



Incidence of School-related Injuries among Students in A'Dakhiliyah Governorate Schools, Oman

Manar Al Sanaa Al Zeedi^{1*}, Lamya Hamed Al Waaili¹, Fatma M. Al Hakmani² and Ahmed Mohammed Al Busaidi³

¹Family Medicine Training Program, Oman Medical Specialty Board, Muscat, Oman

²Department of Environmental and Occupational Medicine, Director General of Disease Surveillance, Ministry of Health, Oman

³Director General of Health Services, A'Dakhiliyah Governorate, Ministry of Health, Oman

ARTICLE INFO

Article history:

Received: 11 November 2018

Accepted: 5 August 2019

Online:

DOI 10.5001/omj.2020.45

Keywords:

Child; Students; Incidence; Schools; Risk Factors; Accidental Falls; Oman.

ABSTRACT

Objectives: Childhood injuries are among the most significant causes of mortality and morbidity as estimated by the World Health Organization. We sought to assess the incidence of school-related injuries in A'Dakhiliyah governorate schools, with the secondary aim of addressing common causes, risk factors, and how the school environment contributes to injuries. **Methods:** We conducted a prospective cohort study involving all students in A'Dakhiliyah governorate schools during the 2015–2016 academic year. Data were collected using a questionnaire that was filled out by the school nurses or social workers at school health units. **Results:** The incidence of school-related injuries was 2.3% per year. The majority of injured students were in grades 1–4 (63.7%) and 72.6% were boys. Improper school equipment and furniture accounted as a risk factor for 25.3% of injuries. The three most common mechanisms causing injury were falling (50.4%, n = 584), collision with an object (30.7%, n = 356), and collision with a person (18.8%, n = 218). Asphalt (59.5%, n = 295) and concrete (40.5%, n = 201) were the most common surfaces in the school environment to contribute to injuries. **Conclusions:** School-related injuries are not uncommon and can be prevented by improving the infrastructure of school buildings and supplying appropriate school stationary equipment for age. Our results are useful in developing a national injury prevention program aimed at enhancing safety in school environments.

Childhood injuries are an important public health issue worldwide. According to the World Health Organization (WHO), an estimated 950 000 children under 18 years of age died of injury in 2004, and more than 9 million required a visit to an emergency department.¹ In Asia, the child injury surveys by the Alliance for Safe Children and UNICEF revealed that injuries account for 20% of deaths among children aged < 18 years old.² In particular, Middle Eastern countries have a higher rate of unintentional injury morbidity and mortality when compared to global averages, with a rate that reaches more than 45 per 100 000 people per year in 2004 compared to less than 20 per 100 000 in America and Europe.^{1,3} Moreover, injuries are reported as a common contributor to daily-adjusted life years.³

Children spend a significant amount of their time at schools, where many hazards, such as

defective equipment and improper playground design, predispose them to different types of injuries. School injuries account for a significant percentage of total child injuries. For example, in the US, 19% of childhood injuries occurred in schools.⁴ The consequence of these injuries can vary from mild pain of the affected area to functional limitation or disability, either temporarily or permanently.

Unfortunately, little is known regarding school injuries in Oman. In general, injuries and poisoning are the fourth leading cause of morbidity, according to the 2015 Ministry of Health's annual report.⁵ In 2010, the Global School-based Student Health Survey was conducted in Oman to evaluate youth risk-taking behavior. The survey involved 1606 students from grade 8 to 10, and 34% of them reported having at least one injury in the past year that caused at least one full day's absence from usual activities or required medical treatment irrespective of the place of injury.⁶

Our study sought to determine the incidence of school-related injuries in A'Dakhiliyah governorate schools. In addition, it will show the common mechanism, risk factors, and impacts of these injuries on students. Moreover, the findings of this study may contribute to improvements in school designs and in accommodating furniture, equipment, and playgrounds in parallel with the necessary specification to ensure injury prevention and enhancement of a healthy and safe environment for injury prevention.

METHODS

This prospective cohort study was conducted from September–June of the 2015/2016 academic year in A'Dakhiliyah governorate schools. A'Dakhiliyah is one of the 11 governorates of Oman. It is located on the western slopes of Al Hajar Mountains, specifically the mountainside of Al Jabal Al Akdhar, towards the desert in the south. The governorate consists of eight wilayats, namely, Nizwa, Bidbid, Samail, Izki, Manah, Bahlah, Al Hamra, and Adam. The population of the governorate in 2016 was 436 458.⁷ The total number of schools in the governorate is 141, and 33 of them did not have a school nurse; for this reason, they were not included in the study. The total number of students who participated in the study was derived from 108 schools, which included students from grade 1 to grade 12. Of the 108 schools, 63 had initiated the WHO Health Promoting Schools program. This program aims to create a healthier environment and lifestyle in schools and society. It has six fundamentals: health education, school environment, school health services, health nutrition and food safety programs, mental health counseling, and promotion of good relationship with families and society.⁸

The target population of this study was all students whose injuries occurred during school hours and presented to the school clinic. Any injury that occurred outside school time was excluded from this study even if it was reported to the school clinic the following day. A direct contact questionnaire to those injured students was filled out by the school nurses (nurses were trained on how to fill the study questionnaires). Items on the questionnaire were derived from the previously validated questionnaire used in the US by the Ohio Department of Health with some modifications to adapt them for

Omani schools.⁹ The research questionnaire was piloted for one month to evaluate the applicability and appropriateness.

Collected data were presented in numbers and percentages, and analyzed using SPSS Statistics (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). A chi-squared test was used for testing the association between categorical variables. A *p*-value of ≤ 0.050 was considered statistically significant. The Research and Ethical Committee of the A'Dakhiliyah governorate approved this study.

RESULTS

In 2015/2016 academic year, there were 86 835 students registered in all A'Dakhiliyah governorate schools. The total number of schools participating in the study was 108. Cycle 1 schools, which include students from grade 1 to grade 4, accounted for 31.9% of the total schools. Cycle 2 schools, which include students from grade 5 to grade 10, accounted for 23.7%. Only 6.5% of schools included grade 11 and grade 12 students. There are other schools that include more than one cycle: cycle 1 and 2 (17.2% of schools), cycle 2 and 3 (16.3%), and all grades (4.4%). The total number of students in the participating schools was 72 840. Of these, 32 825 (45.1%) were male and 40 015 (54.9%) were female.

Of the 72 840 registered students, a total of 1663 injuries were reported. This gives a cumulative incidence of school-based injuries of 2.3% per year. There is not much difference between injuries in schools that adopted the WHO health-promoting program (incidence 2.1%) compared to schools that did not (incidence 2.3%). The percentage of injury in boys (72.6%, $n = 1196$) was more than double that of girls (27.4%, $n = 451$). More reported injuries were in grade 1–4 (63.7%, $n = 1049$), compared to grade 5–8 (23.7%, $n = 391$) and grade 9–12 (12.6%, $n = 207$). The average age at which injury was most common was 10 years. Fifty-five percent of injuries occurred during semester one and 45.0% in semester two.

The most common injuries was abrasion/scrape (59.7%, $n = 831$), followed by cut/laceration (27.2%, $n = 379$) and then pain/tenderness (13.1%, $n = 182$). The body parts primarily involved in injuries were the extremities with 44.5% ($n = 740$) in the legs and 30.7% ($n = 510$) in the arms, followed by head injuries with 9.7% ($n = 161$). According to

Table 1: Number of injuries versus subject or injury characteristics.

Characteristics	Grade 1–4		Grade 5–8		Grade 9–12		Total		p-value
	n	%	n	%	n	%	n	%	
Gender									
Boys	826	78.7	230	58.8	140	67.6	1196	72.6	< 0.001
Girls	223	21.3	161	41.2	67	32.4	451	27.4	
Location of injury									
Playground	328	39.5	140	46.7	109	62.3	577	44.2	< 0.001
Classroom	331	39.8	112	37.3	53	30.3	496	38.0	
Hallway	172	20.7	48	16.0	13	7.4	233	17.8	
Time of injury									
In class	336	38.4	120	36	53	29.3	509	36.7	< 0.001
Break	349	39.9	106	31.8	35	19.3	490	35.3	
Physical education period	189	21.6	107	32.1	93	51.4	389	28.0	
Types of injury									
Abrasion or scrape	568	62.5	170	54.1	93	55.0	831	59.7	< 0.001
Cut or laceration	260	28.6	92	29.3	27	15.0	379	27.2	
Pain or tenderness	81	8.9	52	16.6	49	29.0	182	13.1	
Contributing factors									
Fall	407	52.2	117	47.2	60	46.2	584	50.4	0.425
Collision with an object	233	29.9	83	33.5	40	30.8	356	30.7	
Collision with a person	140	17.9	48	19.4	30	23.1	218	18.8	
Severity									
Yes	164	15.9	60	15.7	38	18.6	262	16.2	0.590
No	870	84.1	323	84.3	166	81.4	1359	83.8	
Equipment involvement									
Yes	250	25.3	112	29.9	40	19.7	402	25.7	0.024
No	739	74.4	262	70.1	163	80.3	1164	74.3	

this study, the three most common accident types causing injury were falling (50.4%, $n = 584$), collision with an object (30.7%, $n = 356$), and collision with a person (18.8%, $n = 218$). Asphalt (59.5%, $n = 295$) and concrete (40.5%, $n = 201$) were the most common surfaces involved in injuries. In 25.7% of the injuries, there were other equipments contributing to the injury, mostly from defective educational toys, school furniture like chairs and tables, or classroom equipments such as pins, staplers, and scissors.

Playgrounds, classes, and the hallway were the three most common locations of injuries reported in schools (44.2%, 38.0%, and 17.8%, respectively). There was a statistically significant difference in the location of injuries between the three age groups (cycles 1, 2, and 3) of students ($p < 0.001$). Injuries mostly occurred during class time (36.7%, $n = 509$), break-time (35.3%, $n = 490$), and during physical education class (28.0%, $n = 389$). Almost three-

quarters of these injuries were witnessed either by a teacher or by other students. Moreover, there was a statistically significant difference in this study regarding the time of injury and the three age groups of students ($p < 0.001$).

The majority of students (96.2%) received first aid in school. Many of the injured students (62.9%) remained at school after the injury. However, 16.2% ($n = 262$) of injuries were severe enough to necessitate the transfer of students to either a primary health care center or hospital for further management and 2.6% ($n = 42$) of students were sent home after the injury [Table 1].

DISCUSSION

We found a cumulative incidence of school injuries of 2.3% for the academic year 2015/2016. The number is close to the incidents taking place in developed countries like UK (2.28%), US (1.74%)¹⁰, and

Poland (1.11%).¹¹ Furthermore, when comparing our incidence results to other developing countries, we observed that Oman had a dramatically low incident rate of school-related injuries from the rates found in countries such as Taiwan (27%),¹² Turkey (10.5%),¹³ and Pakistan (5.7%).¹⁴

There is not much difference in the percentage of injuries between the first (55.0%) and second semester (45.0%), unlike other countries like Turkey and Finland in which injuries were reported more frequently during winter.^{13,15} These differences could be because there is not much change in weather throughout the year in Oman.

When comparing health-promoting schools to other governorate schools, there was not much difference in the percentage of injuries. This could reflect that the health-promoting schools' program is not yet well-structured enough to fulfill the objective of health and safety in the school environment. Another explanation could be that the incidence of injury is generally low in all the schools.

In line with previous research done in other countries, this study showed that boys had more injuries than girls.¹²⁻¹⁶ In other words, being a boy is one of the risk factors for school-related injuries. This might be related to characteristics of male physical activity, a tendency to engage in risk-taking behavior in the presence of their peers, and the types of games played during the school period.

This study also showed that the majority of the injured students were aged eight to ten years (48.0%) which is almost the same age group found in Pakistan where 44% of injuries occurred in aged five to nine year olds.¹¹ In France, 69% of injured students were younger than 15 years¹² as well as in Turkey 73.3%.¹⁷

The percentages of injuries were higher among students in grades one to four (63.7%), different from the findings from other countries. In a study from Turkey, the percentage was higher among students in grades 7 and 8 (15.8% for each) as well as in Taiwan where the seventh-grade students had the highest rate of injury.¹² In general, according to the 2001 Centers for Disease Control and Prevention (CDC)'s report, middle and high school students sustain more injuries at school than elementary school students.¹⁸ The higher risk of injury for younger students in our study could be partially attributed to inadequate supervision and in addition to the use of unsafe and age-inappropriate school supplies. In our study, there was no difference in the severity of injuries between the three groups.

Playgrounds exceeded all other sites of school injuries for all age groups, with a percentage of 44.2%. This finding is almost the same as the findings in a 1999 review of the literature of school-related injuries for a 10-year period.¹⁹ The second most common place where injuries occurred was in the classroom (38.0%). Students in cycle 1 sustained injuries at almost the same rate in both the playground and the classroom. This could be attributed to the fact that most school activities were carried out in these places. Inadequate playground safety and lack of appropriate supervision could be additional risk factors for these injuries.

In our study, older students sustained injuries mostly during physical education class (51.4% in group 3 and 32.1% in group 2), which is similar to findings from Sweden (85%), Colorado (53%), and Ireland (51%).^{15,17,20} On the other hand, in our study, students in cycle 1 sustained injuries mainly during breaks (39.9%) followed by class time (38.4%). This can be explained by the inadequate supervision of this age group. In 25.7% (n = 402) of the injuries, equipment was involved as a contributing factor for injury. Further analysis revealed that most of this equipment was defective educational toys, school furniture like chairs and tables, or classroom equipment such as pins, staplers, and scissors. All these findings indicate the importance of placing more focus on a well-planned classroom structure, adequate recreation space, and proper, safe equipment for each age group.

Specific characteristics of the school environment may contribute to the likelihood of an injury; surface type being one of these characteristics. This study shows a significant relationship between asphalt and concrete surfaces with the severity of injuries, while mats, carpeting and synthetic surfaces were associated with less severe injuries. In a study completed in a school in Utah in the US, the injury rate in playgrounds covered by asphalt was six-times higher than in those covered by sand.¹⁵

In this study, the most frequent causes of injuries were falls, followed by a collision with an object, and then with a person. In addition, the extremities were the most affected by injuries and with the head second. These findings are similar to those of developing and developed countries.^{4,13,14,16,21}

One of the major challenging issues in schools is an intentional injury because of violence/physical altercation. Although this study does not emphasize

this matter in detail, 2.3% (n = 38) of the injuries reported were a result of physical altercation and this was significantly lower than cases reported globally. According to the CDC, nearly 8% of the students had been in a physical fight on school property once or more than one time in a year.²² Nevertheless, though this number was very low in our study, it is important to help in violence prevention and to understand the details of circumstances in where a child is detected to have such an injury at school. Substance abuse is another important issue and is under-reported in most of the studies. In this study, there were three reported injuries related to substance abuse. The underreporting of these types of injuries cannot be overlooked.

Ninety-six percent of injured students received first aid treatment at school, and 62.9% of them remained at school. Only one-fifth of the injured students leave the school. These results highlight the importance of school health services, and set out some priority areas for school health services.

Despite a high response rate, our study has some limitations. First, the study included only cases presenting to school clinics. Therefore, it is likely that mild injuries were not reported. In addition, the schools participated in this study voluntarily, so we cannot be sure that they reported all the injuries in their schools. Most of the questions were closed-ended, and this does not allow students to describe the types and causes of injuries. The potential bias of students' responses to the questionnaire could be another limitation.

Based on our findings, we recommend providing safer playground areas by using a synthetic surface instead of asphalt and/or concrete. Cycle 1 students require more supervision in the playground area at either breaks, physical education class or sports class. We also recommend that school infrastructure should be improved to prevent injuries by taking the time to plan out classroom structure satisfactorily, providing adequate playground space and proper, safe, age-appropriate equipment, and implementing risk management strategies.

CONCLUSION

The incidence of school-related injury among students in A'Dakhiliyah governorate schools is 2.3% per year. It is more among students in a primary school setting, which means that schools need to

be structured to be safer according to student age. Gender, age, inappropriate school equipment for age, inadequate supervision, and unsafe playground areas are risk factors of school-related injuries, as noticed in this study. School clinic services with trained nurses play an important role in first aid management.

Disclosure

The authors declared no conflict of interest. No funding was received for this study.

Acknowledgements

The authors would like to thank the Directorate General of Health services, A'Dakhiliyah governorate, Directorate General of Education, A'Dakhiliyah governorate, and Lesley Carson Editorial Solutions for assistance in finalizing the manuscript.

REFERENCES

1. Peden MM, Oyegbite K, Ozanne-Smith J, Hyder AA, Branche C, Rahman AK, et al. World report on child injury prevention. Geneva, Switzerland: World Health Organization; UNICEF; 2009. p. 211.
2. Towards a world safe for children. Bangkok, Thailand: The alliance for safe children, UNICEF, East Asia and the Pacific Regional Office; 2004. p. 82.
3. Mokdad AH, Jaber S, Aziz MI, AlBuhairan F, AlGhathithi A, AlHamad NM, et al. The state of health in the Arab world, 1990-2010: an analysis of the burden of diseases, injuries, and risk factors. *Lancet* 2014 Jan;383(9914):309-320.
4. Scheidt PC, Harel Y, Trumble AC, Jones DH, Overpeck MD, Bijur PE. The epidemiology of nonfatal injuries among US children and youth. *Am J Public Health* 1995 Jul;85(7):932-938.
5. MOH Oman. Annual report. 2015. [cited 2018 July 5]. Available from: <https://www.moh.gov.om/documents/274609/1136023/عس%20اتل%20ال%20ل%20ص%20ف%20ل%20ع/60499ebe-2225-49bf-9e16-2e42126b2c13>.
6. Peyton RP, Ranasinghe S, Jacobsen KH. Injuries, violence, and bullying among middle school students in Oman. *Oman Med J* 2017;32(2):98-105.
7. Ministry of Foreign Affairs. Ad Dakhiliyah Governorate, Governorate of Sultanate of Oman, 2016. [cited 2018 July 5]. Available from: <https://www.mofa.gov.om/?p=4809&clang=en>.
8. World Health Organization Regional Office for the Eastern Mediterranean. Health-promoting schools initiative in Oman: a WHO case study in intersectoral action. 2013 [cited 2018 July 5]. Available from: <http://apps.who.int/iris/handle/10665/120000>.
9. Yumpu.com. Student injury report form guidelines - Ohio Department of Health. [cited 2018 July 5]. Available from: <https://www.yumpu.com/en/document/read/40979190/student-injury-report-ohio-department-of-health>.
10. Limbos MA, Peek-Asa C. Comparing unintentional and intentional injuries in a school setting. *J Sch Health* 2003 Mar;73(3):101-106.
11. Sosnowska S, Kostka T. Epidemiology of school accidents during a six school-year period in one region in Poland. *Eur J Epidemiol* 2003;18(10):977-982.
12. Yang CY, Yeh YC, Cheng MF, Lin MC. The incidence of school-related injuries among adolescents in Kaohsiung, Taiwan. *Am J Prev Med* 1998 Oct;15(3):172-177.
13. Ozkan O. Incidence and outcomes of school-based injuries during four academic years in Kocaeli, Turkey. *Pediatr Int*

- 2016 Aug;58(8):732-739.
14. Khan UR, Bhatti JA, Zia N, Farooq U. School-based injury outcomes in children from a low-income setting: results from the pilot injury surveillance in Rawalpindi city, Pakistan. *BMC Res Notes* 2013 Mar;6(1):86.
 15. Salminen S, Kurenniemi M, Råback M, Markkula J, Lounamaa A. School environment and school injuries. *Front Public Health* 2014 Jan;1:76.
 16. Chau N, Prédine R, Aptel E, d'Houtaud A, Choquet M. School injury and gender differentials: a prospective cohort study. *Eur J Epidemiol* 2007;22(5):327-334.
 17. Schelp L, Ekman R, Fahl I. School accidents during a three school-years period in a Swedish municipality. *Public Health* 1991 Mar;105(2):113-120.
 18. American Psychological Association. School health guidelines to prevent unintentional injuries and violence. 2001 [cited 2018 Jun 15]. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5022a1.htm>.
 19. Haq SM, Haq MM. Injuries at school: a review. *Tex Med* 1999 Apr;95(4):62-65.
 20. Lenaway DD, Ambler AG, Beaudoin DE. The epidemiology of school-related injuries: new perspectives. *Am J Prev Med* 1992 May-Jun;8(3):193-198.
 21. Li LP, Wang S, Huang G, Luo JY. A survey on injury incidence in school children in Shantou City, China. *Biomed Environ Sci* 2003 Jun;16(2):180-186.
 22. Kann L, McManus T, Harris WA, Shanklin SL, Flint KH, Hawkins J, et al. Youth risk behavior surveillance — United States, 2015. *MMWR Surveill Summ* 2016 Jun;65(6):1-174.