

Epidemiological profile of unintentional accidents in children over a period of 4 years.

Aiat Allah Skiredj^{1,2}, Fadoua Boughaleb^{1,2}, Loubna Aqqaoui^{1,2,3}, Toulalouth Lafia^{1,2,5}, Assia Mouad^{1,2}, Mounir Erraji^{1,2}, Erraji, Fouad Ettayebi^{1,2} and Houda Oubejja^{1,2,3,4}

1-Department of pediatric surgical emergencies, children's hospital of Rabat, Morocco.

2-Faculty of medicine and pharmacy, University Mohammed V, Rabat, Morocco.

3-Laboratory of Genetic and Biometry, faculty of science, university Ibn Tofail Kenitra, Morocco.

4-Laboratory of epidemiology, clinical research and Biostatistics, faculty of medicine and pharmacy, University Mohammed V, Rabat.

5-Ministry of health, Republic of Benin

Abstract:

Background: Unintentional injuries are one of the most important public health problems among children in developed and some developing countries.

Aim: Our purpose is to determine the prevalence of everyday life unintentional injuries among children admitted for at least 24 hours in the pediatric surgical emergencies (PSE) department, Children's hospital of Rabat, Morocco.

Methods: A cross-sectional study of unintentional injuries in children was undertaken over 4 years (2016- 2019) in the pediatric surgical emergencies (PSE) department, Children's hospital of Rabat, Morocco. The data were analysed by statistical software Jamovi 1.6.23. Drownings and foreign bodies were excluded.

Results: 1204 patients were screened, of which 545 files were studied. The median age was 8 years [4;12] with 36,5% were less than 6 years old, 70,4% were boys. The most injuries occurred mostly during winters and summers (41,6 vs 33,8%). The medical insurance plan was provided by compulsory medical insurance (AMO) and RAMED (Medical Assistance Scheme) (30,4% and 46.5% respectively). The main circumstances were accidents of everyday life (52%) with predominance of falls. For the public road accident, pedestrians were predominant. Hospital stay did not exceed 24 hours (73%) mainly in the surgical emergency department.

Keywords: Injuries; child; unintentional trauma; public health; Morocco

1. Introduction:

Unintentional injuries constitute a public health burden in the majority of developed countries [1,2,3]. Despite dramatic advances in other areas of clinical medicine, we have the feeling that injury prevention is poorly targeted, inadequately funded and seldom evaluated [1]. The World Health Organization published in 2008 a report on the prevention of child injuries which demonstrated that approximately 950 000 adolescents under 18 years old died of injury every year in the world [4]. Epidemiologic studies of injury indicated that there were enormous differences in the prevalence, economic burden, consequences and prevention of injuries between high income and middle-low-income countries [5].

Childhood Unintentional Injury Surveillance calculated that nearly 50 % of children under 12 y had a unintentional injuries severe enough to requires presentation to an emergency room (ER) and had some form of disability [14]. In the United States, the current situation and the possible outcomes of child and adolescent accidental injuries could be determined from injury monitoring data. In contrast, in middle-low-income countries, it is difficult to obtain adequate information about injuries because of the lack of comprehensive injury monitoring systems. In Morocco, only few articles have been published on the issue [2,3,7,8,9].

Children are more susceptible to injuries. Their physical, and emotional immaturity limits their physical and cognitive abilities, the curiosity and the desire to experiment, the inability to avoid dangerous situations, the motivation to imitate and repeat behaviour, impatience, and anatomical characteristics are predisposing factors to injuries [1,4]. We aim to describe the general characteristics of unintentional accidents in children less than 12 years old establishing an epidemiological profile.

2. Material and methods:

A cross-sectional study was conducted from January 1st 2016 to December 31st 2019 in the paediatric surgical emergencies (PSE) department, children's hospital of Rabat, Morocco. All children aged less than 16 years with unintentional injuries were screened. Trauma related to foreign bodies, drowning and suicide attempt were excluded because in our structure they used to be admitted in other departments.

Data were collected from PSE register, cross-checked with the hospitalization register. We used a questionnaire covering the demographic, socioeconomic and injury characteristics. The cause of trauma was divided into two groups: Road traffic accident (RTA) and everyday life accident (EDL). The circumstances of everyday life accident were divided into 3 groups: falls, collision and burns. We also divided the patients by age groups: infant and newborn (0 to 2 years), pre-school child (2 to 6 years), schooled (6-12 years) and adolescent (>12 years)

and by gender. The data was analysed by Jamovi software 1.6.23. Khi2 used to variables [9]

3. Results:

During 4 years, 1245 patients consulted for unintentional accidents of which 545 files were selected. 234 (42.2%) resulted in hospitalization in the PSE department of Children’s Hospital in Rabat, Morocco at least during 24 hours. As shown in table 1, the median age was 8 y [4; 12] mostly with predominance of schooled child (40%) and boys (70.4%). Winter and summer accommodate most patients (Graph 1). The place of accident was studied too. Most of accidents sustained at home (46.4%), in the street (25.3%) and on the road (13.2%). More than a half (54.6%) of the children were alone at the time of injury. The injuries related to everyday life were predominant (81%) mostly due to falls (68%). Falls occurred from ground level (53,5%) followed by variable height (32%). The RTA’s victims were mostly pedestrians (71%), followed by cyclists (16,5%) while car passengers represented only 12,7%. Fracture is the most common injury (67%) then comes the head trauma (18.7%). Hematomas and burns represent 8% and 4% respectively. Others injuries regroup abrasions, crushing, lacerations, finger tips... (Figure 2). Limbs represents 53% of parts of body injured followed by head (27%). Most of children (81.8%) had moderate injuries that only require hospitalization less than 48 hours and about 2.5 % had severe injuries leading to several complications.

Table 1: General characteristics of unintentional injuries in children less than 12 years admitted in PSE department, Children’s hospital of Rabat, Morocco.

GENERAL CHARACTERISTICS	n(545)	%
Median of age	8 years [4; 12]	
Gender		
Male	383	70.4
Female	161	29.6
Age group		
Infants and newborn (0-2 years)	70	13.6
Preschool age (2-6years)	118	22.9
School age (6-12 years)	206	39.9
Adolescent (>12 years)	122	23.6
Causes of trauma		
Everyday life (EDL)	439	81.9
Road traffic accident (RTA)	97	18.1
Circumstances		
Fall	364	68.0
Burns	22	4.1
Collision	105	19.6
Other	44	8.2
Fall circumstances		
Ground level	177	53.5
Variable height	107	32.3
Stairs	32	9.7
Furniture/ toys/ rollers...	15	4.5
Accident place		
Home	218	46.4
Street	119	25.3
School	20	4.3
Playground	24	5.1
Road	62	13.2
Others	27	5.7
Duration of hospital stay		
24 hours	142	60.7
48-72 hours	51	21.8
>72 hours	41	17.5
Wards		
PSE department	238	96
Intensive care unit	10	4
Evolution		
Simple	220	96
Complicated	9	4

Socioeconomic characteristics were analyzed too and resumed in table 2. The majority of patients have as health coverage the RAMED. Most of them (85.5%) live in urban areas. Concerning parental education, out of school parents represents 24.9%, who reach the secondary school represents 37.1%. Finally, 72.4% of household has a salary between 1500 and 5000 dirhams.

Table 2: Socio-economic characteristics of patients less than 12 years old admitted with unintentional injuries in PSE department, Children’s hospital of Rabat, Morocco

SOCIO-ECONOMIC CHARACTERISTICS	<i>n</i> (545)	%
Medical insurance		
AMO	155	30.4
RAMED	237	46.5
None	118	23.1
Habitation		
Urban	413	85.5%
Rural	73	14.5%
Parental education level		
Out-of-school	269	24.9%
Primary	183	17%
Secondary	401	37.1%
University	98	9%
Unknow	129	12%
Monthly household salary (dhs)		
<1500	45	12.3
1500-5000	266	72.4
5000-10000	51	13.9
>10000	5	1.4

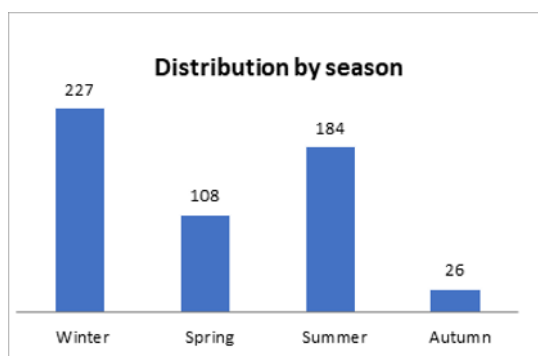


Figure 1: Distribution by season’s of patients admitted at the PSE department, children’s hospital of Rabat.

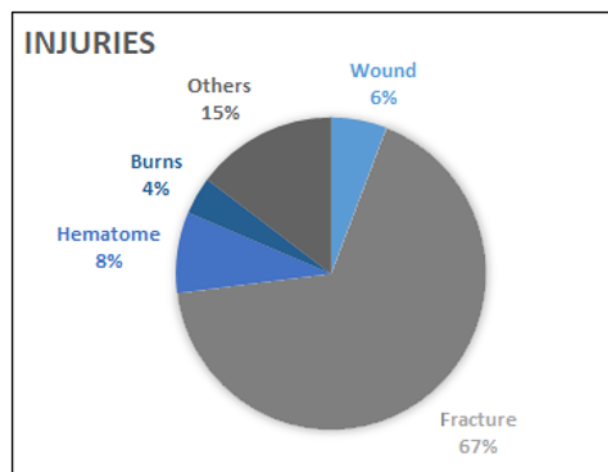


Figure 2: Type of injuries in children presenting unintentional injuries admitted at the PSE department, children’s hospital of Rabat.

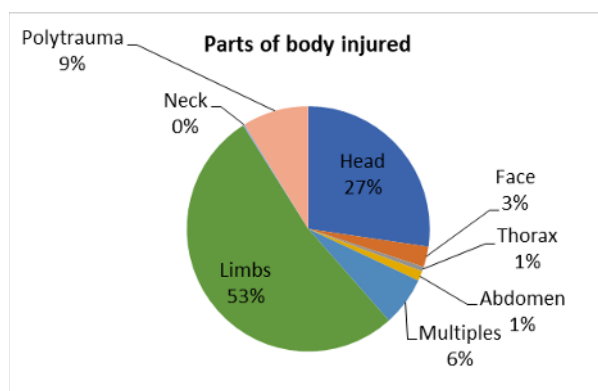


Figure 3: Parts of body injured presenting unintentional injuries admitted at the PSE department, children’s hospital of Rabat.

In this study, we compare the results by age group distribution (table 3). The patients were divided in 3 groups (toddlers less than 2 years, children aged 2 to 6 years old, between 6 and 12 years and finally more than 12 years old). The majority of boys and girls are aged between 6 and 12 years. Everyday life injury is more frequent in children older than 6 years. The road traffic accidents are more expected in children between 6 and 12 years old. Parts of body injured were studied with differences in each age range. Indeed, limb’s injury predominates in children more than 6 years old (Table 2). Moreover, head trauma is frequent in children less than 12 years. There are no differences in the duration of hospitalization between age groups. Most hospitalization takes place in the PSE department. But complications that lead to a hospitalization in Intensive care unit were more common in toddlers. Surgery was performed in the majority (53%), more frequently among children between 6 and 12 years.

Table 3: Distribution by age group: gender, cause of trauma and parts of body injured presenting unintentional injuries admitted at the PSE department, children’s hospital of Rabat.

	Age group (Years old)				p
	0-2	2-6	6-12	>12	
Gender					<0.001
Female	35 (22.4)	43 (27.6)	56 (35.9)	22 (14.1)	
Male	35 (9.7)	75 (20.9%)	150 (41.8)	99 (27.6)	
Cause of trauma					0.067
EDL	63 (15.1)	94 (22.6%)	159 (38.2)	100 (38.2)	
RTA	6 (6.6)	20 (22%)	46 (50.5)	19 (20.9)	
Parts of body injured					<0.001
Head	39 (26.2)	49 (32.9)	44 (29.5)	17 (11.4)	
Thorax-abdomen	2 (20)	1(10)	4 (40)	3 (30)	
Polytrauma	1 (2.4%)	13 (31%)	19 (45.2)	9 (21.4)	
Multiple	11 (33)	8 (24.2)	12 (36.4)	2 (6.1)	
Limbs	15 (5.7)	43 (16.5)	121(46.4)	82 (31.4)	

Table 4: Distribution by age group: duration of hospital stay, wards and outcomes by gender presenting unintentional injuries, admitted at the PSE department, children’s hospital of Rabat.

	0-2 yo	2-6 yo	6-12 yo	>12 yo	p
Duration of hospital stay					0.995
24 hours	20 (57%)	41	47 (58.8%)	28 (62.2%)	
48 -72 hours	8 (22.9%)	15 (22,7%)	18 (22.5%)	9 (20%)	
> 72 hours	7 (20.1%)	10	15 (18.8%)	8 (17.8%)	
Wards					0.568
PSE* department	35 (11.4%)	63(20.5%)	83 (26.8%)	46(15.%)	
Intensive care unit	3 (9.8%)	2(0.65%)	4 (1.3%)	1 (0.3%)	
Outcome					0.261
No complication	27(8.8%)	57 (18.6%)	83 (26.8%)	45 (14.7%)	
Complications	3 (9.8%)	1 (0.3%)	4 (1.3%)	1(0.33%)	

4. Discussion:

The World Health Organization estimates that, in 2004, around 830 000 children under the age of 18 years died as a result of an unintentional injury. Our study found that everyday life accidents are more common than road traffic accidents, which is in agreement with the literature [5,9]. They occur mostly at home especially for the preschooler children younger than 4 years [22]. Over

the age of five years, road traffic injuries and fires are the predominant causes “Geneva” [4].

The present study shows a significantly higher proportion of unintentional injuries in boys than girls because of their dynamic lifestyle and less controlled behavior [1,11] and because of the characteristics of Moroccan society where the boys are used to be fearless, stronger, and more independent than girls. They are less supervised and protected by parents. This is in concordance with studies across the globe [12,13]. Also, authors suggest that parents are more concerned about girls during playing [1,14].

Socio-economic results shows that most families are from low and middle-income families. Few studies established a link between socio economic level and prevalence of accident like Faelker [23] et al., which concluded that the poorest is the family the more frequent, are accident.

Parental Socio-educational level had an impact on the risk of accident [12]. In our study 24.9% had no school education, and children education is insufficient what means a higher risk of accident.

Most injuries occur at home (46.6 %) like in several studies in Pakistan [13] and all over the world. The most common circumstance of accident was accident of everyday life (EDL) (81.9%) with predominance of falls (68%) occurring at home. Similar results were made in studies from India [12] and Pakistan [13].

On the other hand, the etiology of injuries and the age of the child are linked to the impact of injury [15]. The most common site of injury is limb followed by head. The size of the child’ head, the soft and elastic bones of the skull and weaker neck supporting structures contribute to head impact, which is different from the adult. The child’s head is proportionately larger than in the adult [16]

Most of patient stayed at hospital less than 24 hours, without differences in ages. Our study shows that the result distribution is different depending of age group. Our results indicate that the children aged between 4-12 years had a higher injury rate than other groups; this is in discordance with research from the USA and Pakistan [13,15]. Halawa and al. showed that 70% of patients were preschool children, followed by children more than 6 years of age (21,5 %) [17,19,20]. Also, few studies reported a bimodal distribution with a higher rate of injury in children between (1-5 years) and older than 10 years [18]. HU and al. reported that the prevalence of non-fatal injuries in 5-9-year-old children was significantly higher (19.3 per 1000 subjects) than in 10-14 years old children (15.1 per 1000 subjects) [4]. In our study the most common site of injury is limb in children older than 6 years, and head injury is more common in

toddlers those results are similar to a study in Texas where children had more injuries in limbs and younger children had head trauma [18,19].

5. **Conclusion:**

There is a strong association between the stage of life and the type of injuries sustained by a child. The age of a child, the stage of his or her development, how the child interacts with the world, and the type of activities the child undertakes are relevant to this association. The quality of access to medical center is an important factor that can influence an injury in the long-term consequences. Our study summarizes a general overview of unintentional accident in children in Morocco, and allows a better understanding of the common mechanisms and patterns of injuries, essential to predict, treat and prevent unintentional accident.

References:

1. DH Stone, S. Jarvis. *The continuing global challenge or injury*. BMJ; **322**:1557–8 (2001)
2. H. Oubejja, R. Razine, H. Zerhouni, M. Erraji, F. Ettayebi, A. Soulaymani, *Epidemiological profile of child victims of home related injuries, hospitalized in children's hospital of Rabat, Morocco*. International Journal of Innovation and Scientific Research. ISSN 2351-8014 pp. 69-76. Vol. **17** No. 1 Aug. (2015)
3. M. Rafai, N. Mekaoui, N. Chouaib, L. Belyamani, A. El Koraichi, S. Ech-Cherif El Kettani et al., *Epidemiology of severe domestic accidents of children admitted in pediatric intensive care unit of Children Hospital of Rabat-Morocco*. Pan Afr Med J. (2015); **20**: 28.
4. M. Peden, K. Oyegbite, J. Ozanne-Smith, et al. *World report on child injury prevention*. Geneva: World Health Organization (2008)
5. S.N. Bartlett: *The problem of children's injuries in low-income countries: a review*. Health Policy Plan, (2002); **17**(1), 1-13.
6. M. Hu, G.Q. Hu, ZQ. Sun, and X. He: *Epidemiological Survey of the Prevalence of Non-fatal Injury among Children Aged 5-14 Years in China* *Biomed Environ Sci*, (2012); **25**(4): 407-412
7. N. Ennaim. *Prévention des accidents domestiques de l'enfant: enquête à Marrakech*, <http://wd.fmpm.uca.ma/biblio/theses/annee-htm/FT/2009/these68-09.pdf>.
8. H. Oubejja, R. Gacem, T. Lafia, H. Zerhouni, M. Erraji, F. Ettayebi, and A. Soulaymani. *Extremity fracture related to home and leisure activities among children: Epidemiological profile*. International Journal of Innovation and Applied Studies Vol. **16** No. 2 Jun. (2016), pp. 233-240
9. The jamovi project (2021). jamovi. (Version 1.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.
10. AS. Mohamed, A. Omid, ALF Fall, PA. Mbaye, NF. Seck, O. Ndour et al. M. *Domestic accidents in children at Dakar: A study of 555 cases*. Journal de pédiatrie et de puériculture (2015) **28**, 217-222.
11. RI. Leeberk, R. Anuradha, G. Kuryan, B. Anuratha: *Incidence and Impact of Unintentional Childhood Injuries: A Community Based Study in Rural South India*
12. LA. Del Ciampo, IRL. *Unintentional Injuries Among Children: An Observational Study in a Basic Health Unit in Ribeirão Preto, Brazil*. American Journal of Pediatrics. Vol. **2**, No. 5, (2016), pp. 19-22. doi: 10.11648/j.ajp.20160205.11
13. Z. Fatmi, A. Kazi, WC. Hadden, ZA Bhutta, JA. Razzak, G. Pappas. *Incidence and pattern of unintentional injuries and resulting disability among children under 5 years of age: results of the National Health Survey of Pakistan*. Paediatr Perinat Epidemiol. (2009); **23**: 229–38
14. B. Hammig, K. Jozkowski, *Prevention counseling among pediatric patients presenting with unintentional injuries to physicians' offices in the United States*. Prev Med (2015); **74**: 9-13
15. F.P. Rivara, N. Calonge, R.S Thompson: *Population based study of unintentional injury and impact on childhood*. Am J Public Health. (1989); **79**:990–4.
16. F. Donald, A. Huelke *Overview of Anatomical Considerations of Infants and Children in the Adult World of Automobile Safety Design*
17. EF Halawa, A. Barakat, H IRizk, EM. Moawad: *Epidemiology of non-fatal injuries among Egyptian children: a community-based cross-sectional survey*. BMC Public Health. (2015) Dec 17; **15**: 1248.
18. A.A. Arif, P.J Patterson, T.F. Borders, S.M. Shah, *The epidemiology of unintentional nonfatal injuries among children in the south plains/panhandle region of Texas*. Texas J Rural Health. 2003; **21**:31–41
19. B.A. Rudelli, M.V.A. da Silva, M. Akkari, C. Santili. *Accidents due to falls from roof slabs Sao Paulo* Med J. (2013); **131**(3): 153-7.
20. C. Charles, J.C.Y. Cheng, T.W. Wong, C.B. Fhow, B.P.K. Luis, W.L. Cheung et al., *An international comparison of childhood injuries in Hong Kong*, Inj Prev (2006); **6**: 20-3.
21. M.M. Kiser, J.S. Samuel, S.E. Mclean, A.P. Muyco, B.A. Cairns, A.G. Charles. *Epidemiology of pediatric injury in Malawi: Burden of disease and implications for*

prevention. International Journal of Surgery **10** (2012)
611-617.

22. H. Oubejja. *Les accidents de la vie courante chez l'enfant: profil épidémiologique*. Thèse de doctorat national, 175/2016 _CED, Faculté des sciences, université Ibn Tofail (2016)

23. T. Faelker, W Pickett, R J Brison *Socioeconomic differences in childhood injury: a population based epidemiologic study in Ontario, Canada* (2000)Sep;6(3):203-8.