

Serious non-fatal unintentional injuries among in-school adolescents in Sri Lanka: results from the 2016 Sri Lankan Global School-Based Health Survey

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Abstract

Background

Unintentional injuries among adolescents is a major public health problem world over. A great majority of the annual deaths among adolescents is due to unintentional injuries; being the leading cause of death among them throughout the world. The aim of this study was to estimate the incidence of injuries and their associated factors among school going adolescents aged 13-17 years using the data of the most recent Global School-Based Health Survey (GSHS) conducted in Sri Lanka.

Methods

A cross-sectional survey was conducted, using a self-administered questionnaire, among 3,262 adolescents attending government schools. The sample was selected through a two-staged cluster sampling technique. In the first stage, 40 schools were selected, using probability proportional to school enrollment size, out of all schools that have 8-12 grades in the country. Then, from the selected schools, classes were selected using systematic equal probability sampling with a random start. Weighted prevalence was calculated, and logistic regression analysis was conducted in order to determine the correlates.

Results

During the 12 months before the survey, 35.8% (95% CI-30.7 - 41.1) of the students reported being seriously injured once or more times. The injuries were more common among males, but were equally common among different age groups (13-15 age group vs 16-17 age group). The most common type of injury was cut or stab wound (5.5%), followed by broken bone/dislocated joint (5.3%). Multivariable analysis revealed that only a few factors were associated with injury, such as male sex, being bullied, being physically attacked, and/or being in a physical fight.

Conclusion

This study demonstrated that the prevalence of serious unintentional injuries among school going adolescents is a major public health problem in Sri Lanka. This timely and comprehensive survey would help the policy makers and researchers identify the unmet needs related to adolescent injuries. Furthermore, evidence generated from the study should be given due consideration while designing school-based interventions in order to prevent adolescent injuries.

Background

Adolescents are vulnerable to multifarious injuries because of their size, growth and development, inexperience, and natural curiosity ⁽¹⁾. These injuries can occur either intentionally or unintentionally.

Intentionality distinguishes violence from unintended events that result in injury ⁽¹⁾. Unintentional injuries among adolescents is a major public health crisis world over. Interestingly, more than 95% of these injury related deaths among adolescents occur in low and middle-income countries (LMIC) ⁽²⁾. Analysis of data from 68 of LMIC indicated that the overall prevalence of unintentional injuries among 13-15 years age group during the past 12 months is 42.9% (95% CI 39.0 – 46.9)⁽³⁾. Furthermore, the leading cause of death among adolescents aged 15-19 years is unintentional injuries ⁽⁴⁾.

Evidences indicate that for every injured adolescent who dies, there are several thousand adolescents who live on with varying degrees of disability ⁽⁵⁾. Furthermore, significant economic costs and the lifelong social burden are caused by non-fatal adolescent injuries ⁽⁶⁾. Considering the type of unintentional injuries, the five most common injuries in adolescents are road traffic injuries, falls, burns, drowning, and poisoning ^(7, 8). These five categories make up 60% of all adolescent injury deaths worldwide ⁽²⁾. Other injuries that could occur are open wounds injuries, fractures, and muscle and joint injuries ⁽⁹⁾.

In the developed countries, unintentional injuries have replaced infectious diseases as the most serious public health problem of adolescents ^(1, 10). However, the true extent of the problem in developing countries is largely unknown owing to lack of national level surveys. Therefore, information is urgently needed on the incidence rates as well as factors contributing to adolescent unintentional injuries in the developing countries.

Similar to many developing countries, there is a scarcity of knowledge in this regard in Sri Lanka. Most of the studies on adolescent injuries conducted in Sri Lanka are hospital-based studies. Injuries necessitating hospitalization are relatively small in number, and hospital data is only the tip of the iceberg ⁽²⁾. Therefore, national level community-based studies are essential to identify the true magnitude of the problem besides prioritizing the preventive strategies.

The Global School-based Student Health Survey (GSHS), which was initiated in 2001 as a collaborative effort of World Health Organization (WHO), in collaboration with The United Nations Joint Programme on HIV/AIDS (UNAIDS), The United Nations Educational, Scientific and Cultural Organization (UNESCO), and United Nations Children's Fund (UNICEF) along with technical assistance from the US Centers for Disease Control and Prevention (CDC), is a rich source of information on health and related information on school going adolescents ⁽¹¹⁾.

Adolescents consist of one fifth of the population in Sri Lanka. Among the estimated number of 3.8 million adolescents in the country, close to 70% adolescents attend school ⁽¹²⁾. The GSHS was first conducted in Sri Lanka in 2008 among school going adolescents, which provided valuable information on health behaviors among them. This study revealed that among the students of 13-15 years age group, 37.2% (95% CI-32.1-42.2) have had at least one serious injury in the previous year. Obtaining a clear view of the burden of the issue necessitates detailed information on the magnitude, trends, and influencing factors.

Furthermore, repeated surveys of GSHS are recommended by WHO to assess the trends in prevalence of risk factors ⁽¹³⁾.

Thus, the aim of this paper is to estimate the incidence of injuries and their associated factors among school going adolescents aged 13-17 years using the data of the most recent GSHS conducted in Sri Lanka. This is the first national survey conducted among school going adolescents since the first GSHS conducted in 2008. Therefore, the information on the extent of adolescent unintentional injuries and associated factors in local settings gathered from this survey would be useful for health policy makers in formulation of injury prevention policy and strategic framework. It can also be useful for integrating injury preventive interventions into the existing school health programme in Sri Lanka.

Methods

This descriptive cross-sectional study involved analysis of existing data from the Sri Lankan Global School-Based Health Survey conducted in 2016. The GSHS intends to provide data on health behaviors and associated risk and protective factors among school going adolescents. Students of grades 8, 9, 10, 11 and 12 in government schools (which corresponds to 13 to 17 years old) of Sri Lanka were recruited for the survey. Data collection was done during the period from 1st October 2016 to 31st November 2016. Study methodology developed by WHO and US Centers for Disease Control and Prevention (CDC) has been adopted in the current study ⁽¹⁴⁾.

Sample size and sampling

A sample of 3125 students was deemed adequate to assess the magnitude of injuries in this group with a precision of ± 5 percent and 80% response rate. The sample was selected through a two staged cluster sampling technique. In the first stage, 40 schools were selected, using probability proportional to school enrollment size, out of all schools that have 8-12 grades in the country. Then, from the selected schools, classes were selected using systematic equal probability sampling with a random start. All the students in the selected classes were invited to participate in the survey.

The questionnaire

The GSHS questionnaire was adapted to Sri Lanka and was translated to Sinhala and Tamil. This is a self-administered questionnaire. Three questions were included in the questionnaire to obtain information relevant to injuries. The first question assessed the number of times the student was seriously injured during the past 12 months; seriousness was defined as 'making the respondent miss at least one full day of usual activities (such as school, sports, or a job) or necessitating treatment by a doctor or nurse. It had eight responses, with the frequency ranging from 0-12 or more times. The next question inquired about the most serious injury that happened to the respondent during the past 12 months prior to the survey. It had following responses: Was not seriously injured during the past 12 months; I had a broken bone or a

dislocated joint; I had a cut or stab wound; I had a concussion or other head or neck injury, was knocked out, or could not breathe; I had a gunshot wound; I had a bad burn; I was poisoned or took too much of a drug; Something else happened to me. The final question looked into the cause of the most serious injury that happened during the past 12 months. The responses included; I was not seriously injured during the past 12 months; I was involved in a motor vehicle accident or hit by a motor vehicle; I fell; Something fell on me or hit me; I was attacked or abused or was fighting with someone; I was in a fire or too near a flame or something hot; I inhaled or swallowed something bad for me; Something else caused my injury. Information required to assess the associations (socio demographic details, details of students' mental health, substance use, and parental engagement in students' life) were collected. Measures were taken to minimize any interference to school activities during data collection.

Relevant administrative clearance to conduct the study was obtained from the Ministry of Education, zonal education directors, and school principals. The ethical clearance to conduct the study was received from Faculty of Medicine, University of Colombo.

Data analysis.

SPSS version 21.0 was used for data analysis. The data set was cleaned and edited for inconsistencies. Missing data were not statistically imputed. The following weight (W) was assigned to each questionnaire in order to allow differing patterns of non-response and the likelihood of sampling each student:

$$W = W1 * W2 * f1 * f2 * f3$$

W1 = The inverse of the probability of selecting the school

W2 = The inverse of the probability of selecting the classroom within the school

f1 = A school-level non-response adjustment factor calculated by school size category

(small, medium, large). The factor was calculated in terms of school enrollment instead of number of schools.

f2 = A student-level non-response adjustment factor calculated by class

f3 = A post-stratification adjustment factor calculated by grade

Incidences of injuries are presented in terms of having sustained serious injuries, and were reported using frequencies with 95% confidence intervals. The correlates of sustaining a serious injury were identified by conducting a bivariate analysis and a backward logistic regression analysis. The dependent variable was sustaining a serious injury within 12 months prior to survey at least once or not. The independent variables were all categorical in type and included age, sex, being bullied, considering suicide, attempting suicide, feeling lonely most of the time, current substance use (alcohol, cigarettes, recreational drugs etc.),

not having close friends, missing classes without permission, parents not understanding students' problems, parents not knowing what students did during their free time, not being taught anger management in school, being in a physical fight, and being physically attacked. Except for age and sex, all other variables had more than one response and were dichotomized by categorizing any positive response as "Yes" and any negative response as "No". Variables that obtained a p value of 0.05 or less from the bivariate analysis were included in the backward multivariable logistic regression. Adjusted odds ratios with 95% confidence intervals were obtained for the significant associates identified by the logistic regression.

Results

Among the 3650 students who were sampled to participate, 3263 (89%) completed the questionnaires. However, only 3262 questionnaires were usable for the final analysis. Of the sampled population, 387 (3650 minus 3263) did not participate in the study. The reasons included not giving consent (n=116) and being absent from school on the day of data collection (n=271).

Characteristics of the study sample

Majority of the respondents were 13-15 years old (66.5%), and females comprised of 51.1% of the sampled population (Table 1).

During the 12 months before the survey, 35.6% (95% CI-30.7 - 41.1) of the students reported being seriously injured once or more times. Almost one out of two boys (45.3%, 95% CI 39.7-51.1) had been seriously injured as compared to only one fourth of girls (26.4%), which was statistically significant. Serious injuries were equally common among students in younger (13-15 years) age group and older (16-17 years) age groups ($p > 0.05$) (Table 2).

The most common type of injury was cut or stab wound (5.5%), followed by broken bone/dislocated joint (5.3%) and head injury or a concussion (1.2%). While the cut or stab wounds were the commonest injury type among young age groups, broken bones/ dislocated joints were the commonest injury type among older age groups. Broken bones/ dislocated joints were the commonest injury type among males, while among females, the commonest injury type was cut or stab wounds (Table 3).

Analysis of the mechanism of the most serious injury that has happened during the past 12 months revealed that falls were the most common mechanism (12.1%), followed by motor vehicle crashes (3.0%) and something falling on the person (2.7%). Falls were the most common mechanism for injuries among both age groups and both sexes (Table 4).

Factors associated with violence and injury

Bivariate analysis depicted that male sex, being bullied, feeling lonely most of the time within past 12 months, considering suicide, smoking, alcohol use, use of recreational drugs, being physically attacked or being in a physical fight and lack of parental supervision were significantly associated with being seriously injured at least once in the year prior to the survey. Multivariable analysis revealed that only few factors were associated with injury, which included male sex, being bullied, being physically attacked, and/or being in a physical fight (Table 5).

Discussion

Adolescents are more prone to injuries due to the risk taking and sensation seeking behaviors⁽¹⁵⁾. This first national survey conducted among school going adolescents after GSHS-2008 indicated that the common finding in the study group includes serious injuries necessitating medical attention and missing out daily activities. Approximately one in three children in 13-17 years age group were seriously injured at least once within the 12 months prior to the survey. The prevalence of unintentional injuries has not changed over the years. Similar prevalence (37.2%) was found in GSHS-2008 among 13-15 years age group⁽¹⁶⁾, which indicates the necessity of novel public health approaches to combat this serious menace.

Unintentional injuries are a major contributor to the adolescent mortality and morbidity. Direct comparison of results between countries and even within the country, across different studies, is difficult due methodological differences (e.g. age of the study population). However, the comparison of GSHS studies provides useful information as they have used uniform definitions and study populations. Han et al (2019) conducted a secondary analysis of GSHS data from 68 LMIC countries. The overall incidence of serious injuries among 12-15 years old adolescents was 42.9%⁽³⁾, which means that one in two adolescents have been seriously injured during the past 12 months. Similar to other LMIC countries, our study indicates that adolescent non-fatal injuries have the capacity to affect the daily activities of the school going adolescents.

Current study was conducted as a community-based study, which is able to paint a comprehensive picture of injuries as compared to hospital based studies^(17, 18). This is best described as an injury pyramid based on the level of medical treatment of injury victims⁽¹⁹⁾. The apex of the pyramid represents the injuries necessitating hospitalization, which are relatively small in number, whereas lower parts of the pyramid represents the more numerous injuries, which are of lesser severity. Since hospital-based studies can identify injuries that required hospitalization, they will only address the apex of the injury pyramid, which is the tip of the ice berg. Therefore, it is imperative to conduct community-based studies on adolescents' unintentional injuries to identify true magnitude of the problem.

Major limitation in comparing incidence data of unintentional injuries across studies is the lack of consistency in its assessment, recall period, and definitions. It has been found that there is a wide variation in incidence of injuries with varying recall periods. The results of studies using diverse recall periods cannot be compared without bearing in mind the factors affecting such differences⁽²⁰⁾. However,

since GSHS has been conducted in several countries and it has used a consistent definition and a recall period, so it enables meaningful comparison across countries. Analysis of GSHS data of 13 to 15 years old school students of Indonesia, Myanmar, Sri Lanka and Thailand for identifying the burden of serious injuries among school students has reported a prevalence of 42.2% for all countries, ranging from 27.0% in Myanmar to 46.8% in Thailand ⁽²¹⁾. It indicates that the prevalence among low and middle-income countries is uniform across countries. However, relatively low figures have been reported from developed countries ^(9, 22).

Boys are more prone to serious injuries that necessitate medical attention and/or lead to missing out daily activities, which was re-instated by the current study. Male gender was found to be significantly associated with the occurrence of unintentional injuries in the present study. This was in line with some other studies which had shown similar sex differences in injury rates ⁽²³⁻²⁵⁾. This might be explained by the fact that males have a higher probability of risk taking behavior, are physically more active, and have more probability of engaging in competitive sports ^(26, 27). Several studies have demonstrated that older adolescents are more prone to unintentional injuries ^(28, 29). However, similar to GSHS results in 2008, the present study has failed to demonstrate this association.

Current study found that falls and motor vehicle accidents are the most common causes of unintentional injuries among the school going adolescents, and similar studies have found these two to be the most common etiologies for the injuries ^(21, 30, 31). Similarly, a large-scale household survey conducted to assess the epidemiology of unintentional injuries in Nepal has reported falls as the commonest cause for unintentional injuries among adolescents ⁽³²⁾. Likewise, vehicle accidents too are a leading cause of non-fatal injuries among adolescents ⁽³³⁾. Evidences indicate that vehicle accidents among adolescents cause a sizeable economic burden due to loss of productivity and medical costs ⁽³⁴⁾. Furthermore, it has been shown that the commonest vehicle involved in these accidents is motor cycle, and most of the injured children were not wearing helmets at the time of injury ⁽³⁰⁾. Riding motor cycle without a helmet is common among adolescents in Sri Lanka, which indicates a serious public health problem among adolescents, thus it needs urgent attention ⁽³⁵⁾. This study has also reported that fatal road traffic accidents are more commonly seen among boys than in girls.

Though physical attacks have contributed to only 2.7% of all injuries, being in a fight was significantly associated with being injured. Violence leads to 5.8% of injury related deaths among children below 17 years globally, and is more commonly seen among older adolescent groups (2). Therefore, more attention should be given to interpersonal violence among school children.

In addition to ill health, serious injuries also have dire effects on school performance. Thus, proper attention should be given to impose remedial measures for this problem. Knowledge about the extent and correlates of the problem is a valuable asset while designing remedial measures. According to the current study, male sex, being bullied, being physically attacked and/or being in a physical fight were associated

with obtaining serious injuries. Identification of such vulnerable populations should be targeted while planning interventions for injury prevention.

This study has several limitations. Firstly, as the study was conducted among the school going adolescents, generalizing the findings to the entire adolescent population in Sri Lanka is not possible, as their circumstances may differ significantly. Secondly, the standard questionnaire used in the study did not have the location of the injury occurrence. This could have been an important piece of knowledge to plan the intervention. Thirdly, the study population was schooling adolescents between 13 to 17 years, and does not represent the total schooling adolescent population as according to WHO, an adolescent is defined as an individual between 10 to 19 years of age. Fourthly, current study only included adolescents attending government schools, excluding those who attend private schools in the country. However, since private school attendees comprise only 3% of the school going population⁽³⁶⁾, authors believe that the current sample adequately represents the total school going population. Finally, recall bias is a possible limitation, as information were inquired regarding last 12 months, and participants may not be remembering the information accurately.

Conclusion

This study demonstrated that the prevalence of serious unintentional injuries among school going adolescents has not changed over the years, indicating that it is still a major public health problem in Sri Lanka. Health policy and interventions related to prevention of adolescent non-fatal serious injuries necessitate solid evidence. This timely and comprehensive survey would help the policy makers and researchers identify the unmet needs in this arena. School-based interventions to address these issues should be designed with the goal of increasing adolescents' awareness of possible preventive measures of unintentional injuries.

List Of Abbreviations

CDC	-	US Centres for Disease Control and Prevention
GSHS	-	Global School-based Student Health Survey
UNAIDS	-	United Nations Joint Programme on HIV/AIDS
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UNICEF	-	United Nations Children's Fund
WHO	-	World Health Organization
YLDs	-	Years Lost due to Disability

Declarations

Ethics approval and consent to participate The study is in accordance with Helsinki Declaration. The ethical clearance to conduct the study was received from Faculty of Medicine, University of Colombo, Sri Lanka (EC-16-184). Written informed consent was obtained from all parents/guardians prior to participation in the study and filling out the questionnaires. The form of consent was approved by the ethics committee. Consent for publication Not applicable Availability of data and materials The dataset used during the current study is available from WHO's NCD Microdata Repository (<https://extranet.who.int/ncdsmicrodata/index.php/catalog/648>) Competing interests The authors declare that they have no competing interest. Funding This study was funded by the World Health Organization (WHO). The funder only provided financial assistance to conduct the study and had no role in the study design, data collection, data analysis, data interpretation, or writing the manuscript. Authors' contributions SW, SS, NSG, AL; Research idea, study design, analysis and interpretation. SS, SW, DP; Drafting of the manuscript. SW, SS, NSG, AL, SG, CW, RP, DP; Data analysis, interpretation, supervision and mentorship. All authors read and approved the manuscript. Acknowledgements Authors would like to acknowledge Dr Manju Rani (Regional Advisor - NCD and Tobacco Surveillance) and Mr Naveen Agarwal of WHO SEARO, Delhi for technical and logistical support. Ms. Leanne Riley (WHO – Geneva), Dr. Laura Kann (CDC - Atlanta, USA) and others at CDC for providing technical support. All the students who have participated in the survey with enthusiasm, honesty and willingness

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Tables

Table 1: Description of study participants of the 2016 Sri Lankan Global School-Based Survey (including the variables used to assess the correlates of unintended injuries)

Characteristic		Number*	Percentage**
Sex (n=3262)	Male	1437	48.9
	Female	1805	51.1
Age (n=3261)	<13 years	66	2.1
	13-15 years	2196	66.5
	16-17 years	977	30.7
	>17 years	22	0.7
Was Bullied (n=3196; missing =66)		1208	38.6
Felt lonely most of the time (n=3250; missing =12)		294	9.1
Considered suicide (n=3221; missing =41)		298	9.4
Current smoking (n=3244; missing =18)		107	3.6
Current use of alcohol (n=3191; missing =71)		103	3.3
Current use of recreational drugs (n=3217; missing =45)		79	2.7
Had no close friends (n=3245; missing =17)		180	5.6
Lacked parental supervision (n=3233; missing =29)		987	30.8

**Unweighted frequency; **Weighted percentage*

Table 2: Incidence of unintentional injuries among study participants (N=3262)

	Was seriously injured at least once, within 12 months prior to survey % (95% CI)
Total	35.6 (30.7- 41.1)
Sex	
Males	45.3 (39.7-51.1)
Females	26.4 (21.6-32.2)
Age	
13-15 years	35.9 (30.3-41.9)
16-17 years	34.8 (29.1-40.9)

Table 3: Description of the serious injuries that has happened to the study participants

Type of injury	Age group				Sex				Total	
	13-15 years (N=2196)		16-17 years (N=977)		Male (N=1437)		Female (N=1805)		(N=3262)	
	N	%	N	%	N	%	N	%	N	%
Cut or stab wound	134	6.1	41	4.2	113	7.9	65	3.6	181	5.5
Broken bone/ dislocated joint	121	5.5	49	5.0	116	8.1	57	3.2	173	5.3
Concussion/ Head injury	34	1.5	6	0.6	22	1.5	16	0.9	40	1.2
Burns	19	0.9	1	0.1	7	0.5	13	0.7	22	0.7
Poisoned	5	0.2	4	0.4	6	0.4	6	0.3	12	0.4
Something else	229	10.4	139	14.2	205	14.3	176	9.8	381	11.7

Table 4: Description of the serious injuries that has happened to the study participants

Type of injury	Age group				Sex				Total	
	13-15 years (N=2196)		16-17 years (N=977)		Male (N=1437)		Female (N=1805)		(N=3262)	
	N	%	N	%	N	%	N	%	N	%
Falls	293	13.3	95	9.7	223	15.5	168	9.3	395	12.1
Motor vehicle accidents	53	2.4	39	4.0	74	5.1	24	1.3	99	3.0
Something falling on the person	61	2.8	22	2.3	59	4.1	28	1.6	87	2.7
Attacks	14	0.6	8	0.8	13	0.9	9	0.5	22	0.7
Fire	7	0.3	1	0.1	6	0.4	3	0.2	9	0.3
Breathed a noxious material	8	0.4	3	0.3	4	0.3	9	0.5	14	0.4
Something else	119	5.4	66	6.8	91	6.3	97	5.4	190	5.8

Table 5 : Factors associated with being physically attacked (results of bi-variable and multi-variable analysis)

Characteristic		Bi-variable analysis OR (95%CI)	Multi-variable analysis aOR (95%CI)
Age	13-15 yrs	1.0 (0.8-1.2)*	-
	16-17 yrs	1	
Sex	Male	2.3 (1.9-2.7)	1.8 (1.5-2.1)
	Female	1	1
Was Bullied	Yes	4.1 (3.5-4.8)	2.3 (1.9-2.5)
	No	1	1
Felt lonely	Yes	2.1 (1.6-2.7)	-
	No	1	
Considered suicide	Yes	2.2 (1.7-2.8)	-
	No	1	
Current smoking	Yes	3.8 (2.5-5.8)	-
	No	1	
Current use of alcohol	Yes	3.2 (2.1-4.9)	-
	No	1	
Current use of recreational drugs	Yes	7.7 (4.3-13.6)	-
	No	1	
Had close friends	No	1.3 (0.9-1.8)*	-
	Yes	1	
Lacked parental supervision	Yes	1.6 (1.1-1.9)	-
	No	1	
Was physically attacked	Yes	3.5 (3.0-4.1)	1.6 (1.3-1.9)
	No	1	1
Was in a fight	Yes	3.5 (3.0-4.1)	1.9 (1.6-2.3)
	No	1	1

**Not significant at $p=0.05$ level*