DOI: 10.4274/tpa.456

Admissions to pediatric intensive care unit due to preventable injuries

Ali Ertuğ Arslanköylü, Mustafa Kömür*, Sercan Uysal*, Semra Erdoğan**

Mersin University Medical Faculty, Department of Pediatrics, Division of Pediatric Intensive Care, Mersin, Turkey

** Mersin University Medical Faculty, Department of Pediatrics, Mersin, Turkey*

*** Mersin University Medical Faculty, Department of Biostatistics, Mersin, Turkey*

Summary

Aim: One of the major causes of the morbidity and mortality in chidhood is preventable injuries. In the present study, we aimed to analyze the admissions to pediatric intensive care unit (PICU) because of preventable injuries.

Material and Method: Demographic characteristics, injury category, pediatric intensive care unit days, ventilation days and mortality of the patients admitted to the PICU of Mersin University Faculty of Medicine Hospital due to preventable injuries between July 2006 and December 2009 were reviewed retrospectively.

Results: Out of 822 admissions 124 (15%) were due to preventable injuries. Among these subjects, 69 (55.6%) were male and 55 (44.3%) were female. Mean hospitalization time was 3.7 ± 3.1 days. 9.7% of the subjects were ventilated and the mortality rate was found to be 12.5%. The most common reason for admission was intoxication (64.6%) which was followed by trauma (17.7%) and the other reasons (burns, animal bites, near drowning and foreign body aspiration) (17.7%).

Conclusions: Preventable injuries constitute an important part of PICU admissions. Increasing preventive measures against preventable injuries may reduce the morbidity and mortality rates during childhood. *(Turk Arch Ped 2012; 47: 45-8)*

Key words: Pediatric intensive care, preventable injuries, intoxication, trauma

Introduction

Injuries constitute a significant part of childhood morbidities and mortalities. Although different results have been obtained on this subject, the most common reasons of injuries reported during childhood include traffic accidents, drowning in water, intoxications and burns (1,2). These injuries which are predictible and thus preventable are not only the leading reason of mortality and morbidity in children, but also cause health expenses which bring significant economical load (3,4). Especially when the patient has to be followed up in Pediatric Intensive Care Unit (PICU), economic cost and emotional stress is increased. There are very few studies about patients followed up in PICU because of preventible injuries (5). In our country, no study about patients hospitalized in PICU because of injuries has been performed. Knowing the mortality and morbidity rates of childhood injuries in our country where the pediatric and adolescent population is large is significant in terms of institution and monitorization of prevention programs. In this study, it was aimed to retrospectively examine the patients hospitalized in PICU because of preventible injuries.

Material and Methods

The hospital records of patients who were hospitalized in PICU in Mersin University Medical Faculty Hospital between July 2006 and December 2009 were examined retrospectively. Approximatey more than 250 patients are addmitted each year to the Medical-Surgical PICU of our university hospital which is a tertiary healthcare center containing 7 beds and which serves a wide geographical region including mainly East Mediteranean region.

Preventable injuries are determined according to the criteria defined by the American Pediatric Academy (6). Demographic characteristics (gender, age), reasons of admission, hospitalization times in the intensive care unit, ventilator requirement, status of discharge or referral to

Address for Correspondence: Ali Ertuğ Arslanköylü MD, Mersin University Medical Faculty, Department of Pediatrics, Division of Pediatric Intensive Care, Mersin, Turkey
E-mail: aliertug@gmail.com **Received:** 01.16.2011 **Accepted:** 09.15.2011

another division and mortality rates of the patients included in the study were examined. In the statistical analysis, comparisons were made between three groups including intoxication, trauma and others. Since admission numbers related to other preventable injuries except for trauma and intoxication were not adequate for statistical calculation, they were evaluated under the group of others.

Statistical analysis: The data were entered into SPSS 11,5 package program, normality controls related to age and hospitalization time were done using Shapiro-Wilk test and it was found that they did not show normal distribution. The relation between reasons of admission, hospitalization times and ages of the patients admitted to pediatric intensive care unit because of preventable causes was evaluated using Kruskall-Wallis test and the least, the highest, the median and 25-75% quartiles were given as descriptive statistics. The relation between admission reasons, genders, requirement for mechanical ventilation, morbidity and prognosis of the groups was evaluated using Pearson chi-square and Likehood ratio chi-square tests and descriptive statistics related to these data were given as numerical and percent values. The relation between significant differences was analysed using two proportion test (z test) and calculated using MINITAB 15,0 package program.

Results

The reason of admission in 124 (15%) of 822 patients admitted in PICU between July 2006 and December 2009 was preventable injuries. 55.6% of these subjects (n=69) were male and 44.4% (n=55) were female. The age of the patients ranged between 1,5 and 192 months. The mean age was found to be 74.4±59.5 (1.5-192) months. Mean hospitalization time was 3.8±3.2 (1-21) days. The rate of mechanical ventilation was found to be 9,7% (n=12) and the mortality rate was found to be 6.5% (n=8). The most common reason for admission was intoxication (n=80, 64.6%) and this was followed by trauma (n=22, 17.7%) and other reasons (n=22, 17.7%) in order. The most common reason for admission in the patients who constituted the group of others was burns (n=12). This was followed by animal bites (n=6), drawning in water (n=3) and foreign body aspiration (n=3) in order. 79.8% of the patients (n=99) were discharged, 13.7% (n=17) were referred to other divisions and 6.5% (n=8) were lost (Table 1). The most common reasons of intoxication included amitriptyline (n=10), rat poison (n=5) and paracetamol (n=3). Suicide attempts constituted 28.7% (n=23) of intoxication cases. Fallings from a high level constituted half of trauma patients (n=11) and extra-vehicle traffic accidents constituted the other half (n=11). There was no in vehicle traffic accident among our cases. Five of the patients who were lost were hospitalized in PICU because of trauma, one was hospitalized because of intoxication and two were hospitalized because of other reasons (drawning in water and foreign body aspiration).

Table 1. Descriptive statistics of the patients hosptalized in Pediatric Intensive Care Unit because of preventable reasons

Variable		n (%)
Gender	Male	69 (55.6)
	Female	55 (44.4)
Causes	Intoxication	80 (64.6)
	Trauma	22 (17.7)
	Other reasons	22 (17.7)
Use of mechanical ventilation	Yes	12 (9.7)
	No	112 (90.3)
Prognosis	Discharge	99 (79.8)
	Referral to ward	17 (13.7)
	Exitus	8 (6.5)

Patients who were hospitalized in PICU because of preventable injuries were divided into three groups including intocixation, trauma and other reasons. There was statistically significant difference between the groups in terms of gender distribution (p=0.046). In the intoxication group, no significant difference was found in terms of gender distribution. In the patient groups hospitalized in PICU because of trauma and other reasons, the ratio of males was higher than the ratio of females (p values 0.001 and 0.010, respectively). There was statistically significant difference between the groups in terms of mechanical ventilation rates (p<0.0001). There was no statistical difference between rates of use and non-use of mechanical ventilation in patients hospitalized because of other reasons (p=0.536). However, a statistically significant difference was found between the rates of use and non-use of mechanical ventilation in patients hospitalized because of trauma and intoxication (p values <0.0001 and <0.0001, respectively). The prognosis was found to be statistically significantly different between the groups (p<0.0001). In the intoxication group, the rate of discharged patients was higher compared to the rate of referred or lost patients (p values <0.0001 and <0.0001, respectively). In the trauma group, there was no statistically significant difference between the patients who were discharged, the patients who were referred and the patients who were lost. When the patients who were hospitalized in PICU because of other reasons were examined, the rate of the patients who were discharged was higher compared to the rates of the patients who were referred and the patients who were lost (p values <0.0001 and 0.0001, respectively) (Table 2).

No statistically significant difference was found between the groups in terms of hospitalization time and age. Descriptive statistics and p values are given in Table 3.

Table 2. Comparison of patients hospitalized in Pediatric Intensive Care Unit because of preventable reasons

		Intoxication	Trauma	Other	p
Gender	Male	38 (47,5)	16 (72,7)	15 (68,2)	0,046*
	Female	42 (52,5)	6 (27,3)	7 (31,8)	
Use of mechanical ventilation	Yes	1 (1,3)	8 (36,4)	3 (13,6)	< 0,0001**
	No	79 (98,8)	14 (63,6)	19 (86,4)	
Exitus	Yes	1 (1,3)	5 (22,7)	2 (9,1)	0,003**
	No	79 (98,8)	17 (77,3)	20 (90,9)	
Prognosis	Discharge	76 (95,0)	7 (31,8)	16 (72,7)	< 0,0001**
	Referral to ward	3 (3,8)	10 (45,5)	4 (18,2)	
	Exitus	1 (1,3)	5 (22,7)	2 (9,1)	

*Pearson chi-square and **Likelihood Ratio chi-square testleri

Table 3. Comparison of the groups in terms of hospitalization times in Pediatric Intensive Care Unit

	Intoxication		Trauma		Other		
	The least-the highest	Median (25-75 quartiles)	The least-the highest	Median (25-75 quartiles)	The least-the highest	Median (25-75 quartiles)	p*
Time of hospitalization	2-17	3 (2-3)	1-15	3 (3-6)	2-21	3 (2-8)	0.050
Age	6-192	48 (30-156)	1.5-192	75 (33-108)	7-156	33 (11.75-84.00)	0.058

*: Kruskall-Wallis test

Discussion

Because of lack of perception of possible risks and presence of curiosity, the morbidity and mortality rate related to preventable injuries in children is higher compared to adults. It has been reported that deaths related to preventable reasons (trauma, intoxication, etc.) have increased in developed and developing countries in studies performed (7,8). In USA, injuries are responsible of 50% of the deaths between the ages of 1 and 24 and of 71% of the deaths between the ages of 15 and 19 (9). In a study performed in USA and Canada, it was found that the most common cause of death in children older than one year of age was preventable injuries and the mortality rate related to these injuries was 5.5% (5,6). In our country, there is no study which reports the mortality rate related to preventable injuries. This study is the first investigation performed about preventable injuries in our country.

In the study performed by Joffe et al. (5) in Canada, the reason for hospitalization was preventable injuries in 13.2% of the patients followed up in PICU. 52.4% of the patients were male and 47.6% were female. The mean age was 99 months, the mean hospitalization time was 2.9 days, the rate of the patients who were administered mechanical ventilation was 73% and the mortality rate was found to be 12.5%. In the same study, 81% of preventable injuries were involuntary and motor vehicle injuries were in the first order. In our study, the rate of patients hospitalized in PICU because of preventable injuries, the gender distribution of the patients, mean ages and and mean hospitalization times were similar to the results of Joffe et. al.(5). On the other hand, the rate of administration of mechanical ventilation and the mortality rate was lower compared to the results of Joffe et al. (5). It was thought that this difference arised from the fact that the most common reason of preventable injuries was traffic accidents in Canada, while it was intoxications in our study. On the other hand, the fact that intoxication was in the first order among preventable injuries was evaluated to be an indicator of inadequacy of rules about access to drugs and drug prescription in our country.

In the study performed by Yüksel et al. (10) which examined autopsy findings in pediatric deaths, 54.5% of the cases were found to be male and 45.5% were found to be female. In our study, the gender distribution was similar to the study performed by Yüksel et al. (10). While intoxication cases were more common in girls, traffic accidents and falls were reported to be more common in boys. In our study, the rate of intoxication was found to be high in girls though not statistically significantly. The rate of boys was statistically higher compared to the rate of girls in the patient groups hospitalized in PICU because of trauma and other reasons. Hon et al. (11) reported that intoxication cases constituted 7% of the patients who were hospitalized in PICU because of preventable injuries in the study in which they examined the children who were hospitalized in PICU because of injuries and intoxications. Çınar et al. (12) found that the second common reason for admission was intoxication and suicide attempt (22%) in the study in which they evaluated the forensic cases presented to the emergency department in the 0-18 year-old age group. In our study, intoxication was in the first order with a rate of 64.6% (n=80) among preventable injuries in

patients hospitalized in PICU because of preventable injuries. Suicide attempts constituted 28.7% (n=23) of the cases of intoxication. Similar to the study of Çınar et al.(12), all patients with suicide attempts were aged 12 years and older. In the study performed by Lai et al. (13), it was shown that the most common agents of intoxication included personel care products, cleaning substances and analgesics. The fact that drugs were found to be in the first order in our study may be related to inadequacy of rules about access to drugs and drug prescription in our country.

Children are faced with home accidents with a higher rate before school age. In USA, the mortality rate is reported to be 7/100000 and 12 million children are reported to be injured each year (14). In Turkey, home accidents are reported to constitute 18-25% of all accidents (15). In our study, no differentiation was made as home accidents. However, considering that many intoxication cases occur at home it will be observed that home accidents constituted a large part of the cases also in our study. Home accidents can be prevented by simple arrangements in the house and regular education given to mothers and caregivers who spend most of their time with children (16). Trauma was the most common reason of death in the study performed by Yüksek et al.(10) which included autopsy findings in cases of preschool age death. In the same study, the most common reasons of trauma were found to be traffic accidents and falls. In the study performed by Joffe et al. (5) in Canada, it was found that traumas constituted 81% of the patients who were hospitalized in PICU because of preventable accidents. In our study, trauma was the second most common reason of hospitalization and was observed more frequently in boys. In addition, trauma was the most common reason of death in our study (62.5%). In the study performed by Çınar et al. (12) in which forensic cases between the ages of 0 and 18 years who presented to the emergency department were examined, the rate of extra vehicle traffic accidents was higher than in vehicle accidents. Aşırdizer et al (17) found that in-vehicle injuries were observed with a higher rate in children compared to the general population in their study (29%/71%). This shows that children are exposed to extra vehicle traffic accidents with a higher rate compared to adults. In our study, falls from a high place constituted half of the patients (50%) hospitalized in PICU because of trauma. Extra vehicle traffic accidents constituted the rest. There was no in-vehicle accident among our cases. Similar to our study, Hon et al. (11) evaluated 86 patients hospitalized in PICU because of preventable accidents retrospectively in their study. It was reported that 13 of these cases were hospitalized in PICU because of burns, 7 because of foreign body aspiration, 4 because of drowning in water and 2 because of animal bites.

Increasing precautions directed to prevent accidents and increasing the consciousness level of parents by education will contribute to a decrese in morbidity and mortality in childhood. The fact that intoxications fell into lower orders in countries where prescription of drugs and access to drugs are bound to strict rules indicates that this kind of precautions are effective (13). Bringing pediatric losses because of preventable reasons into question will contribute to acceptance and implementation of precautions by the population.

Consequently, preventable accidents constitute a significant part of the patients hospitalized in PICU. This study is significant in that it is the first study about patients hospitalized in PICU because of preventable accidents. Considering that PICU's and the number of beds are inadequate in our country, prevention of accidents and hospitalization of less patients in PICU because of preventable reasons will be a hope for children who need intensive care, but can not be hospitalized in intensive care units because of limitations of place and source. Briefly, prevention of accidents will protect children from morbidity and mortality arising from accidents and additionally contribute to survival of children who need intrensive care.

Conflict of interest: None declared.

References

1. Colombani PM, Buck JR, Dudgeon DL, Miller D, Haller JA Jr. One-year experience in a regional pediatric trauma center. J Pediatr Surg 1985; 20: 8-13.
2. Peclet MH, Newman KD, Eichelberger MR, et al. Patterns of injury in children. J Pediatr Surg 1990; 25: 85-91.
3. Child Injury Division, Bureau of Reproductive and Child Health, Laboratory Centre for Disease Control. Canadian Injury Data: Mortality 1997 and Hospitalizations 1996-97. Ottawa, Canada: Health Protection Branch, Health Canada 1999. Available online at: http://www.hc-sc.gc.ca/pphbdgspsp/ injury-bles/index.html.
4. Smartrisk. The economic burden of unintentional injury in Canada. Ottawa, Canada: Ontario Ministry of Health and Health Canada 1998. Available online at: http://www.hc-sc.gc.ca/pphb-dgspsp/injury-bles/index.html.
5. Joffe AR, Lalani A. Injury admissions to pediatric intensive care are predictable and preventable: a call to action. J Intensive Care Med 2006; 21(4): 227-34.
6. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Available online at: http://www.aap.org/policy/search.cfm.
7. Wheatley J, Cass DT. Traumatic deaths in children: the importance of prevention. Med J Aust 1989; 150(2): 72-8.
8. Yurdakök K, Alanay Y. Dünyada ve Türkiye'de çocukların durumu. Katkı Pediatri Dergisi 2003; 25: 13-26.
9. Cohle SD. Unintentional trauma. In: Byard RW, Cohle SD, (eds). Sudden death in infancy, childhood and adolescence. 2nd. Cambridge UK: Cambridge University Press, 2004: 11-76.
10. Yüksel F, Türkan D, Ünal BM, Dinç AH. Okul öncesi çocukluk dönemi ölümlerinde otopsi bulguları. Trakya Univ Tıp Fak Derg 2010; 27: 65-7.
11. Hon KL, Leung TF, Cheung KL, et al. Severe childhood injuries and poisoning in a densely populated city: where do they occur and what type? J Crit Care 2010; 25(1): 7-12.
12. Çınar O, Acar YA, Çevik E, ve ark. Acil servise başvuran 0-18 yaş grubu adli olguların özellikleri. Anatol J Clin Investig 2010: 4: 148-51.
13. Lai MW, Klein-Schwartz W, Rodgers GC, et al. 2005 Annual report of the American Association of Poison Control Centers' national poisoning and exposure database. Clin Toxicol 2006; 44(6-7): 803-92.
14. Runyan CW, Casteel C, Perkis D, et al. Unintentional injuries in the home in the United Stataes part I: mortality. Am J Prev Med 2005; 28(1): 73-9.
15. Altundağ S, Öztürk MC. Ev kazaları nedeniyle hastaneye gelen 3-6 yaş grubu çocuklardaki kaza türleri ve bunu etkileyen etmenler. Çocuk Forumu 2004; 5: 60-4.
16. Altundağ S, Öztürk MC. The effects of home safety education on taking precautions and reducting the frequency of home accidents. Ulus Travma Acil Cerrahi Derg 2007; 13(3): 180-5.
17. Aşırdizer M, Zeyfeoğlu Y, Ziver A,Yavuz SM, Uluçay T. Celal Bayar Üniversitesi Tıp Fakültesi Adli Tıp Polikliniği' ne başvuran olguların değerlendirilmesi. Adli Tıp Dergisi 2006; 20(2): 22-9.