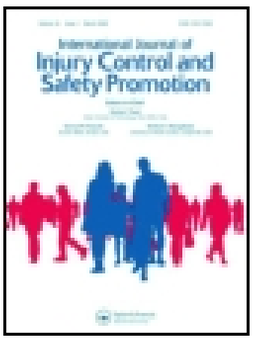

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School safety assessment in Bengaluru and Kolar districts, India

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ABSTRACT

Ensuring optimum safety in schools to prevent injuries and promote safety of children is a mandate by the Constitution of India. However, there is limited evidence regarding safety and injury prevention in schools. This safety appraisal was conducted on a sample of 131 schools, selected by stratified random sampling in Bengaluru and Kolar districts in India. Trained investigators collected data using smart phone-assisted interview, observational methods and record review between 1 January and 31 March 2019. Safety was assessed across the domains of macro areas (policy, guidelines, committee, budget, coordination and training), physical infrastructure, road and transport safety, fire safety and first-aid services. Safety level (%) at each school was computed based on scores obtained in each domain. Overall safety level was at 50.8% of the assessment criteria and was relatively better in private schools (54%). Most schools scored less than 30% in domains of transport safety, fire safety and macro areas. Results highlight the need for implementing and augmenting safety measures in schools.

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Child safety; child injury; school safety; road safety; policy;India

Introduction

The future of a nation lies in the healthy survival, growth and development of children as they are an asset to the family and society. Despite an overall reduction in childhood mortality, children continue to face the triple epidemic of communicable, non-communicable diseases (predominantly risk factors) and injuries. Injuries among children are on the rise in India and other Low and Middle Income countries and pose a major threat to their safety and survival (Dandona et al., 2017; Peden et al., 2008).

The United Nations Convention on the Rights of the Child, article 1, includes children under 18 years (UNICEF, 2012). Injury (nonfatal) is a bodily harm resulting from exposure to an external force or substance (mechanical, thermal, electrical, chemical, or radiant) or a submersion (Centers for Disease Control and Prevention, 2007), especially when exposure exceeds the threshold of human tolerance (World Health Organization, 2008).Children sustain intentional, unintentional and accidental (undetermined) injuries resulting in deaths, hospitalizations, disability (ies) and socioeconomic losses. Unintentional injuries include road traffic injuries, falls, burns, drowning, poisoning, mechanical injuries, sports injuries and others. Children are specifically vulnerable to injury and its effects due to their smaller physical size, ongoing physical, psychological, cognitive and social changes and risk taking behaviours (World Health Organisation, 2015).

Globally, 950,000 children (0–18 years) succumbed to injuries (year 2004) of which 60% were due to unintentional injuries (Peden et al., 2008). In India, Global Burden of Disease (GBD) estimates (year 2016) indicated that over 72,000 children died and 6.35 million Disability Adjusted Life Years (DALYs) were lost due to injuries. (Dandona et al., 2017; GBD, 2017). Recently, an Indian review on child safety and injury prevention estimated that over 60,000 children (0–18 years) died due to injuries (over 45,000 due to unintentional injuries) and nearly 1.8 million were hospitalized in the year 2015 (Gururaj & Gautham, 2019). The official figures (National Crime Records Bureau) are likely to be an underestimate due to several reasons (Bhalla et al., 2017; Dandona et al., 2008).

Injuries among children can occur at home, on the roads, in schools, recreational or play areas, and other places. Children spend a significant amount of their time (approximately 1500 hours per year) in schools and interact with several objects, people and surroundings, both inside and outside the school. Injury prevention (both intentional and unintentional injuries) and safety promotion in schools is thus crucial towards ensuring the safety of children. It also implies ensuring compliance and enforcement to prevailing legislations and regulations for enhancing safety behaviours and safer environments for children (Council for the Indian School Certificate Examinations, 2018; National Commission for Protection of Child Rights, 2017; National Disaster Management Authority, 2016). Moreover, safety of children in schools in India is mandated as per rights, and

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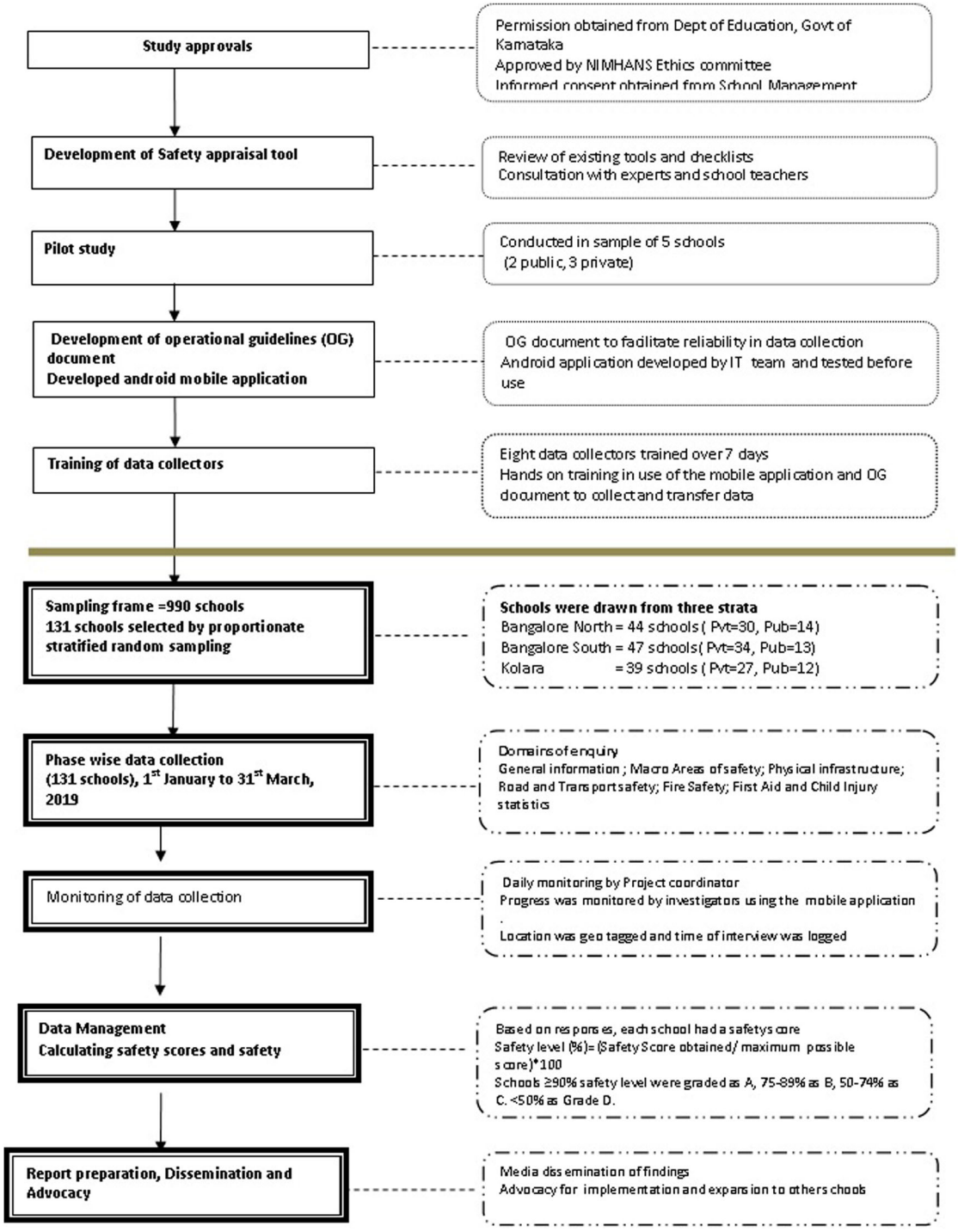

Figure 1. Methodology adopted to conduct school safety appraisal in Bengaluru and Kolar, India.

it is a constitutional priority. However, the current safety status and conditions in schools are not known in India despite the promulgation of several legislations and guidelines by various Ministries and agencies.

Hence, the present study was undertaken to assess safety levels in schools of Bengaluru city and Kolar districts in India in the school year 2018–19, with a focus on unintentional injuries. The specific objectives were to develop a methodology for school safety appraisal, assess current safety levels in a sample of schools, and compare safety levels between public, private, urban and rural schools, and provide a roadmap for continued activities.

Methodology

Detailed methodology is available in the report 'Advancing child safety in India; Implementation is the key' (Gururaj & Gautham, 2019) and an overview is provided in Figure 1. The study involved physical observation of safety parameters within and outside school premises, interviews with teachers

and school management authorities and examination of records maintained by schools, in consultation and with the prior approval of school management. The present study is an appraisal and not a school safety audit.

Necessary permission and approvals were obtained from the Department of Public Instruction, Government of Karnataka. Ethics approval for the study was provided by NIMHANS Ethics committee vide letter, NIMHANS/IEC (Behavioural and Neuro Sciences Division) 13th meeting/ 20178 dated 29/6/2018.

Study setting

This safety appraisal was undertaken in a sample of randomly selected schools in Bengaluru and Kolar districts (a geographically defined administrative unit) between 1 January and 31 March 2019. The two districts were chosen due to operational reasons as well as to cover both urban and rural schools. Bengaluru city is an urban area and Kolar district is a neighbouring transitional rural district and is also the public health observatory of the Centre for Public Health at NIMHANS (http://nimhans.ac.in/center-for-public-health/).

The Department of Education, Government of Karnataka provided a random list of 990 registered schools (public and private – aided and unaided) from three strata (Bengaluru South, North and Kolar) based on geo-administrative region, which served as the sampling frame. Based on the proportional distribution of number and type of schools in each strata, 131 schools were randomly selected from each stratum proportionate to number and type of school (a ratio of 70:30 was maintained for private and public schools) to account for higher enrolment of children in private schools. The number of schools selected was based on convenience sampling, but the selection was random. Schools from Bengaluru were considered urban schools and the remaining were rural schools. Day care centers, schools for the children with special needs, Montessori's and schools not providing informed consent were excluded from the appraisal. Schools funded and operated by the State Government are 'public schools'. Schools partially funded (grant-in-aid) by State Government, but operated by a private partner (usually an NGO) are private aided schools. Schools owned and operated totally by private sector are considered as private schools.

Development of appraisal tool

Due to the lack of a validated and comprehensive tool for school safety assessment from an injury prevention perspective, the study team developed a 'School safety appraisal tool'. A review of available checklists/questionnaires/manuals related to school safety within and outside India was conducted. Variables commonly present in reviewed checklists were considered relevant from a content validity perspective and included. Additional items were added considering national level recommendations and guidelines (Council for the Indian School Certificate Examinations, 2018; Ministry of Human Resource Development, Department of School Education and Literacy, 2014; National Commission for Protection of Child Rights, 2017; National Disaster Management Authority, 2016). A stakeholder consultation was conducted to ascertain content validity and finalize domains of enquiry (Box 1).

Box 1. Domains in safety appraisal tool.

Section	Number of items	Domain assessed	Contents	Data source	Sub score
A	18	General Information	School name, type address Location of School Year of establishment and construction Available facilities Number of children and staff	Discussion	0
B	19	Macro Level safety appraisal	Presence and availability of – • Safety Guidelines/SOP • Previous Safety audits • Dedicated Safety budget • Safety promotion meetings • Availability of trained teachers • Safety education activities for students • Networking with key service providers • Emergency communication system	Discussion and review of available records	25
C	21	Safety appraisal of Physical infrastructure	Building structures- walls, windows, balconies, roofs, corridors, entrance and exits Play grounds, toilets, classrooms, lifts, laboratories, terrace and water resources	Physical walk through of the facility with a check list	57
D	18	Road safety and Transport safety	Appraisal of school buses and drivers, • Road type and conditions adjoining school premises • Presence of road safety signage around schools • Presence of safety infrastructure(zebra crossing, elevated pedestrian marked road	Physical walk through of the facility with a check list	24

(*continued*)

Box 1. Continued.

Section	Number of items	Domain assessed	Contents	Data source	Sub score
			crossing , supervised road crossing facilities, availability of side-walks, traffic signal, pot hole free road etc)		
E	5	Fire safety	Presence and availability of • Fire safety Certificate • Fire-fighting systems- fire extinguishers, fire hose, fire sprinkler etc. • Emergency number • Conduct of training and Mock drills.	Review of records and physical verification	10
F	7	First aid for injured	• First aid essentials and services • Networking with nearby hospitals • Basic first aid training • Maintenance of health records	Discussion with teachers and records review	10
G	5	Child injury statistics	Number of injuries Total fatalities Causes of injuries Absenteeism records.	Verification of records	0

Total items = 93.
Maximum possible score = 126.

A pilot study was conducted in a sample of five schools to understand operational issues and required modifications were made. The complete and final paper-based version of the appraisal tool was digitalized into a user-friendly android mobile application, which enabled uniform data collection, limited errors, allowed regular monitoring and customized automated scoring of safety levels in each school. The complete data of each school were synced to the server and the application generated section and overall safety scores for each school.

The operational guidelines document

A guide for school safety appraisers was developed to enhance the reliability of data collection. This document detailed the process of data collection, section by section, for the benefit of the interviewer, operational definitions of study variables, scoring and 'how to' sections. It was provided to appraisers during training and referred to during appraisals.

Safety scoring for schools

Scoring was applicable for appraisal sections, except Section A (general information) and Section G (child injury statistics), given that schools did not maintain quality records. The response codes (number) entered in the answer column was the respective score for each item. The score for each item was added to arrive at the sub-total score for each section. The sum of sub-total scores across sections formed the total school's overall score. The maximum possible score for each school was 126. The safety level (%) of each school was calculated as

Safety level (%) = (score obtained by each school/maximum possible score)*100.

The safety level (%) is an indication of the safety level of that particular school at the time of appraisal implying that the school is functioning at a certain percentage of safety. The safety level (%) was intended for regular monitoring to document changes over time.

Training of data appraisers

Eight appraisers, specially recruited for the survey, were trained over seven working days to enable understanding of the project, data collection process, use of safety appraisal tool and to provide hands on training to use the android phone application for accurate data collection. The appraisers had completed post-graduation in psychology or social work. Each appraiser completed data collection in three schools (for training purpose and not included for analysis) along with the core team as part of training and data collection exercise.

Data collection and quality control

Data collection was planned and undertaken in a phased manner based on geography, travel, approval, permissions and other logistics. In total, 131 schools participated in data collection process (52 schools in Bengaluru south, 40 schools in Bengaluru north and 39 schools in Kolar), of which 92 were in urban areas. Two schools were excluded from the appraisal as they did not provide consent. Data collected through the mobile app was synced to a central server in NIMHANS and monitored by the project team every week. Time taken for data collection was half to one day for smaller schools and 1–3 days for larger sized schools with multiple buildings. Data collection process was monitored daily for allotment of schools, obtaining permissions, facilitating queries raised by data collectors, negotiations with school management, etc. Data were extracted in MS Excel format.

Statistical analysis

Percentage and frequencies across socio-demographic variables were calculated. School safety scores (overall and

Table 1. Macro areas for safety in schools ($n = 131$) (%).

Macro areas	All schools ($n = 131$)	Rural schools ($n = 39$)	Urban schools ($n = 92$)	Public schools ($n = 39$)	Private schools ($n = 92$)
Adoption of School Safety Policy or Guidelines	24.0	38.5	18.5	11.1	31.4
Presence of a School Safety Committee	65.0	56.4	68.5	55.6	69.8
Exclusive staff to coordinate safety activities in the school	7.0	2.6	8.7	4.4	8.1
Teachers trained in traffic and fire safety education	52.0	43.6	55.4*	53.3	51.2
Teachers trained in basic first aid	15.0	17.9	14.1	11.1	17.4
Allocation of specific budget for school safety	12.0	5.1	15.2*	4.4	16.3*
Any safety audit/ assessment conducted in previous year	29.0	48.7	18.5	15.6	33.7*
Play sites are supervised	92.0	94.9	90.2	88.9	93.0
CCTV (Video) surveillance in schools	81.0	61.5	89.1*	60.0	91.9*

Chi-square test of significance, *$p < 0.05$.

section wise) were summarized as mean and standard deviation. Safety level (%) in each school was calculated. Independent *t*-test was used to test for significant differences in safety scores and safety levels between urban, rural, public and private schools with result considered significant at $p < 0.05$. Shapiro–Wilk test was applied to test for normality. Mann–Whitney *U* test was used when normality test failed. Chi-square test of significance was used to test for association between macro areas, type (public/private) and location of school (urban/rural).

Results

Over a period of three months, 131 schools were assessed for safety covering around 79,000 students; 76 (58%) were private and 55 (42%) were public schools. Nearly 70% of schools provided education till 10th grade. English was medium of instruction in 92% of private schools as against 29% of public schools ($p = 0.04$, Chi-square = 2.74). Most schools in rural areas (74%) and in urban areas (62%) were located on inner roads and in residential areas.

Macro areas for school safety

As depicted in Table 1, only 24% of schools (38% of rural and 31% of private) reported they had adapted school safety guidelines. School safety committees, including school management, parents and others, were present in 65% of the schools. Parents were members of the school safety committee in 53% of the schools. For this appraisal, school safety committees were defined as 'a committee comprising of members of the board, governing body, management, teachers and parents (at least one) who meet on a regular basis to plan, implement and monitor safety related activities in the school. Only 7% of schools had exclusive staff for managing safety and 58% had designated one of the staff members for safety promotion activities. A dedicated budget for school safety was present in only 12% of schools, though significantly better in urban and private schools ($p < 0.05$). Around 29% of schools reported safety assessments were previously conducted in their schools, though more in public schools (55.4% v/s 43.6%, $p < 0.05$).

Physical infrastructure

Assessment included visual inspection of status of windows, electrical sockets, lighting and ventilation in classrooms and in common areas like balconies, corridors and lobbies. Infrastructure was significantly better in private schools in terms of safe corridors (86% versus 67%) and safe classrooms (69% versus 54%), compared to public schools. Observations indicated that 3/4th of windows and balconies were safe in 84% and 83% of schools, respectively. Similarly, 3/4th of classrooms were safe in 66% of the schools (Table 2).

Over 50% of schools had anti-skid flooring (54.2%), more so in urban schools ($p < 0.05$). Access to water sources (wells, sumps, overhead tanks) was restricted to children in 61.8% of schools. Less than 50% of schools had ensured 'no access to roof for children' (42%). Ramps for disabled students were significantly better in public schools ($p = 0.017$). Minus type desks was present in 10% of the schools.

Fire safety

Fire extinguishers were present in 94% of schools. Fire safety certificate was present in 32.8% of schools, significantly more in urban schools (43%). Nearly half of assessed schools had never conducted fire safety mock drills. Overall, only 22% of schools had emergency exits though significantly better in private schools ($p = 0.028$). The specific requirements of fire logbook, an evacuation plan, fire detector and fire alarm were present in <10% of schools.

Transportation and road safety

Our assessment of 173 roads adjoining 131 schools for presence of school zone signage, speed limit sign, zebra crossing, elevated pedestrian crossing, footpath and pot-holes (within 100 metres from the school entrance) revealed that only 51% of roads had speed breakers. School zone and speed limit signage was present in 18.5% and 11.5% of the roads, respectively (Figure 2). The differences between urban and rural roads were not statistically significant.

Transportation safety in schools is summarized in Table 3. Nearly 40.5% of schools provided school bus service. Availability of transport safety manager, and designated

Table 2. Safe windows, balconies, corridors and classrooms in schools ($n = 131$) (%).

Schools wherein >3/4th of Windows, electrical sockets, balconies, corridors and classrooms are safe					
Safe	Rural $n = 39$ n (%)	Urban $n = 92$ n (%)	Public $n = 45$ n (%)	Private $n = 86$ n (%)	Total ($n = 131$) n (%)
Windows	21 (87.5)	89 (83.2)	34 (75.6)	76 (88.4)	110 (83.9)
Electrical sockets	19 (79.2)	96 (89.7)	37 (82.2)	78 (90.7)	115 (87.8)
Balconies	19 (79.2)	90 (84.1)	35 (77.8)	74 (86.0)	109 (83.2)
Corridors	19 (79.2)	86 (80.4)	31 (68.9)	74 (86.0)*	105 (80.2)
Classroom	13 (54.2)	74 (69.2)	23 (51.1)	64 (74.4)**	87 (66.4)

Chi-square test, *$p = 0.019$, **$p = 0.007$.

Note:

Windows defined as safe if all of the below criteria are met.

1. No visible cracks in glass/shattered glass / broken glass in windows .For wooden windows, window is intact and not broken.
2. Window panes (grills) are present and not broken.
3. Windows are not damaged to large extent or absent.

Electrical sockets are safe if all of the below criteria are met.

1. Are covered; 2. There is no open and visible wiring in sockets.

Balconies are safe if all of the below criteria are met.

1. Restricted and supervised access to children.
2. Balcony wall height is >48 inches/4 ft.
3. Balconies have railings with railings spaced of 15cms or less.
4. No cracks or breach in concrete balcony.

Corridors are safe if all of the below criteria are met.

1. No broken patches in the floor.
2. No obstruction in terms of almirahs, big pots at the entry/exit junctions of corridors or any other furniture blocking more than 25% corridor width.
3. Corridors have adequate lighting.

Classroom infrastructure includes combination of windows, electrical sockets, flooring, lighting and ventilation.

***Classroom** is operationally defined as the room/space reported or used as a 'classroom' for academic teaching purpose by the school management. It does not include labs, library, music room and other co-curricular spaces.*

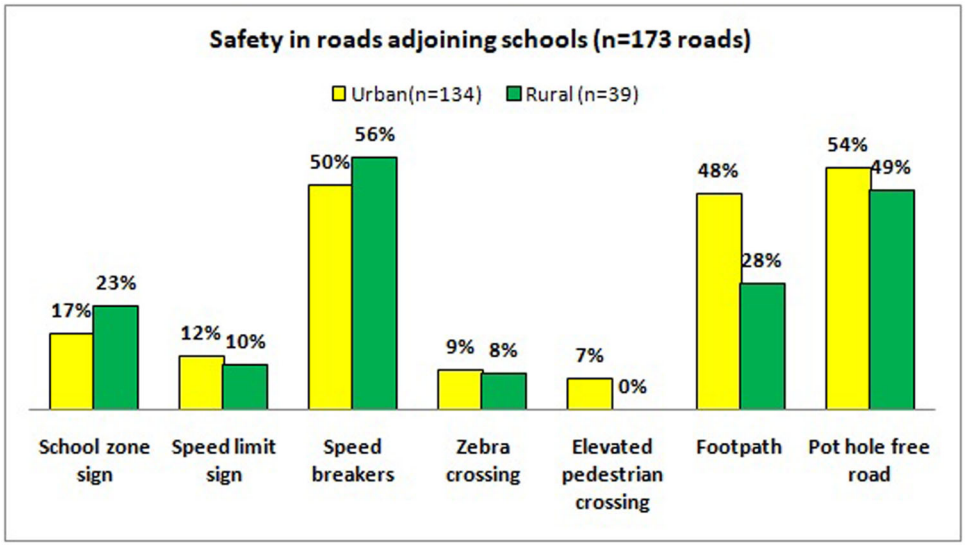

Figure 2. Road Safety in roads adjoining the schools ($n = 173$ roads, 131 schools).

pick-up and drop off zones, were significantly better in private schools than in public schools (Table 4). Global positioning system tracking systems and closed-circuit television (CCTV) in school buses were present more in urban schools ($p < 0.05$), than in rural schools. Most of the school (86.8%) bus drivers were subjected to police verification before being employed.

First aid and record maintenance

Most schools (92.4%) reported availability of first-aid services in school premises though only 17% of schools reported that their teachers were trained to deliver first aid services and about 50% of schools had expired medicines in the first aid box.

Around 63% of schools reported they maintained annual health records of students, which was significantly better in public schools (71.1%), than in private schools (59.3%). However, information related to injury among children was not documented in any records; most schools (90.1%) did not have a mechanism for recording or monitoring of injuries among children.

Safety level in schools

The overall appraisal provided a baseline grading for understanding the present scenario and for tracking progress in

Table 3. Fire safety in assessed schools ($n = 131$) (%).

	Rural $n = 39$ n (%)	Urban $n = 92$ n (%)	Public $n = 55$ n (%)	Private $n = 86$ n (%)	Total ($n = 131$) n (%)
Fire safety certificate is present	3 (7.7)	40 (43.5)*	12 (26.7)	31 (36.0)	43 (32.8)
Fire safety mock drill conducted	23 (58.9.0)	42 (45.6)	22 (40.0)	43 (50.0)	65 (49.6)
Do's and Don'ts for fire emergencies' is displayed	13 (33.3)	18 (19.6)	10 (22.2)	21 (24.4)	31 (23.7)
Emergency exit is present	13 (33.3)	16 (17.4)	5 (11.1)	24 (27.9)^	29 (22.1)
Presence of fire log book	0 (0.0)	7 (7.6)	1 (2.2)	6 (7.0)	7 (5.3)
Evacuation plan is displayed	0 (0.0)	3 (3.3)	1 (2.2)	2 (2.3)	3 (2.3)
Fire detector is present	0 (0.0)	3 (3.3)	1 (2.2)	2 (2.3)	3 (2.3)
Fire alarm is present	0 (0.0)	10 (10.9)	1 (2.2)	9 (10.5)	10 (7.6)
Fire extinguisher is present	38 (97.4)	85 (92.4)	42 (93.3)	81 (94.2)	123 (93.9)

*$p = 0.001$.
○$p = 0.028$.

Table 4. Transport safety in schools.

	Location		Type of school		
	Rural N (%) $n = 39$	Urban N (%) $n = 92$	Public N (%) $n = 55$	Private N (%) $n = 86$	Total ($n = 131$) N (%)
Transport safety manager present	13 (33.3)	39 (42.4)	11 (24.4)	41 (47.7)#	52 (39.7)
Demarcated pick-up and drop-off zone is present	8 (20.5)	34 (37.0)	9 (20.0)	33 (38.4)^^	42 (32.1)
Availability of school bus services ($n = 53$)	22 (56.4)	31 (33.7)	9 (20.0)	44 (51.2)	53 (40.5)
Safety aspects in school buses ($N = 53$)					
N	22	31	9	44	53
**Fitness Certificate present	18 (81.8)	28 (90.3)	7 (77.8)	39 (88.6)	46 (86.8)
**GPS trackers present	3 (13.6)	28 (90.3)*	3 (33.3)	28 (63.6)	31 (58.5)
**CCTV present in bus	4 (18.2)	19 (61.3)○	2 (22.2)	21 (47.7)	23 (43.4)
**Police verification of drivers done	22 (100.0)	24 (77.4)	9 (100.0)	37 (84.1)	46 (86.8)
**Drivers checked for drugs and alcohol intake	13 (59.1)	26 (83.9)	6 (66.7)	33 (75.0)	39 (73.6)

*$p < 0.0001$.
○$p = 0.017$.
^^$p = 0.032$.
#$p = 0.010$.
**Denominator is restricted to schools providing school bus service.
N = number included for calculating column percentages for each item under safety aspects in school buses, by location and type of school.

future. The overall school safety level was 50.8% (Table 5). Overall safety level, transportation safety and physical infrastructure safety were significantly better in private schools as compared to public schools. Although safety in urban schools (50.8%) was higher than rural schools (47.6%), the difference was not significant. Safety levels were about 20% each for fire and road safety, first-aid services and in macro areas.

Among the 131 schools surveyed, only one school met the requirements for grading as A, with safety level more than ninety percent. Among the rest, about half of schools each, fell in the categories of Grade C (safety level 50–74% and D (25–49%), with 3% in Grade B (75–89%). Among public schools, nearly 22% were graded C as against 62% of private schools. We observed better safety levels (>50% of expected) in schools having school safety committees (OR = 2.7), but 44% of rural schools and 32% of urban schools did not have safety committees required for rigorous implementation of the guidelines.

Discussion

This study is a rapid appraisal of school safety in an Indian context where there is limited information on injuries (fatal and nonfatal) occurring in school environments, roads around schools and during transit to schools in India. In Delhi, it was reported that nearly 8% of injuries occurred in schools (Parmeswaran et al., 2017). Data from school health records indicated 5% of children were injured every month with 94% occurring in outdoor school environments (Gupta et al., 2017). Global School-based Health Survey (GSHS) of 9,333 students from Four South East Asian countries indicated that 'fall' (14.6%) was the leading external cause of injury, followed by playing or training for a sport (9.9%) and vehicle accident (6.1%) (Peltzer & Pengpid, 2012). On an average, 3.5 days was lost per injury among school children (Hemalatha & Prabhakar, 2018). About 9% of all injuries in Palestine occurred in schools (Jildeh et al., 2013) and 38% of school injuries in Finland occurred due to unsafe physical environments, with about 9% due to unsafe traffic arrangements (Salminen et al., 2014). Unsafe travel patterns and physical environments can predispose children, who are already vulnerable and susceptible due to their physical and psychosocial characteristics to injury. Thus, understanding the safety characteristics and attributes of school and transport environment is an important prerequisite to improve safety of children and to prevent injury as well as for better implementation of existing regulations and guidelines that emphasize school safety in the Indian region.

From a methodological perspective, the present study used a mixed-methods approach based on primary data collection through specific local observations, review and

Table 5. Safety level of schools ($n = 131$).

	Rural ($n = 24$) %	Urban ($n = 107$) %	Public ($n = 45$) %	Private ($n = 86$) %	All schools ($n = 131$) %
Macro areas	44	48	32	52*	48
Physical infrastructure	66	70	63	72*	70
Road safety	37	21	17	33○	21
Fire safety	20	20	20	25	20
First aid	40	40	40	40	40
Overall safety level	47.6	50.8	42.1	54.4*	50.8

Safety level = (Score obtained/Maximum score)*100.
*Statistically significant difference (Independent *t*-test), $p < 0.05$.
○Mann–Whitney *U* test was used to compare.

verification of records, physical observation of infrastructural facilities along with consultations with school management authorities. This approach enabled a holistic assessment through combined methods to quantify and qualify safety parameters along with identifying challenges in school safety program. Among the several existing methods, self-reported check lists, though common, suffer from limitations of incomplete and inaccurate reporting. School safety audits are well-established assessment methods but require skilled multi-disciplinary teams. Considering limitations in availability of comprehensive assessment tools, an appraisal by trained personnel using a mobile-based technology can serve as a useful screener for more detailed and focussed assessments. Improvements in the present approach are in progress to refine the methodology and for wider geographical applications in consultation with stake holders.

The overall assessment revealed that 48% of schools had safety levels <50% of expected (Grade D) and 96% had safety levels <75% of expected, indicating lesser importance to safety of children in schools. The macro assessment revealed the poor enforcement by required agencies or limited self-compliance by institutions leading to situations of safety being compromised. Only 7% of the schools reported appointing a staff member exclusively for safety promotion, but close to 58% of the schools had designated staff members, though not trained for safety promotion. Availability of space, location, infrastructure, funding and trained manpower were major constraints on the part of schools and enforcement by concerned agencies was an added limitation. Funding is critical as both injuries and severe injuries are more in schools with lower per pupil spending (Shendell et al., 2018).

Generally, a school environment comprises of classrooms, corridors, balconies, laboratories, library, washrooms and play areas located inside the building, whereas swimming pools, playgrounds, and other facilities are located outside the school premises. Presence of facilities/amenities and the safety of the physical infrastructure determine exposure to injury risk among students and are relevant to estimate need for scaling up safer infrastructure facilities. Our appraisal revealed that in nearly half the schools surveyed, compliance was to the extent of 50%. Our criteria were similar to existing specifications of the National School Safety Policy guidelines of 2016 by National Disaster Management Authority (NDMA) (National Disaster Management Authority, 2016) indicating incomplete compliance to existing guidelines though relatively better in private schools. In February 2017, Ministry of Human Resource Development, Department of School Education and Literacy, Government of India directed States to implement the NDMA National School Safety Policy Guidelines (National Commission for Protection of Child Rights, 2017). Discussions with school management authorities revealed a lack of knowledge with regard to these guidelines, indicating need for better communication and capacity building measures.

Reliable data on school commuting patterns are not available at national, state or local levels in India, as transport of children is left to the discretion of parents or school authorities. In a recent review by Tetali et al. (2016), it has been reported that road traffic injuries accounted for 35–47% deaths and injuries among children and a substantial number occurred during school commute times. Road traffic injuries were reported by 17% of children aged 11–14 years and more among boys (25%) than girls (11%). Study indicated a clear association between road traffic injuries, mode of travel and distance to school. Children who cycled to school were more likely to be injured compared to children who walked (OR 1.5; 95% CI 1.2 to 2.0), and travel by school bus was safer than walking (OR 0.5; 95% CI 0.3 to 0.9). In the present study, only 40% of the schools had a school transport vehicle, and observations on 173 adjoining roads in 131 schools revealed that only 18.5% roads had school zone signage and 11% had speed limit signage. Road safety education of children and teachers was not a systematic regular activity in most schools. This indicates the need for making safe travel of children an important strategy for strengthening road safety activities.

The death of nearly 100 school children in a tragic fire incident in Kumbakonam, Tamil Nadu (Department of School Education, Government of Tamil Nadu, 2004) necessitated the promulgation of systematic fire safety guidelines, reinforced by strict guidelines by the National Disaster Management Authority, in year 2016 . Our appraisal revealed poor compliance to fire safety, as only 43% of urban schools and about 8% of rural schools had a fire safety certificate as a proxy to compliance. Thus, rigorous implementation of the guidelines is warranted. Several components of the existing guidelines necessitate requirements for exit routes for evacuation, detection and alarm systems, fire extinguishers and electrical systems maintained and operated in compliance with fire safety design criteria. NDMA guidelines also emphasize the need for school safety management committees, school development plan and

disaster management plan in schools to operationalize the safety measures.

Information systems for injuries in schools were totally absent as most schools did not have a system for recording or reporting injuries, which limits evidence-based planning of child injury prevention strategies at the school, district or national level. Health records were present more often in public schools (71.1%) than in the private schools (59.3%) due to existing regulations specified from the Department of Education to maintain health cards of each child under the school health programme. However, more than 90% of schools didn't have any injury-related records or injury related information in existing records. Evidence from high-income countries indicate that injury surveillance systems help to identify factors associated with unintentional injuries in school environments (Apostolico & Shendell, 2016).

Most schools (92.4%) had some type of first aid services in school which was better in private and urban schools, but most teachers were not trained in first aid. Recent first aid guidelines (International Federation of Red Cross & and Red Crescent Societies, 2016) highlight the importance of training teachers as first care responders to benefit injured children. It is also important for school health programmes across the country, both at national and state levels, to integrate injury prevention and safety promotion of children in ongoing health and child welfare programmes.

Our assessment revealed that the minimal importance was given to child safety in schools as noticed by the low scoring on safety appraisal and an absence of comprehensive child cantered safety programmes in educational institutions covering both unintentional and intentional injuries. Anecdotal media reports on incidents of transport, fire, chemical and mechanical injuries are stark remainders of neglect of child safety. Most of the surveyed institutions did not have a state driven programme, action plan or a defined focus and mechanism for safety. Safety of children in schools and their travel to and from schools, has received increasing attention as evidenced by the presence of standards for school buses as well as guidelines and notifications from national and state governments. Several guidelines/regulations/acts (Box 2) are available for safety and security of children in the Indian context. However, the implementation of these is left with state/district agencies and school management authorities. Despite the presence of these regulations, implementation remains a low priority.

Box 2: Key guidelines/regulations/Acts pertaining to safety in schools.

- National Commission for Protection of Child rights
- POSCO – Protection of Children from Sexual Offences Act 2012(*POSCO*, 2012)
- Right to Education Act(*The Right of Children Free and Compulsory Education Act 2009*, 2009)
- The Motor vehicles amendment bill 2019 (Ministry of Law and Justice, 2019)
- National Disaster Management Authority School Safety Policy Guidelines
- Guidelines on Safety of School Buses – Supreme court committee on road safety(*Supreme Court Committee on Road Safety*, 2015)
- National Building Code (2016 version) (Bureau of Indian Standards, 2016),
- Guidelines for School Safety under Section 19 of RTE Act (October 2014) (Ministry of Human Resource Development, Department of School Education and Literacy, 2014)
- Council for Indian School Certificate Examination (ICSE): School Safety Manual (2018)
- Rashtriya Kishor Swasthya Karyakram (RKSK) (*Rashtriya Kishor Swasthya Karyakram (RKSK)*, 2016)

Even though child injuries have been examined to a limited extent, information on safety aspects in school settings is not available, especially in LMICs. Global School-based Health Surveys (Peltzer & Pengpid, 2012) and systematic review of unintentional injuries in South East Asian Region (Pant et al., 2015) highlight the lack of data regarding child injuries, especially on macro and micro factors contributing in school environment and the need for strengthening child injury research using standard methodologies across the region. Although this appraisal was limited to couple of Indian districts, it has contributed to developing school safety appraisal methods which could be adapted across India and in other countries with similar socio-economic development and education infrastructure.

Understanding school safety in terms of existing safety policies, guidelines, standards, financing, appraisals, training of teachers, and its current status of implementation is vital in India and other LMICs to bring positive improvements to ensure safety of children. Our findings reiterate that implementing safety strategies based on data and continuous planning is crucial to prevent injuries and promote safety in schools. Our findings also reveal the need for more research in this area to strengthen safety in school environments as well as the tools required for such assessments. The methodology developed in this study can evolve to a more robust self-appraisal mechanism and supplemented with complete safety audits at periodical intervals and monitored regularly by government agencies.

Limitations and challenges

This study's sample size was for convenience, and not determined by a statistical power calculation; however, random selection of schools was conducted. Facilitating appointment and participation of schools was a big challenge as school authorities were busy in academics and less interested in safety issues. The mobile application was useful, but paper and pencil formats were still used for conducting walk-through surveys as it was more practical. As it was a first step, we provided equal weight to all components of safety assessment instead of adopting a differential and proportional system. This was done intentionally as the objective was to develop a simple scoring system for the self-monitoring of safety levels that could be completed at school level by the school staff themselves.

Conclusion

Our appraisal revealed an overall school safety level of 50.8%. Road safety level was at 20.8% (16%–33% across different schools), implying an urgent need to implement road safety practices in roads adjoining schools. The fire safety level across schools was around 20%, indicating poor implementation of fire safety guidelines and the need for construction of school building as per NBC mandated guidelines. Presence of first aid systems was at 40%, highlighting need for further improvement. There is a need for schools to adopt and implement school safety guidelines, school safety committees, have trained staff for safety management and conduct regular safety appraisals. The study concludes that while there is a need to improve school safety across all assessment areas, our assessment provides a baseline to monitor progress in interventions for future.

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