INCIDENCE AND NATURE OF FARM-RELATED INJURIES AMONG CHILDREN AGED 6-15 DURING A 10-YEAR PERIOD IN ONE REGION IN POLAND

Stefania Sosnowska[1,2], Tomasz Kostka[1]
[1]Department of Preventive Medicine, Medical University of Łódź, Poland
[2]Regional Administration Unit for the Control of Epidemics and Hygiene Promotion in Włocławek, Poland

SUMMARY

The health risks among children in "new" and "old" members of the European Union seem to be different. Farms are the most frequent place of injuries among children living in rural areas in Poland. Our aim is to present data on the farm-related injuries conditions among children aged 6–15 in one large region in Poland. The analysis has been made on the basis of information collected from the Farmers' Insurance Fund in Włocławek, which registers all farm-related injuries reported within the Włocławek Province. Over the 10-year study period 449 injuries were recorded (1.29 injuries per 1000 person-years). Among all victims there were 132 girls (29.4% of the total) and 317 boys. 14-year-old children fell victims of injuries most frequently (20.0% of all injuries). The highest number of injuries was recorded during the summer season. The injuries resulted mainly from falls or slips (47.2%) and falling from high altitudes (22.9% of all injuries). Individual and unattended works accounted for 37.5% of cases while 30.4% of all injuries happened while children were assisting in the work performed by adults. The sites were farm facilities (29.0%), farmyard (23.8%), around farm facilities (13.1%), pastures and meadows (11.1%), fields (9.1%), roads leading to houses or farm facilities (7.6%) and home (6.2%). We conclude that 13–15-year-old boys falling during an individual unattended work or while assisting in the work performed by adults, inside and around farm facilities, and during summer months, were the most frequent victims of injuries on farms. Information obtained in this study may be helpful in developing and implementing injury prevention strategies tailored to the Central-Eastern European agricultural realities.

Key words: childhood injury, farm injuries, farm safety, falls, prevention

Address for correspondence: T. Kostka, Department of Preventive Medicine, Medical University, WHO Collaborating Centre for Noncommunicable Diseases Prevention and Control, Pl. Hallera 1, 90-647 Łódź, Poland. E-mail: prevmed@poczta.onet.pl

INTRODUCTION

In many countries the problem of injuries among children has become a social issue (1–4). Over the last 50 years, a number of preventive programmes have been implemented in order to decrease accident rate among children and teenagers in many Western countries (5–7). Among all strategies, multidisciplinary approaches to injuries are the most favoured ones (8–10). Also, there are special measurement standards of efficiency applied (1, 8, 11). The cases of burns are among the most frequently analysed ones (12), as well as those of road injuries (13, 14), school accidents (15, 16), the cases of poisoning and other circumstances (2, 3).

According to the Health for All Targets for European Region, the health risks among children and adolescents in "new" and "old" members of the European Union seem to be very different (17). In Poland, injuries among children and teenagers are considered to be the major cause of death and the main reason of further hospitalisation in this age group (18). Overall mortality rate for the period 1985–1990 was 1.7 times higher for injuries in Poland than in Sweden (19). The greatest difference concerns injuries registered in 1996, with mortality of 18.8 per 100,000 1–19-year-olds in Poland as compared to 7.3 in Sweden (19). It is farms that are the most frequent place of injuries among children living in rural areas (20, 21). Socio-economic transformations started in 1989 involve also profound changes in agricultural structure of Central and Eastern Europe. However, it is still a common thing for children to participate in farm activities (22). Children raised on farms often experience many hazardous exposures during play and work. It is the specifics of the rural environment works that pose dangers to the child's health. This is due to the variety of activities performed and the scope of responsibilities, different machines and farm animals used. On the whole, work on the farm is dangerous and difficult. This is illustrated by much higher accident incidence during farming works as compared to other industries (20). Also, the incidence of fatal injuries is three time higher than in other branches of industry (23).

The literature on farm-related child injury lacks analysis of detailed epidemiological descriptions based on large databases (24). Especially, little information has been available on the incidence and nature of farm-related accidents in the countries of Central and Eastern Europe (25, 26). Data on the children farm injuries in Poland comprise only general information related to accidents reported and are classified as the ones that happened during farm works. The research is lacking comprehensive data illustrating the specifics of the injuries: the age and sex of the victims, the frequency of injuries over specified months, the place of injuries, the circumstances as well as the type of activities per-

Table 1. *Injuries among children aged 6-15 on farms with reference to the number of children living in the rural areas within the former Włocławek Province over the years 1994–2003*

Year	Children living in the rural areas aged 6–15 years			Injuries among children on farms		
	Total n	Boys n	Girls n	Total n	Boys n	Girls n
1994	38,389	19,835	18,554	34	23	11
1995	38,114	19,682	18,432	36	24	12
1996	37,857	19,486	18,371	45	34	11
1997	37,200	19,189	18,011	61	42	19
1998	36,179	18,618	17,561	55	39	16
1999	33,912	17,478	16,434	35	25	10
2000	32,950	16,951	15,999	55	36	19
2001	32,055	16,499	15,556	58	46	12
2002	31,285	16,029	15,256	35	23	12
2003	30,499	15,766	14,733	35	25	10
1994–2003	348,440	179,533	168,907	449	317	132

formed during the accident and the type of injuries. Therefore, the aim of this study is to present complete data on the farm-related injuries conditions among children aged 6–15 over the years 1994–2003 in one large region in Poland.

MATERIALS AND METHODS

A former Włocławek Province is situated in central Poland (26). It used to be an independent administrative unit till December 31, 1997. On January 1, 1998, as a result of the country administrative reform, it became a part of a bigger administrative unit. Before the reform implementation, it occupied the area of 4,402 km^2, which constituted 1.4% of total country's area. Its population amounts to 435,000 inhabitants, which makes 1.1 % of the country's population. Density of population of the region equals 99 people per km^2 on average, while the average density in Poland amounts to 123 people per km^2. As many as 53% of total population of the region is represented by people living in rural areas. It is undoubtedly an agricultural region when we consider the structure of the land use. Out of total area of the region, agricultural lands represent about 71.8%. The structure is dominated by relatively small farms of the area below 7 ha constituting 47% of all farms. Farms of the area of 7–10 ha make 24% of the total, farms of 10–15 ha represent 20%, and those above 15 ha amount to 9%. It is its fertile soil and relatively high agricultural know-how that makes the region one of the strategic areas for the agricultural production.

The study presents the analysis of on-farms injuries among children aged 6–15 over the period of January 1, 1994 till December 12, 2003 in the former Włocławek Province. The analysis has been made on the basis of information collected from the Farmers' Insurance Fund in Włocławek, which registered all farm-related injuries reported within the former Włocławek Province. The choice of the age span 6–15 years was done, because injuries that happened to younger children were not reported to the Farmers' Insurance Fund.

The analyses of all reported injuries have been carried out according to the following categories: the age and sex of victims, occurrence of injuries in particular months, places of injuries, circumstances of injuries and types of works performed, types of injuries. All injuries have been analysed in accordance with their place of occurrence: farmyard, at home, on the road to the farm facilities, in farm facilities, around farm facilities, on the field, on meadows (pastures).

The injuries have been classified according to types of work: falls of people, falls of objects on people (being hit or pressed by an object), contact with sharp manual equipment or other sharp objects, being run over or crashed with a means of transport, work with animals, work with machines, other cases.

RESULTS

Over the 10-year study period 449 injuries among children aged 6–15 were recorded (1.29 injuries per 1,000 person-years). Distribution of all the injuries with reference to the number of children living in the rural areas within the former Włocławek Province over the years 1994–2003 is presented in Table 1.

Among all victims there were 132 girls (29.4% of the total) and 317 boys (70.6% of the total). Over the period of 1994–2003 the average annual incidence rate was 0.13% of all children living in the rural area. Incidence rate varied from 0.09% in 1994 to 0.18% in 2001. The average annual incidence rate was 0.176% for boys and 0.078% for girls.

Figure 1 illustrates the injuries distribution among children by age. It has been noted that the injury rate increased along with the age of children. A much higher percentage of children victims was recorded from the age group of 10 (7.4% of all the injuries), up to the age of 15 (17.4% of all the injuries) when compared with younger children. The data refer both to boys and girls. 14-year-old children fell victims of injuries most frequently (20.0% out of total injuries). Injuries among boys aged 14 (15.6%) were 3.5 times more frequent than among girls at the same age (4.5%).

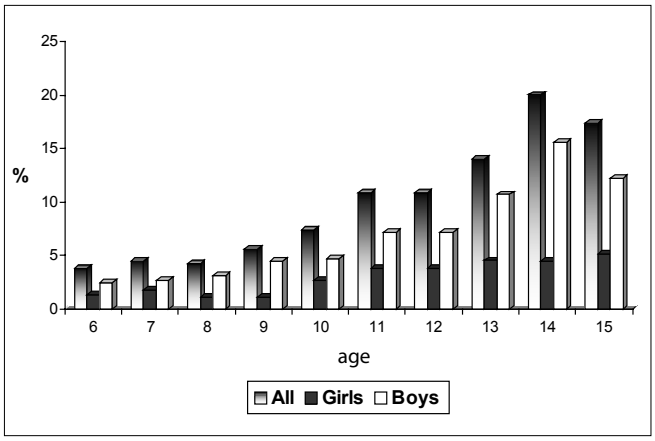

Fig. 1. *Distribution of injuries among children aged 6–15 on farms within the area of the former Włocławek Province over the years 1994–2003.*

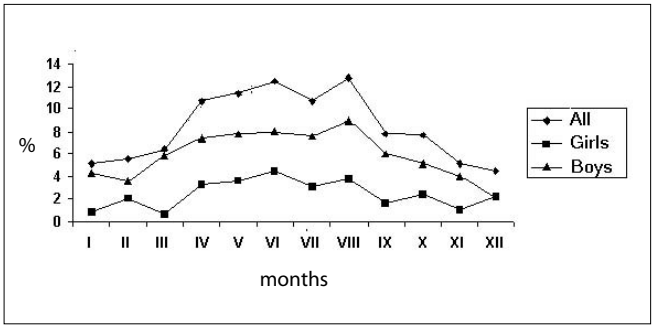

Fig. 2. *Distribution of injuries among children aged 6–15 on farms by month within the area of the former Włocławek Province in the years 1994–2003.*

Figure 2 illustrates children injuries by month. The highest number of injuries was recorded during the summer season: in June and August (12.5 and 12.7%, respectively). The late autumn season (November – 5.1%) and the winter time (December – 4.5%, January – 5.1%, February – 5.6%) had the lowest records.

Considering the circumstances and type of work performed by children, the injuries resulted from:

1. Falls and slips while lifting or carrying materials, equipment, tools, which led to 212 injuries (47.2% of all injuries).
2. Falling from high altitudes, 103 injuries (22.9%) among which we can specify the following cases:

- falling off stairs, falling off a ladder, which cases resulted in injuries of 26 children (5.8%)
- falling off trailers, carriages, tractors, which cases led to injuries among 16 children (3.6%)
- falling off bicycles resulting in injuries among 30 children (6.7%). All occurred on the roads leading to facilities or outside facilities
- falling from high altitudes onto concrete surfaces in farm facilities, which led to injuries among 15 children (3.3%)
- other cases: falling off trees, fencing, potato planter, stacks. Totally, the number of injuries resulting from other cases amounted to 1.6%.

3. Work with the use of machines (being caught, hit or crashed with parts of machines and working devices), 67 injuries (14.9%).
4. Work with farm animals (being hit, pressed, bitten by animals), 26 injuries (5.8%).
5. Work with sharp manual tools (knives, axes), mechanical cutters (mechanical sawing machines, straw cutters), 19 injuries (4.2%).
6. Being run over by vehicles, 8 injuries (1.8%).
7. Burns with hot liquids, 6 injuries (1.3%).
8. Children being hit or pressed with falling objects, 5 injuries (1.1% of total).
9. Electric shocks, 1 injury (0.2%).
10. Other reasons led to 2 injuries (0.5%).

Individual and unattended works were the major cause of injuries making 37.5% out of total. 30.4% of all injuries happened while children were assisting in the work performed by adults. Other cases were not related to children works. Injuries that occurred when children were playing amounted to 4.9%, and those within a close distance to work area equalled 9.4%. 17.9% represent other cases unrelated to any types of children activities.

Having analysed the places of injury occurrence, it has been concluded that the most frequent sites were:

- inside farm facilities (29.0%)
- farmyard (23.8%)
- around farm facilities (13.1%)
- on pastures and meadows (11.1%)
- on the field (9.1%)
- on the road leading to houses, farm facilities (7.6%)
- at home (6.2%).

Children suffered from the following harms resulting from injuries:

- limb harms in 345 injuries (76.8%) including 139 fractures (30.7%), 120 dislocations (26.7%), 24 finger crushes (5.4%), 18 fingers cutting-off (4.0%), 44 wounds and gashes (9.8%)
- trunk harms in 92 injuries (20.5%) including collar-bone fractures, shoulder-blade fractures, burns, bites by animals, bruises
- head injuries in 12 cases (2.7%).

Over the period of 1994–2003, 3 fatal injuries were recorded: 2 injuries resulted from falls off the carriage, 1 from being run over by the car.

DISCUSSION

It is both developed and developing countries that face the problem of children work on farms (27). As far as Poland is concerned, the issue is related to the children engaged in work at their parents' farms (22). Nationwide data illustrates only injuries reported and classed as the ones that occurred on farms, in accordance with the Farmers' Insurance Fund statistics. This study provides new information on the specifics of all injuries recorded in accordance with: place and type of work during which injuries took place, the age and sex of victims, types of injuries, seasonal distribution of injuries. A big number of injuries recorded over a 10-year period is the key to an accurate and proper assessment of injuries circumstances on farms.

Several studies have noted the influence of sex and age on the probability of farm-related children injuries (27–30). Boys are more often victims of agricultural injuries than girls (27, 29). These gender differences in the occurrence of farm-related injuries

are similar for children and adults (30). In the present study males accounted for 70.6% of injuries as compared to 64% of animal related injuries to youth occurring on farms in the United States (31). Both sexes showed similar age-related distribution with consistently higher rates for boys and the highest incidence for 14–15-year-old children. In the present study children aged 1–4 years were not taken into consideration, while in some studies this age group was found particularly vulnerable (28). In the United States the age distribution of farm injuries in children is bimodal, with one peak at 3–4 years of age and a second peak at 13–16 years (27).

Although the frequency of farm-related injuries undergoes seasonal fluctuations, the exact information on those variations has been gathered in relatively few studies. The highest incidence of agricultural children injuries occurs during summer months (29), the finding being confirmed in the present study. The risk is more than doubled in comparison with winter months. This implicates an obvious attention that should be paid by families and authorities during the time of agricultural works.

Farm machinery, livestock, falls from structures, chemical burns or poisonings and wound infections accounted for most of the morbidity on the US farms (32). Our findings indicate that falls constitute an important part of farm injuries in children. Falls from high altitudes accounted for 22.9% of injuries in our study and only for 12.5% of injuries in the recent study of Smith et al. (33). However, it were the cases of falling over and slips, which resulted from carrying heavy loads that proved to be the most frequent reasons of injuries in all examples analysed. Therefore, a reduction of exposure of children to fall-related hazards on farms is especially required. Work with farm animals accounted for only 5.8% of injuries as compared to 40.6% of animal-related injuries in the study of Smith et al. (33). In the United States one out of five youth injuries occurring on farms is animal-related (31).

The type of supervision the farm children receive at the time of the injury may provide important information on potential risk prevention measures. The majority of injuries occurred while working (67.9%), either unattended or supervised. It was individual, unattended work that resulted in the biggest number of injuries among children. Similar data were presented by Mason and Earle-Richardson (34) in New York State where 55% of child agricultural injuries were work-related. In the United States 69% of animal related farm injuries to youth occurred at work (31). The most frequent place of injuries were farm facilities and areas outside farm facilities, outdoor areas, fields, meadows and pastures.

Among the major injuries there were: limb injuries, trunk injuries, and less frequently, head injuries. Head trauma accounted for only 2.7% of injuries as compared to 36.4% of injuries in the recent study of Smith et al. (33). This may be explained by the fact that probably larger scale of injuries was registered in our study in comparison with usually seriously injured hospitalised patients in the study of Smith et al. (33). Nationwide data from the United States indicate that limbs are more often the sites involved in older children (27).

Research carried out so far has proved that the costs of treatment far more exceed those of prevention (4, 6, 35, 36). Information obtained in this study may be helpful in developing and implementing injury prevention strategies tailored to the Central-Eastern European agricultural realities. The need of surveillance and implementation of countermeasures is of utmost importance. Manifold possibilities of preventive strategies (e.g. legislative measures, education of the public, options of intervention programs), taking into consideration main environmental, economic and socio-cultural challenges, should be considered (37). In order to prevent such injuries from happening, it is necessary to establish coordination centres and work on prevention programmes. There is a need for a consistent and wide-scaled information action for accident prevention activities that will be implemented among children and teenagers as well as their parents, tutors, school staff and health service personnel. The prevention action should refer to potential threats of injuries within various working places: at home and its surrounding, in farm facilities, and all other sites making the farm area. A substantial number of injuries among children requires the application of effective prevention activities, implementation and execution of special programmes, and education of families on how to avoid potential dangers during farm works. For instance, in Sweden since 1989 many campaigns and long-term programmes have been carried out in order to promote safety. Certain checklists for injury prevention and safety promotion are used for children living in farms (19).

CONCLUSION

14-year-old boys were the most frequent victims of injuries on farms. The incidence was more than twice higher during summer as compared to winter months. Falls during work was the most important circumstance of injury. With similar frequency injuries occurred both during an individual unattended work performed by children and happened while children were assisting in the work performed by adults. Inside and around farm facilities were the most frequent sites of injuries. The most frequent injuries suffered by children were limbs and trunk injuries. Results from the present study will be useful in identifying potentially applicable measures able to attenuate accident risk among children living in rural areas.

Acknowledgements

The authors of the study would like to express their special thanks to the director of Kasa Rolniczego Ubezpieczenia Społecznego in Włocławek for his assistance and willingness to provide access to data on injuries among children aged 6–15 in the former Włocławek Province over the period of the study.

T.K. was supported by a grant 502-16-109 from the Medical University of Lodz.

REFERENCES

1. Chalmers D, Pless B. UNICEF's child injury league tables: a bag of mixed messages. Inj Prev. 2001 Jun;7(2):81-2.
2. Runyan CW, Gerken EA. Epidemiology and prevention of adolescent injury. A review and research agenda. JAMA. 1989 Oct 27;262(16):2273-9.
3. Roberts I, Pless B. Social policy as a cause of childhood accidents: the children of lone mothers. BMJ. 1995 Oct 7;311(7010):925-8.
4. Grivna M. Injuries among children - some cost considerations in USA. Cent Eur J Public Health. 2001 May;9(2):109-12.
5. Carter YH, Bannon MJ, Jones PW. The role of the teacher in child accident prevention. J Public Health Med. 1994 Mar;16(1):23-8.

6. Miller TR, Galbraith M. Injury prevention counseling by pediatricians: a benefit-cost comparison. Pediatrics. 1995 Jul;96(1 Pt 1):1-4.
7. Gallagher SS, Finison K, Guyer B, Goodenough S. The incidence of injuries among 87,000 Massachusetts children and adolescents: results of the 1980-81 Statewide Childhood Injury Prevention Program Surveillance System. Am J Publ Health. 1984 Dec;74(12):1340-7.
8. Gallagher SS, Hunter P, Guyer B. A home injury prevention program for children. Pediatr Clin North Am. 1985 Feb;32(1):95-112.
9. Miller TR, Spicer RS. How safe are our schools? Am J Public Health. 1998 Mar;88(3):413-8.
10. Johnston BD, Britt J, D'Ambrosio L, Mueller BA, Rivara FP. A preschool program for safety and injury prevention delivered by home visitors. Inj Prev. 2000 Dec;6(4):305-9.
11. Bannon MJ, Carter YH. Paediatricians and child protection: the need for effective education and training. Arch Dis Child. 2003 Jul;88(7):560-2.
12. Chapman JC, Sarhadi NS, Watson AC. Declining incidence of pediatric burns in Scotland: a review of 1114 children with burns treated as inpatients and outpatients in a regional centre. Burns. 1994 Apr;20(2):106-10.
13. Begg DJ, Langley JD, Chalmers D. Motor vehicle road crashes during the fourteenth and fifteenth years of life. N Z Med J. 1992 Apr 22;105(932):150-1.
14. Micik S, Miclette M. Injury prevention in the community: a system approach. Pediatr Clinics North Am. 1985 Feb;32(1):251-65.
15. Schelp L, Ekman R, Fahl I. School accidents during a three school-years period in a Swedish municipality. Public Health. 1991 Mar;105(2):113-20.
16. Stark C, Wright J, Lee J, Watt L. Two years of school injuries in a Scottish education sub-division. Public Health. 1996 Jul;110(4):229-35.
17. Health 21: the health for all policy framework for the WHO European Region. European Health for All Series No. 6. Copenhagen: WHO Regional Office for Europe; 1999.
18. Mazur J, Woynarowska B. Injuries in adolescents aged 11-15 in Poland and other countries. Zdrowie Publiczne. 2000;110:211-7. (In Polish.)
19. Pellmer Wramner K. Healthy start in life - a comparison between health in Poland and Sweden with the first four WHO Health for All Targets as a starting point [doctoral thesis]. Poland. Medical University of Lodz; 2002.
20. Zagorski J. Accidents in agriculture. Lublin: IMW; 1996. (In Polish.)
21. Lachowski S, Zagorski J. Health hazards for children working in family farms. Lublin: IMW; 1999. (In Polish.)
22. Lachowski S, Bujak F, Zagorski J. Agricultural work demands for children living in farm families. Lublin: IMW; 1998. Research report. (In Polish.)
23. Farm accidents and occupational diseases in farmers - preventive activity of Farmers' Insurance Fund KRUS in 2002. Warszawa: KRUS; 2003. (In Polish.)
24. Reed DB, Claunch DT. Nonfatal farm injury incidence and disability to children: a systematic review. Am J Prev Med. 2000 May;18(4 Suppl):70-9.
25. Pelech L, Roth Z, Zvadová Z. Accidents and children. Čas Lék Čes. 1998 Aug 3;137(15):460-3. (In Czech.)
26. Sosnowska S, Kostka T. Epidemiology of school accidents during six school-year period in one region in Poland. Eur J Epidemiol. 2003;18(10):977-82.
27. DeMuri GP, Purschwitz MA. Farm injuries in children: a review. WMJ. 2000 Dec;99(9):51-5.
28. Bancej C, Arbuckle T. Injuries in Ontario farm children: a population based study. Inj Prev. 2000 Jun;6(2):135-40.
29. Meiers S, Baerg J. Farm accidents in children: eleven years of experience. J Pediatr Surg. 2001 May;36(5):726-9.
30. Dimich-Ward H, Guernsey JR, Pickett W, Rennie D, Hartling L, Brison RJ. Gender differences in the occurrence of farm related injuries. Occup Environ Med. 2004 Jan;61(1):52-6.
31. Hendricks KJ, Adekoya N. Non-fatal animal related injuries to youth occurring on farms in the United States, 1998. Inj Prev. 2001 Dec;7(4):307-11.
32. American Academy of Pediatrics; Committee on Injury and Poison Prevention and Committee on Community Health Services. Prevention of agricultural injuries among children and adolescents. Pediatrics. 2001 Oct;108(4):1016-9.
33. Smith GA, Scherzer DJ, Buckley JW, Haley KJ, Shields BJ. Pediatric farm-related injuries: a series of 96 hospitalized patients. Clin Pediatr. 2004 May;43(4):335-42.
34. Mason C, Earle-Richardson G. New York State child agricultural injuries: how often is maturity a potential contributing factor? Am J Ind Med. 2002 Aug;Suppl 2:36-42.
35. Overpeck MD, Jones DH, Trumble AC, Scheidt PC, Bijur PE. Socioeconomic and racial/ethnic factors affecting non-fatal medically attended injury rates in US children. Inj Prev. 1997 Dec;3(4):272-6.
36. Paul CL, Redman S, Evans D. The cost and availability of devices for preventing childhood injuries. J Paediatr Child Health. 1992 Feb;28(1):22-6.
37. Kudlová E. Life cycle approach to child and adolescent health. Cent Eur J Public Health. 2004 Sep;12(3):166-70.

Received May 29, 2006
Received in revised form and accepted September 15, 2006