Annals of the University of Oradea, Fascicle: Ecotoxicology, Animal Husbandry and Food Science and Technology, Vol. XVI/A 2017

Analele Universităţii din Oradea, Fascicula: Ecotoxicologie, Zootehnie si Tehnologii de Industrie Alimentara, Vol.XVI/A 2017

# EPIDEMIOLOGICAL ASPECTS OF CHILDHOOD TRAUMATISMS

**Lele Laura, Spineanu Radu, Sava Cristian, Cheregi Simona**

University of Oradea

## *Abstract*

*The authors studied the traumatic pathology of the child for a period of 10 years, focusing on traffic accidents, falling from heights and falling at the same level. During all the years of study trauma victims were predominantly boys, the risk being 1.8 times higher compared to girls. The incidence of trauma in the urban area was significantly higher than in rural settlements, urban / rural ratio being 1.5. Regarding the age of the injured children, it was observed that those between 7 to 10 years had a risk of trauma 1.6 higher by comparison to other age groups. During 2003 and 2012, the incidence of accidents by falls from the same level was significantly higher than other types of trauma, and the incidence of injuries produced by falls from height was significantly higher than traffic accidents.*

**Keywords:** trauma, children, fallings, traffic accidents.

## INTRODUCTION

Pediatric traumatology represents a chapter of great importance amongst childhood pathology, with direct implications for the children physical and neuropsychological health, but also with consequences on child mortality.

However, epidemiological and exhaustive demographic studies were rarely conducted on pediatric population groups, and significant biostatistical analysis of collected data lacked.

## OBJECTIVES

Assessment of the value of pediatric traumatology particularities in Bihor County over a decade.

## MATERIAL AND METHOD

The authors analyze the traumatisms recorded between 2003 and 2012 on Bihor County territory, focusing on traffic accidents, falling from heights and same level fall injuries. 3671 trauma were registered. Demographic data were collected, together with medical records, forensic and judicial inquiries, familial and environmental background.

**RESULTS AND DISCUSSIONS**

1. Evolution of 0 – 16 years age group population during 2003 – 2012 period

During 2003 – 2012 interval population between 0 and 16 years recorded in Bihor County had a downtrend, descending from 108344 in 2003 to 96132 in 2012, the decrease being of 11,27%.

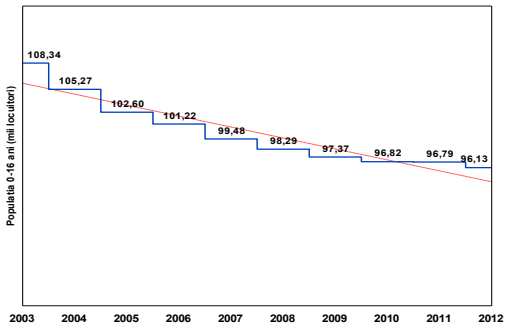


Chart 1. Evolution of 0 – 16 years age group population during 2003-2012 period

This downtrend is present in both genders (drop of 11,11% in males and of 11,45% in female gender) and in terms of habitation (decrease of 11,60% in urban area and 10,99% in countryside).

Male gender represents more than 50% of entire 0-16 years population group during the studied period, with a boys to girls ratio of 1.1:1. More than half of the population included in the study originates from the rural area (rural/urban ratio of 1.2:1).

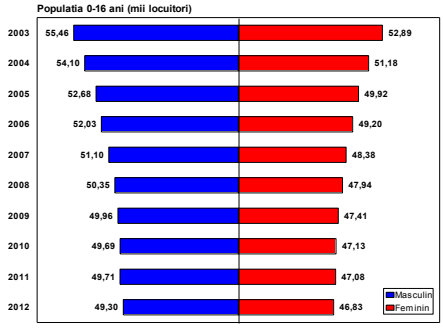


Chart 2. Evolution of 0 – 16 years age group during 2003-2012 according to gender

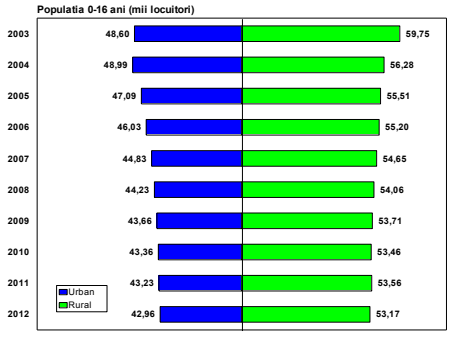


Chart 3. Evolution of 0 – 16 years age group during 2003-2012 according to habitation

*Table 1*

Age group distribution of 0-16 years population during 2003-2012 period

| Year | Infants | 1-3 years | 4-6 years | 7-10 years | 10-16 years |
|---|---|---|---|---|---|
| 2003 | 6.183 | 12.360 | 18.962 | 27.320 | 43.519 |
| 2004 | 6.143 | 12.353 | 18.565 | 26.506 | 41.707 |
| 2005 | 6.080 | 12.129 | 18.773 | 26.096 | 39.526 |
| 2006 | 6.212 | 12.401 | 18.706 | 25.541 | 38.364 |
| 2007 | 6.258 | 12.493 | 18.712 | 25.163 | 36.854 |
| 2008 | 6.351 | 12.724 | 18.600 | 24.882 | 35.728 |
| 2009 | 6.430 | 12.878 | 18.631 | 24.653 | 34.782 |
| 2010 | 6.470 | 12.911 | 18.648 | 24.540 | 34.254 |
| 2011 | 6.425 | 12.903 | 18.626 | 24.790 | 34.045 |
| 2012 | 6.296 | 12.530 | 18.835 | 24.929 | 33.542 |

During the period under survey, 0 to 6 years population remained almost constant, with variations comprised between 1-2%, while 7-10 years and 10-16 years age groups decreased by 8,75%, and 22,93%, respectively.

2. The evolution of trauma incidence in children during 2003 – 2012 period

*Table 2*

Incidence of traumatisms in children between 2003 and 2012

| Year | No. | % | Incidence ($^0/_{0000}$) |
|---|---|---|---|
| 2003 | 417 | 11,36 | 384,89 |
| 2004 | 390 | 10,62 | 370,46 |
| 2005 | 438 | 11,93 | 426,88 |
| 2006 | 428 | 11,66 | 422,82 |
| 2007 | 237 | 6,46 | 238,24 |
| 2008 | 394 | 10,73 | 400,88 |
| 2009 | 313 | 8,53 | 321,44 |
| 2010 | 310 | 8,44 | 320,17 |
| 2011 | 366 | 9,97 | 378,14 |
| 2012 | 378 | 10,30 | 393,21 |
| **Total** | **3671** | **100,00** | **366,25** |

Of the 3671 injuries registered between 2003 and 2012, most were recorded in the 2005 (11,93%), 2006 (11,66%) and 2003 (11,36%), and the fewest in the 2007 (6,46%).

Incidence of trauma during 2003-2012 period was 366,25 $^0/_{0000}$. High-incidences, over $400^0/_{0000}$, were recorded in the 2005 ($426,88^0/_{0000}$), 2006 ($422,82^0/_{0000}$) and 2008 ($400,88^0/_{0000}$), while minimum incidence was registered in the 2007 ($238,24^0/_{0000}$).

2a. Incidence of traumatisms according to gender

*Table 3*

Incidence of traumatisms in children between 2003 and 2012 according to gender

| Year | Male | Female | p |
|---|---|---|---|

| | No. | % | Incidence ($^0/_{0000}$) | No. | % | Incidence ($^0/_{0000}$) | |
|---|---|---|---|---|---|---|---|
| 2003 | 269 | 64,51 | 485,04 | 148 | 35,49 | 279,85 | <0,001 |
| 2004 | 257 | 65,90 | 475,08 | 133 | 34,10 | 259,88 | <0,001 |
| 2005 | 277 | 63,24 | 525,81 | 161 | 36,76 | 322,50 | <0,001 |
| 2006 | 269 | 62,85 | 517,06 | 159 | 37,15 | 323,18 | <0,001 |
| 2007 | 144 | 60,76 | 281,80 | 93 | 39,24 | 192,23 | 0,023 |
| 2008 | 267 | 67,77 | 530,30 | 127 | 32,23 | 264,94 | <0,001 |
| 2009 | 192 | 61,34 | 384,30 | 121 | 38,66 | 255,20 | 0,003 |
| 2010 | 221 | 71,29 | 444,75 | 89 | 28,71 | 188,83 | <0,001 |
| 2011 | 227 | 62,02 | 456,69 | 139 | 37,98 | 295,22 | <0,001 |
| 2012 | 284 | 75,13 | 576,06 | 94 | 24,87 | 200,72 | <0,001 |
| **Total** | **2407** | **65,57** | **467,95** | **1264** | **34,43** | **259,04** | <0,001 |

During 2003-2012 period, out of the 3671 registered traumatisms in children, 2407 affected male gender (65.57%) and 1264 involved female patients (34.43%), sex ratio 1.9:1.

From a total of 2407 traumatisms affecting boys, most cases were recorded in the 2012 (284 cases accounting for 11.80% of the total trauma in boys), and the fewest in the 2007 (144 cases – 5.98%).

Female gender was affected in 1264 cases, with the majority in the 2005 (161 cases, representing 12,74% of total girls' injuries) and the least in the 2008 (89 cases – 7,04%).

During all the years included in the study male gender was predominantly affected by trauma, boys/girls 1,9:1. Higher values of this ratio (greater than 2) were recorded during 2012 (3,0:1), 2010 (2,5:1) and 2008 (2,1:1).

Incidence of traumatisms involving boys ($467,95^0/_{0000}$) was significantly higher than in girls ($259,04^0/_{0000}$) ($p<0,001$).

In relation to male gender, higher incidence of traumatic episodes was registered in the 2012 ($576,06^0/_{0000}$), whereas the minimum incidence occurred in the 2007 ($281,80^0/_{0000}$). Maximum incidence in girls was recorded in the 2006 ($323,18^0/_{0000}$), and minimum in the 2010 ($188,83^0/_{0000}$). Throughout the 10 years of study, the incidence of injuries was significantly higher in boys. The risk of trauma is 1.8 times higher in boys compared to girls (RR=1,806, RA=0,002).

2b. Incidence of traumatisms according to habitation

*Table 4*

Incidence of traumatisms in children during 2003-2012 period according to habitation

| Year | Urban | | | Rural | | | p |
|---|---|---|---|---|---|---|---|
| | No. | % | Incidence ($^0/_{0000}$) | No. | % | Incidence ($^0/_{0000}$) | |
| 2003 | 268 | 64,27 | 551,47 | 149 | 35,73 | 249,38 | <0,001 |
| 2004 | 211 | 54,10 | 430,66 | 179 | 45,90 | 318,05 | 0,099 |
| 2005 | 256 | 58,45 | 543,63 | 182 | 41,55 | 327,85 | 0,006 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2006 | 236 | 55,14 | 512,76 | 192 | 44,86 | 347,83 | 0,039 |
| 2007 | 141 | 59,49 | 314,51 | 96 | 40,51 | 175,67 | <0,001 |
| 2008 | 253 | 64,05 | 572,07 | 142 | 35,95 | 262,67 | <0,001 |
| 2009 | 194 | 61,98 | 444,30 | 119 | 38,02 | 221,56 | <0,001 |
| 2010 | 198 | 63,87 | 456,61 | 112 | 36,13 | 209,50 | <0,001 |
| 2011 | 223 | 61,10 | 515,91 | 142 | 38,90 | 265,10 | <0,001 |
| 2012 | 223 | 58,99 | 519,11 | 155 | 41,01 | 291,50 | <0,001 |
| **Total** | **2203** | **60,01** | **486,34** | **1468** | **39,99** | **267,22** | <0,001 |

In the period 2003-2012, of the 3671 injuries recorded, 2203 were placed in urban areas (60.01%) and 1468 in rural areas (39.99%), with an urban / rural ratio of 1.5: 1.

Out of 2203 registered trauma in urban areas, most cases were in 2003 (268 cases, representing 12.17% of the total urban trauma) and the fewest in 2007 (141 cases - 6.40%).

Out of 1468 registered trauma in rural areas, most cases were in 2006 (192 cases, representing 13.08% of all injuries in rural areas) and the fewest in 2007 (96 cases - 6.54 %).

Traumatisms occurred predominantly in urban areas in all years included in the study, urban/rural ratio being 1,5:1. Values higher than 1.7 of this ratio were registered in 2003 (1,80:1), 2008 (1,78:1) and 2010 (1,77:1).

The incidence of trauma in urban areas was $486,34^{0}/_{0000}$, significantly higher than in rural areas ($267,22^{0}/_{0000}$) ($p<0,001$).

In urban areas the maximum incidence of trauma was recorded in 2003 (($551,47^{0}/_{0000}$), and the lowest in 2007 ($314,51^{0}/_{0000}$), while in rural areas the maximum incidence was recorded in 2005 ($347,83^{0}/_{0000}$) and the minimum in 2007 ($175,67^{0}/_{0000}$). Throughout the 10 years of study, the incidence of injuries was significantly higher in urban areas, except for 2004 ($p = 0.099$).

The risk of injury is 1.8 times higher in urban than in rural areas (RR = 1.820, R = 0.003).

2c. Incidence of traumatisms according to age

*Table 5*

Trauma rates according to age

| Year | Infant | | 1-3 years | | 4-6 years | | 7-10 years | | 11-16 years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| 2003 | 21 | 5,04 | 46 | 11,03 | 75 | 17,99 | 124 | 29,74 | 151 | 36,21 |
| 2004 | 13 | 3,33 | 39 | 10,00 | 67 | 17,18 | 140 | 35,90 | 131 | 33,59 |
| 2005 | 29 | 6,62 | 70 | 15,98 | 92 | 21,00 | 113 | 25,80 | 134 | 30,59 |
| 2006 | 11 | 2,57 | 38 | 8,88 | 57 | 13,32 | 167 | 39,02 | 155 | 36,21 |
| 2007 | 12 | 5,06 | 19 | 8,02 | 26 | 10,97 | 98 | 41,35 | 82 | 34,60 |
| 2008 | 16 | 4,06 | 37 | 9,39 | 51 | 12,94 | 154 | 39,09 | 136 | 34,52 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 20 | 6,39 | 23 | 7,35 | 66 | 21,09 | 77 | 24,60 | 127 | 40,58 |
| 2010 | 10 | 3,23 | 31 | 10,00 | 48 | 15,48 | 109 | 35,16 | 112 | 36,13 |
| 2011 | 12 | 3,28 | 30 | 8,20 | 51 | 13,93 | 143 | 39,07 | 130 | 35,52 |
| 2012 | 16 | 4,23 | 38 | 10,05 | 71 | 18,78 | 154 | 40,74 | 99 | 26,19 |
| **Total** | **160** | **4,36** | **371** | **10,11** | **604** | **16,45** | **1279** | **34,84** | **1257** | **34,24** |

Most cases of trauma were registered in almost equal proportions, within the age groups 7-10 years (34.84%) and 11-16 (34.24%), while the fewest occurred in infants (4.36%).

Related to age groups, highest rates for traumatisms were recorded as it follows: for infants in 2005 (6,62%), for 1-3 years age group in 2005 (15,98%), for 4-6 years age group in 2005 and 2009 (21,00% and 21,09%, respectively), for 7-10 years age group in 2012 (40,74%), and for the 11-16 years age group in 2009 (40,58%).

Calculating incidence per 100,000 children, it is found that the highest incidence of trauma was encountered in the age group 7-10 years old (502.71), significantly higher than other age groups ($p < 0.001$).

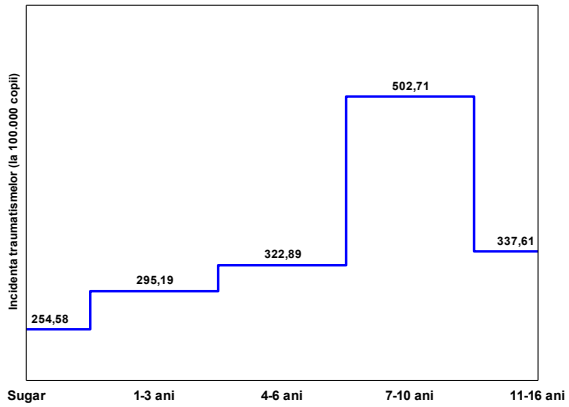


Chart 4 Incidence of traumatisms according to age

In 2005 was recorded a peak incidence for the following age groups: infants, 1-3 years and 4-6 years ($476,97^0/_{0000}$, $577,13^0/_{0000}$ and $490,07^0/_{0000}$). For the age group 11-16 years the incidence peak occurred in 2006 ($404,02^0/_{0000}$), while the age group 7-10 years has experienced three peaks in 2006, 2008 and 2012 ($653,85^0/_{0000}$, $618,92^0/_{0000}$ and $617,75^0/_{0000}$).

The risk of trauma in the age group 7-10 years is 1.6 times higher than at other ages (RR = 1.572, R = 0.021).

2d. Incidence of traumatisms according to the trauma types

*Table 6*

Incidence of traumatisms according to the trauma types

| Year | Same-level falls | | | Falling from height | | | Traffic accidents | | |
|---|---|---|---|---|---|---|---|---|---|
| | No. | % | Incidence ($^0/_{0000}$) | No. | % | Incidence ($^0/_{0000}$) | No. | % | Incidence ($^0/_{0000}$) |
| 2003 | 235 | 56,35 | 216,90 | 90 | 21,58 | 83,07 | 92 | 22,06 | 84,91 |
| 2004 | 163 | 41,79 | 154,83 | 116 | 29,74 | 110,19 | 111 | 28,46 | 105,44 |
| 2005 | 230 | 52,51 | 224,16 | 104 | 23,74 | 101,36 | 104 | 23,74 | 101,36 |
| 2006 | 218 | 50,93 | 215,36 | 100 | 23,36 | 98,79 | 110 | 25,70 | 108,67 |
| 2007 | 123 | 51,90 | 123,64 | 55 | 23,21 | 55,29 | 59 | 24,89 | 59,31 |
| 2008 | 186 | 47,21 | 189,25 | 155 | 39,34 | 157,70 | 54 | 13,71 | 54,94 |
| 2009 | 184 | 58,79 | 188,96 | 54 | 17,25 | 55,46 | 75 | 23,96 | 77,02 |
| 2010 | 218 | 70,32 | 225,15 | 43 | 13,87 | 44,41 | 49 | 15,81 | 50,61 |
| 2011 | 210 | 57,38 | 216,97 | 93 | 25,41 | 96,09 | 62 | 16,94 | 64,06 |
| 2012 | 194 | 51,32 | 201,81 | 97 | 25,66 | 100,90 | 87 | 23,02 | 90,50 |
| **Total** | **1961** | **53,42** | **195,64** | **907** | **24,71** | **90,49** | **803** | **21,87** | **80,11** |

53.42% of traumatisms were produced by same-level fall mechanism, other 24,71% injuries occurred after falls from height and 21,87% resulted from traffic accidents.

Highest percentage of trauma related to same-level falls was recorded in 2010 (70,32%), while for the falling from height injury maximum was noted in 2008 (39,34%), and for traffic accidents in 2004 (28,46%).

In the period 2003-2012 the incidence of trauma from same level falls was $195,64^0/_{0000}$, significantly higher than for the other two types of trauma ($90,49^0/_{0000}$ and $80,11^0/_{0000}$, respectively, $p<0,001$). The incidence of falls from height is significantly higher than the incidence of traffic accidents ($p = 0.009$).

Injuries produced by same level falls recorded peaks of incidence in 2010 and 2005 ($225,15^0/_{0000}$, respectively $224,16^0/_{0000}$), as in case of falls from height peak was in 2008 ($157,70^0/_{0000}$) and for road accidents in 2006 ($108,67^0/_{0000}$).

## CONCLUSIONS

Analysis of pediatric traumatology in the light of certain demographic and epidemiological modern concepts determines an accurate understanding of the logic and structure of these phenomena.

## REFERENCES


1. Bachani, A.M.T., N. T.; Agrawal, S.; Hyder, A. A.;, *The role of NGOs in child injury prevention: An organizational assessment of one network of NGOs.* Health Policy, 2014.
2. Barraco, R.D., et al., *Child passenger safety: an evidence-based review.* J Trauma, 2010. **69**(6): p. 1588-90.

3. Christoffel, K.K., et al., *Psychosocial factors in childhood pedestrian injury: a matched case-control study. Kid's'n'Cars Team.* Pediatrics, 1996. **97**(1): p. 33-42.
4. Cross, D.S. and M.R. Hall, *Child pedestrian safety: the role of behavioural science.* Med J Aust, 2005. **182**(7): p. 318-9.
5. Dissanayake, D., J. Aryaija, and D.M. Wedagama, *Modelling the effects of land use and temporal factors on child pedestrian casualties.* Accid Anal Prev, 2009. **41**(5): p. 1016-24.
6. Illingworth, C.M., *Injuries to children riding BMX bikes.* Br Med J (Clin Res Ed), 1984. **289**(6450): p. 956-7.
7. Hasselberg, M. and L. Laflamme, *Children at risk in traffic: improvement potentials in the Swedish context.* Acta Paediatr, 2004. **93**(1): p. 113-9.
8. Hoffrage, U., et al., *How to keep children safe in traffic: find the daredevils early.* J Exp Psychol Appl, 2003. **9**(4): p. 249-60.
9. Kanchan, T., R.G. Menezes, and F.N. Monteiro, *Fatal unintentional injuries among young children--a hospital based retrospective analysis.* J Forensic Leg Med, 2009. **16**(6): p. 307-11.
10. Mihic, J., et al., *Head injury in children.* Acta Clin Croat, 2011. **50**(4): p. 539-48.
11. Olufunlayo, T.F., et al., *An observational survey of child car safety practices in private pre-primary and primary schools in two local government areas of Lagos State, Nigeria.* Inj Prev, 2012. **18**(4): p. 216-20.
12. Pomerantz, W.J., M.A. Gittelman, and G.A. Smith, *No license required: severe pediatric motorbike-related injuries in Ohio.* Pediatrics, 2005. **115**(3): p. 704-9.
13. Raman, S.R., et al., *Keeping our children safe in motor vehicles: knowledge, attitudes and practice among parents in Kuwait regarding child car safety.* Int J Inj Contr Saf Promot, 2013. **20**(4): p. 358-67.
14. Read, J.H., et al., *The Epidemiology and Prevention of Traffic Accidents Involving Child Pedestrians.* Can Med Assoc J, 1963. **89**(14): p. 687-701.
15. Rice, T.M., C.L. Anderson, and A.S. Lee, *The association between booster seat use and risk of death among motor vehicle occupants aged 4-8: a matched cohort study.* Inj Prev, 2009. **15**(6): p. 379-83.
16. Richmond, S.A., et al., *The impact of pedestrian countdown signals on pedestrian-motor vehicle collisions: a reanalysis of data from a quasi-experimental study.* Inj Prev, 2014. **20**(3): p. 155-8.
17. Roney, L., et al., *Distracted driving behaviors of adults while children are in the car.* J Trauma Acute Care Surg, 2013. **75**(4 Suppl 3): p. S290-5.
18. Schnitzer, P.G., *Prevention of unintentional childhood injuries.* Am Fam Physician, 2006. **74**(11): p. 1864-9.
19. Tamburro, R.F., et al., *Association between the inception of a SAFE KIDS Coalition and changes in pediatric unintentional injury rates.* Inj Prev, 2002. **8**(3): p. 242-5.
20. Trowbridge, M.J. and R. Kent, *Rear-seat motor vehicle travel in the U.S.: using national data to define a population at risk.* Am J Prev Med, 2009. **37**(4): p. 321-3.
21. Warsh, J., et al., *Are school zones effective? An examination of motor vehicle versus child pedestrian crashes near schools.* Inj Prev, 2009. **15**(4): p. 226-9.
22. Will, K.E., K.E. Dunaway, and E.J. Lorek, Jr., *Tweens at risk: examining car safety practices in four economically disadvantaged urban elementary schools in Virginia.* J Safety Res, 2013. **46**: p. 77-82.