had at least one crosswalk nearby(81%), particularly at intersections. Other traffic calming measures, such as speed bumps (5%), were less common (9), whereas in our study half of the schools did have entrance open to the main roads with only 50% of schools having any of the mentioned safety features. Road safety features around schools

in urban and rural districts as well as among Government and Private schools were inadequate putting children at risk. Compared to schools in urban district, road safety features were inadequate around schools in rural district and among them, compared to Private schools Road safety features were inadequate around Government schools.

#### Limitations of the Study

Though schools representing different divisions of Bangalore were part of the study, representation of all the sub-divisions was not ensured due to time constraint.

#### CONCLUSION

Road safety features around schools were inadequate in schools of both Bangalore urban and rural districts.

#### Recommendations

Safe environment must be created around schools to ensure safe travel of school children.

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#### Conflicts of interest

There are no conflicts of interest.

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