

ARTICLE ORIGINAL / ORIGINAL ARTICLE

PROFILE OF INJURED PATIENTS PRESENTING TO A TERTIARY HOSPITAL IN A DEVELOPING COUNTRY

<http://www.lebanesemedicaljournal.org/articles/59-4/original2.pdf>

Umayya MUSHARRAFIEH¹, Amal C. RAHI², Assaad TAHA³, Wael SHAMSEDDINE²
Suzanne STEITIEH², Faek JAMALI³, Hala TAMIM⁴

Musharrafieh U, Rahi AC, Taha A, Shamseddine W, Steitieh S, Jamali F, Tamim H. Profile of injured patients presenting to a tertiary hospital in a developing country. *J Med Liban* 2011 ; 59 (4) : 191-196.

ABSTRACT • BACKGROUND : In most developing countries including Lebanon, trauma research is lacking and warranted. Objectives of the current study were to describe trauma patients referred to a tertiary care center during one year and identify outcomes and patterns of injury.

METHODS : Review of hospital charts of every 12th consecutive patient presenting to the emergency unit (ED) after a traumatic event during the year 2001-2002. Data collected include : demographics, injury description, and hospital data.

RESULTS : A total of 736 patients were included, 212 pediatric, 455 young, and 62 geriatric patients. The most common body regions injured were the extremities followed by the face. The most encountered mechanism of injury was fall from less than 15 feet (38.2%) followed by penetrating/gunshot injury (14.8%), and road traffic accidents (11.8%). The rates of hospital admission and surgical intervention were highest among geriatric patients ($p = 0.03$ and $p < 0.001$). Most injuries occurred during the evening shift and the average time spent in the ED was 86 minutes. The police was informed in 6.6% of the cases.

CONCLUSIONS : Falls represent a worrisome mechanism across all age groups. This may be an indication for unaddressed occupational hazards for the working young and lack of awareness about the need for more children supervision. More rigorous investigation of intentional and unintentional firearm injuries, and their predisposing factors are needed.

¹Family Medicine Dept., American University of Beirut Medical Center (AUBMC), ²Epidemiology & Biostatistics Dept., Faculty of Health Sciences, American University of Beirut, ³Surgery Dept., AUBMC, Beirut, Lebanon; ⁴School of Kinesiology and Health Science, Bethune College, Toronto, Canada.

Corresponding authors:

• Umayya Musharrafieh, MD. Dept of Family Medicine. American University of Beirut Medical Center. New York Office: 3 Dag Hammarskjold Plaza, 8th Fl. New York, NY 10017-2303. USA.

e-mail: um00@aub.edu.lb

• Tamim Hala, PhD. School of Kinesiology and Health Science. Bethune College, 4700 Keele St. Toronto ON M3J 1P3. Canada.

e-mail: htamim@yorku.ca

Musharrafieh U, Rahi AC, Taha A, Shamseddine W, Steitieh S, Jamali F, Tamim H. Profil des blessés se présentant aux urgences d'un centre hospitalier universitaire dans un pays en voie de développement. *J Med Liban* 2011 ; 59 (4) : 191-196.

RÉSUMÉ • CONTEXTE : La recherche sur les traumatismes dans la plupart des pays en voie de développement, y compris le Liban, est rare et nécessaire. Les objectifs de cette étude étaient de décrire les caractéristiques des patients traumatisés adressés à un centre de soins tertiaire pendant un an et d'identifier les résultats et les traumatismes encourus.

MÉTHODES : Revue des dossiers hospitaliers de chaque 12^e patient s'étant présenté aux urgences suite à un événement traumatique au cours de l'année 2001-2002. Les données collectées incluent la démographie, la description des traumatismes et les données intra-hospitalières.

RÉSULTATS : Un total de 736 patients dont 212 enfants, 455 jeunes, et 62 personnes âgées ont été inclus. Les régions du corps les plus atteintes étaient les extrémités suivies par le visage. Le mécanisme de traumatisme le plus fréquent était 'chute d'une hauteur moins de 5 mètres' (38,2%), suivi par les traumatismes pénétrants (14,8%) et les accidents de la route (11,8%). Les admissions et les interventions chirurgicales étaient plus élevées chez les patients âgés ($p = 0,03$ et $p < 0,001$). La plupart des traumatismes survenaient la nuit et le temps moyen passé aux urgences était de 86 minutes. La police a été informée dans 6,6% des cas.

CONCLUSIONS : Les chutes représentent un mécanisme majeur dans tous les groupes d'âge. Ceci tendrait à indiquer qu'il est nécessaire de prendre conscience des accidents de travail auxquels sont exposés les jeunes et d'œuvrer à assurer une meilleure surveillance des enfants. Les blessures par armes à feu, intentionnelles ou non, ainsi que les facteurs prédisposant à de tels traumatismes, nécessitent d'être investigués avec plus de rigueur.

INTRODUCTION

Worldwide, trauma is estimated to account for 15% of the burden of death and disability [1]. In young individuals, it is the leading cause of death and disability and contributes more person years of life lost than do heart disease and cancer combined. Consequently, nearly two decades ago, trauma research led to the development of trauma care systems that ensure the immediate trans-

portation of severely injured patients to designated trauma centers where comprehensive care would be readily available [2]. Organized trauma care systems were established within the health care systems of many developed countries and were effective in reducing the number of preventable trauma deaths and injury incidence [1]. Two thirds of the total injury deaths are occurring nowadays in developing countries [3].

Formal trauma care systems are nonexistent in most developing countries including Lebanon, where even trauma research (either population or hospital based), is still lacking. Moreover, pre-hospital care in Lebanon is delivered mainly by volunteers who transport and transfer patients, rather than providing actual medical intervention [4]. Some data suggest that only 20% of critical cases are transferred by ambulances, and the vast majority of patients reach emergency rooms by private transportation, often inadequately transported [5]. Resource hospital base stations are not in use and ambulances rarely notify the ED of the impending arrival of critical cases, and EDs do not notify ambulance agencies in case of bypass.

Trauma research is strongly warranted in a Middle Eastern country such as Lebanon for injury prevention, implementation of legislative measures, and organization of trauma care. Despite the wealth of trauma cases that overwhelmed the Lebanese hospitals during the war period and that extended from 1982 till 1990, no studies looked at the epidemiology, pattern, and mechanisms of trauma in the country pre- and postwar period. The American University of Beirut Medical Center has served as a tertiary referral center for trauma patients in Lebanon since 1905, surviving the civil war that considerably affected Beirut city for several years. It is a 420-bed university-affiliated hospital in Beirut (local population of 3.8 mil-

lion) and is a referral center for trauma patients from all over the country. Injured patients are either transported to AUBMC emergency department (ED) directly after the trauma event or are transferred from other hospitals throughout the country.

The objectives of this study were to:

1. Describe and characterize trauma patients referred to AUBMC during the year 2001-2002,
2. Identify outcomes and patterns of injury resulting in hospitalization.

METHODS

Data were collected according to a preset questionnaire from hospital charts of every 12th consecutive patient presenting to the ED after a traumatic event from January 2001 till January 2002, including those who were dead on presentation or died in the ED (number 12 was chosen randomly in order to obtain an adequate sample size for the whole year).

Data collected included: • I. *Demographic characteristics*: age, gender, marital status, nationality, religion, place of residence, education, occupation, insurance coverage, diet, substance use, and activity. • II. *Injury description and ED data*: mechanism and cause of injury, the main or two main body regions injured, physical examination and vital signs upon arrival to the ED, interventions done in the ED. • III. *Hospital data* (for hospital admissions only): preexisting conditions present, type of ward, Intensive Care Unit (ICU) admissions, length of hospital stay, number and type of interventions done in the hospital including blood transfusions and surgical interventions, complications occurring during the hospital stay, and discharge information and destination.

Data was analyzed using the SPSS software for Win-

TABLE I
DEMOGRAPHIC CHARACTERISTICS OF TRAUMA PATIENTS PRESENTING TO THE ED IN AUBMC (N = 736)*

DEMOGRAPHICS		Total N (%) ¹	AGE CATEGORY			p-value
			Pediatric ² N (%)	Young ³ N (%)	Geriatric ⁴ N (%)	
Gender	Male	440 (60.4)	130 (61.3)	287 (63.1)	23 (37.1)	< 0.01
	Female	289 (39.6)	82 (38.7)	168 (36.9)	39 (62.9)	
Nationality	Lebanese	668 (92.3)	198 (94.3)	411 (90.7)	59 (96.7)	0.11
	Non-Lebanese	56 (7.7)	12 (5.7)	42 (9.3)	2 (3.3)	
Residence	Beirut	615 (86.3)	175 (84.1)	384 (86.3)	56 (93.3)	0.50
	Mount Lebanon	75 (10.5)	25 (12.0)	47 (10.6)	3 (5.0)	
	Other	23 (3.2)	8 (3.8)	14 (3.1)	1 (1.7)	
Police Informed	Yes	48 (6.6)	2 (0.9)	41 (9.0)	5 (8.1)	< 0.01
	No	681 (93.4)	210 (99.1)	414 (91.0)	57 (91.9)	
Insured	Private insurance	449 (68.4)	137 (69.5)	284 (70.8)	28 (48.3)	< 0.01
	NSSF/MOH ⁵	7 (1.1)	1 (0.5)	4 (1.0)	2 (3.4)	
	Self payer	200 (30.5)	59 (29.9)	113 (28.2)	28 (48.3)	

* Values in the different categories may not add up to the total count of 736 because of missing information in the charts.

1. Column percentage 2. Pediatric : < 16 3. Young : 16-64 4. Geriatric : ≥ 65 5. NSSF: National Social Security Fund MOH: Ministry of Health

dows version 11. Patients were categorized into pediatric (< 16 years old), young (between 16 and 65 years old), and geriatric (≥ 65 years old). The χ^2 test was performed at the bivariate level to determine the variables that were associated with the different age categories. *P*-value was used to determine significance.

RESULTS

Demographic characteristics of the trauma patients

The study sample consisted of a total of 736 patients, 60% of them were males. There were a total of 212 pediatric, 455 young, and 62 geriatric patients. The majority of these patients were Lebanese (92.3%), muslims (68.4%), and living in Beirut (86.3%). Values in the dif-

ferent categories may not add up to the total count of 736 because of missing information in the charts.

In the bivariate analysis, the demographic characteristics that were significantly associated with age were gender, extent of police informed, and insurance status.

The majority of the pediatric and young trauma patients (70%) had private insurance whereas geriatric patients were divided equally between private insurance and self pay (48.3%) (Table I).

Body region injured

The most common body region injured was upper extremity (38%) followed by lower extremity (32%) and face (13.4%). Body region injured in each age group is shown in Table II.

TABLE II
INJURY CHARACTERISTICS OF TRAUMA PATIENTS PRESENTING TO THE ED IN AUBMC (N = 736)*

	Total N (%) ¹	AGE CATEGORY			<i>p</i> -value
		Pediatric ² N (%)	Young ³ N (%)	Geriatric ⁴ N (%)	
TIME OF INJURY					
Season					
Winter	170 (23.3)	48 (22.6)	112 (24.6)	10 (16.1)	0.74
Spring	193 (26.5)	57 (26.9)	121 (26.6)	15 (24.2)	
Summer	185 (25.4)	55 (25.9)	110 (24.2)	20 (32.3)	
Fall	181 (24.8)	52 (24.5)	112 (24.6)	17 (27.4)	
Time of presentation					
7:00 - 14:59	244 (33.7)	54 (25.5)	162 (36.1)	28 (45.2)	< 0.01
15:00 - 22:59	384 (53.1)	138 (65.1)	217 (48.3)	29 (46.8)	
23:00 - 6:59	95 (13.1)	20 (9.4)	70 (15.6)	5 (8.1)	
Time spent in ED⁵					
Mean \pm SD ⁶	85.62 \pm 156.30	61.79 \pm 58.07	95.83 \pm 189.38	94.48 \pm 113.90	0.05
Range	73.06 - 98.19	53.18 - 70.41	76.42 - 115.25	62.77 - 126.19	
INJURY CHARACTERISTICS					
Mechanism of injury					
Road Accident	67 (11.8)	8 (5.2)	55 (15.4)	4 (7.1)	< 0.01
Fall < 15 ft	217 (38.2)	80 (51.9)	93 (26.0)	44 (8.6)	
Fall \geq 15 ft	4 (0.7)	0 (0.0)	4 (1.1)	0 (0.0)	
Blunt trauma	54 (9.5)	16 (10.4)	36 (10.1)	2 (3.6)	
Penetrating/Gunshot	84 (14.8)	19 (12.3)	62 (17.3)	3 (5.4)	
Burn/Electricity	18 (3.2)	2 (1.3)	16 (4.5)	0 (0.0)	
Suicidal	7 (1.2)	0 (0.0)	7 (2.0)	0 (0.0)	
Undefined	117 (20.6)	29 (18.8)	85 (23.7)	3 (5.4)	
Body region injured⁷					
Head	64 (8.8)	30 (14.2)	23 (5.1)	11 (17.7)	< 0.01
Face	97 (13.4)	54 (25.5)	39 (8.7)	4 (6.5)	0.00
Neck	15 (2.1)	2 (0.9)	13 (2.9)	0 (0.0)	0.13
Thorax	25 (3.5)	4 (1.9)	14 (3.1)	7 (11.3)	< 0.0
Abdomen & Pelvis	14 (1.9)	4 (1.9)	9 (2.0)	1 (1.6)	0.98
Vertebral column	26 (3.6)	2 (0.9)	22 (4.9)	2 (3.2)	0.04
Upper extremity	275 (38.0)	71 (33.5)	186 (41.3)	18 (29.0)	0.05
Lower extremity	231 (31.9)	48 (22.6)	158 (35.1)	25 (40.3)	< 0.01

* Values in the different categories may not add up to the total count of 736 because of missing information in the charts.

1. Column percentage 2. Pediatric : < 16 3. Young : 16-64 4. Geriatric : ≥ 65 5. Time spent in ED in minutes
6. SD: standard deviation 7. The main or the two main body regions injured were considered.

TABLE III
INTERVENTIONS AND OUTCOMES OF TRAUMA PATIENTS PRESENTING TO THE ED IN AUBMC (N = 736)*

	Total N (%) ¹	AGE CATEGORY			<i>p</i> -value
		Pediatric ² N (%)	Young ³ N (%)	Geriatric ⁴ N (%)	
ED INTERVENTIONS					
Blood test	41 (5.7)	9 (4.2)	24 (5.3)	8 (12.9)	0.03
Urine analysis	11 (1.5)	1 (0.5)	8 (1.8)	2 (3.2)	0.23
Intravenous infusion	32 (4.4)	5 (2.4)	20 (4.4)	7 (11.3)	0.01
X-rays	370 (51.1)	95 (44.8)	236 (52.4)	39 (62.9)	0.03
MRI	1 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)	0.74
CT scan	34 (4.7)	9 (4.2)	17 (3.8)	8 (12.9)	0.01
Application of cast	83 (11.5)	21 (10.0)	57 (12.7)	5 (8.1)	0.40
Suturing	132 (18.2)	53 (25.1)	75 (16.6)	4 (6.5)	0.00
Folly catheter	4 (0.6)	0 (0.0)	4 (0.9)	0 (0.0)	0.30
Intubations	3 (0.4)	0 (0.0)	3 (0.7)	0 (0.0)	0.40
ECG	20 (2.8)	1 (0.5)	9 (2.0)	10 (16.1)	0.00
HOSPITAL INTERVENTIONS					
Admission to hospital	33 (4.5)	5 (2.4)	19 (4.2)	9 (14.5)	0.03
Surgical intervention	23 (3.2)	2 (0.9)	14 (3.1)	7 (11.3)	0.00
Admission to ICU ⁵	2 (0.3)	0 (0.0)	2 (0.4)	0 (0.0)	0.55
OUTCOME					
Death	6 (0.8)	0 (0.0)	5 (1.1)	1 (1.6)	0.26
On arrival	4 (0.5)	0 (0.0)	4 (0.9)	0 (0.0)	
In ED	1 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)	
In hospital	1 (0.1)	0 (0.0)	0 (0.0)	1 (1.6)	

* Values in the different categories may not add up to the total count of 736 because of missing information in the charts.
1. Column percentage 2. Pediatric : < 16 3. Young : 16-64 4. Geriatric : ≥ 65 5. ICU : Intensive care unit

Mechanism of injury

The most encountered mechanism of injury in the study sample was fall from less than 15 feet (38.2%) followed by penetrating/gunshot injury (14.8%) and road traffic accidents (11.8%). Mechanism of injury was significantly associated with age group ($p < 0.001$), however, fall from less than 15 feet was still the most common mechanism in all age categories (Table II).

Time of occurrence, time of presentation and time spent in ED

More than half of the injuries occurred between 15:00 and 22:59 (evening shift). The average time spent in the ED by our trauma patients was 85.62 minutes, the pediatric patients spending the least time with an average of 62 minutes (Table II).

Intervention and outcomes of patients in ED

Table III displays the various interventions done for the trauma patients in the ED and in the hospital. The most common interventions in the ED were X-rays (51.1%), suturing (18.2%), and application of cast (11.5%). The performance of blood tests, intravenous infusions, X-Rays, CT scans, and ECGs was significantly higher for geriatric patients compared to the young and pediatric age groups ($p < 0.05$). However, suturing was significantly higher among pediatric patients ($p < 0.001$). About 5% of the patients were admitted to the hospital and 3.2% underwent

surgical intervention. The rates of hospital admission and surgical intervention were highest among geriatric patients ($p = 0.03$ and $p < 0.001$) (Table III).

DISCUSSION

Epidemiological studies on trauma in Lebanon are only limited to description of war experiences (trauma management during war and types of injuries encountered during the war period) [6-8]. Since then, there were no studies addressing the issue of injuries encountered in Lebanon (types, pattern, causes, risk factors, etc.). This paper presents new information from a tertiary care center in a developing country, describing patterns and extent of injury of trauma patients in Beirut city.

Elderly trauma

Falls were more common in females, unlike the case in the younger age groups. As expected, conditions like osteoporosis in women [9] and lack of sufficient physical activity [10], were likely contributing factors. This is consistent with other reports from Lebanon that estimated the annual incidence rate of hip fractures to be 0.129% (women: 0.153%, men: 0.100%), increasing with age and remaining higher in women [11].

Among elderly patients, the most common body part affected was the lower extremity (40.3%). A study of low falls among 1906 elderlies found that hip fractures were

the most commonly encountered injuries [12].

In this study, elderlies had the highest admission and surgical intervention among all groups. This is important as age ≥ 65 years was associated with increased hospital mortality and increased hospital length of stay compared with patients age < 65 years, after controlling for other variables that affect outcome in trauma [13].

Pediatric category

More male children were involved in trauma injuries as compared to females (1.5:1). A review of childhood injuries in a university teaching hospital in Nigeria [14], revealed the same ratio of males to females (1.5:1). This can be explained by greater involvement of boys in more daring activities than girls.

Pediatric low-level falls (< 15 feet height) contributed 51.9% of pediatric injuries. This is higher than the results of Bulut et al. (2006) who found that falls accounted for 36.3% of their pediatric trauma cases [15]. Studies have shown that the burden of pediatric falls in the developing world is under-reported and the public health implications are huge. Although rarely mortal, falls cause significant morbidity and are costly [16]. Penetrating and gunshot injuries are only superseded by falls in the pediatric category, accounting for 12.3% of all childhood injuries. This is much higher than those noted in other developing countries which is 0.4% [17-18], although lower than a previous report in Lebanon where firearm injuries in children was 21.3%, the first cause of death among other pediatric injuries [19]. This type of child abuse and physical violence are seen more commonly in developed countries and rarely in third world communities [17-18]. In our case, more information on the circumstances and characteristics of the injury and the firearm used is required. In a country like Lebanon that had witnessed and is still witnessing periods of war and instability, the resort to owning a firearm by households remains always an option. Of importance is the fact that people who live in homes with guns are more likely to die from homicide and suicide in the home than those who live in homes without guns [20]. In this study there were no suicide attempts. Further studies should investigate if suicide attempts were more likely to be with methods other than trauma.

Mortality was very high in those who sustained head injuries from falls. This is consistent with the fact that the height of falls is not a predictor of injury severity or outcome [21-22]. Head injuries are sustained in children because they have a higher head/body ratio than adults and their center of gravity is more cephalic, facilitating their landing on their heads than extremities. However, the issue of child abuse should not be undermined in this context [23].

Road traffic crashes stand out as the fourth leading cause accounting for 5.2% of childhood injuries in this study and has declined from 8.9% as reported by Gerbaka et al. in 1996 [19]. This may be due to the recent great efforts of public awareness campaigns and the new law for drivers' license issued in the country.

Young category

In the young, falls were the most common mechanism of injury (19%) followed by penetrating/gunshot injuries (13.8%) and road accidents (12%). Falls were predominantly from low heights as in the elderly. In one study, looking at low level falls among hospitalized patients, 62% of patients were younger than 50 years, and had significant injuries, most commonly to the head and spine. Unsafe conditions in the work place in Lebanon have been found to be the overriding factor for work-related injuries regardless of being a Lebanese or foreigner [24].

Such low falls in the young remain underappreciated because young patients injured in low falls might not be taken to trauma centers because of their stability, while they might be sustaining multi-system injuries [25].

Gunshots ranked second after falls in this age group. According to the Lebanese law, carrying and using firearms without a specific license is prohibited but this law is being poorly implemented and the political situation in the country is relatively unstable. Our results are in agreement with studies from Iran and other Middle Eastern countries in having the highest percentage of gun victims among the young age group [26].

Despite being highest among the young, 15.4%, the overall incidence of road accidents (11.8%) may represent an underestimation, as many of the motor vehicle accidents result in immediate death, reaching 377 victims per year, many of which do not reach hospital care [27].

Severe injuries and death

In agreement with other reports, our study showed that geriatric patients have more complications and greater resource requirement per admission when compared to younger age groups with similar mechanism of injury [28]. Severe injuries defined as death or admission characterized 14% of the elderly trauma cases in this study as compared to 5.3% in the young.

Limitations of the current study include: 1) The study was conducted in a single tertiary center in the capital city, and this cannot be generalized to all regions in the country, the percentage of patients referred from other hospitals versus those who came directly from the trauma could have been helpful to assess the representativeness of this center of Lebanon; 2) The Injury Severity Score was not computed for the sample of the severely injured patients, and 3) The high number of undefined mechanism of injury which is attributed to incomplete medical charts.

However, this study provides basic injury and injury care data that was previously lacking in our country after the war period like in most developing countries and this will initiate trauma research and development in Lebanon. By the time this article was written, a new ED was established. An updated ED charting system as well as the setting up of appropriate communication between the ED and pre-hospital agencies is now taking place. Immense work is still needed in this area because complete, reliable and consistent data provides an important tool for clinicians and administrators to implement changes and im-

prove trauma care in developing countries like ours.

Moreover, simple trauma as cut wounds, sprains and even hip fractures can be well treated in most of Emergency Departments in Beirut or in Lebanon. Thus, in Lebanon, studies on severely injured patients (mechanism, location, number, nature and outcome) are needed. These can lead to the development of trauma care systems that ensure for these patients immediate transportation to designated trauma centers.

CONCLUSION

Over the past few years, there has been growing attention to the problem of injuries in the setting of developing countries. This study is one from very few studies in the Arab world that described trauma cases at a tertiary care center conducted in a defined geographical area. Prevention remains the key to reducing trauma injuries which are affecting all age groups, more frequent in the young but more severe in the elderly. Falls represent a worrisome mechanism across all age groups and may be a marker for other important underlying health perils like unaddressed occupational hazards for the working young and lack of awareness about the need for more children supervision. In order to decrease trauma from gunshots we suggest surveillance of such injuries and more rigorous investigation of intentional and unintentional firearm injuries, and their predisposing factors.

REFERENCES

1. Demetriades D, Murray J, Sinz B et al. Epidemiology of major trauma and trauma deaths in Los Angeles County. *J Am Coll Surg* 1998 ; 187 (4) : 373-83.
2. Cales RH, Trunkey DD. Preventable trauma deaths. A review of trauma care systems development. *JAMA* 1985 ; 254 (8) :1059-63.
3. Forjuoh S, Gyebi-Ofosu E. Injury surveillance : Should it be a concern to developing countries ? *J Public Health Policy* 1993 ; 14 (13) : 355-9.
4. Bayram JD. Emergency medicine in Lebanon : an overview and prospects. *J Emergency Medicine* 2007 ; 32 : 217-22.
5. Pane GA. Emergency Medical Services Systems : Assessment and recommendations. The World Bank, Health Sector Rehabilitation Project ; 1999 : 1-7.
6. Jebara V, Saade B. Penetrating wounds to the heart : a wartime experience. *Am Thorac Surg* 1989 ; 47 (2) : 250-3.
7. Nassoura Z, Hajj Z, Dajani O et al. Trauma management in a war zone : the Lebanese war experience. *J Trauma* 1991 ; 31 (12) : 1596-9.
8. Ramadan H, Samara M, Hamdan U, Shahinian H. Penetrating neck injuries during the Lebanese war : AUB-MC experience. *Laryngoscope* 1987 ; 97 (8 Pt 1) : 975-7.
9. Krall EA, Dawson-Hughes B. Heritable and life style determinants of bone mineral density. *J Bone Miner Res* 1993 ; 8 : 1-9.
10. Province MA, Hadley EC, Horbooh MC et al. The effects of exercise on falls in elderly patients. *JAMA* 1995 ; 273 : 134-7.
11. Baddoura R. Incidence of hip fracture in the Lebanese population. *East Mediterr Health J* 2001 ; 7: 725-9.
12. Hanna EL, Mendeloff J, Farrell LS et al. Multivariate models for predicting survival of patients with trauma from low falls : the impact of gender and pre-existing conditions. *J Trauma* 1995 ; 38 : 697-704.
13. Taylor MD, Kathleen TJ, Meyer W et al. Trauma in the elderly : Intensive Care Unit resource use and outcome. *Trauma* 2002 ; 53 : 407-14.
14. Shokunbi T, Olurin O. Childhood head injuries in Ibadan. *West Afr J Med* 1994 ; 13 : 38-42.
15. Bulut M, Koksal O, Korkmaz A et al. Childhood falls : characteristics, outcome, and comparison of Injury Severity Score and New Injury Severity Score. *Emerg Med J* 2006 ; 23 : 240-5.
16. Hyder AA, Sugerman D, Ameratunga S, Callaghan JA. Falls among children in the developing world : a gap in child health burden estimations ? *Acta Paediatr* 2007 ; 96 (10) : 1394-8.
17. Gedlu E. Accidental injuries among children in northwest Ethiopia. *East Afr Med J* 1994 ; 71 : 807-10.
18. Junanod C, Ruangkanhanasetr S, Chunharas A. The childhood trauma, country report (Thailand). *J Med Assoc Thai* 1993 ; 76 (suppl 2) : 209-13.
19. Gerbaka B, Rassi P, Chaib-Ghosn A et al. Accidents chez l'enfant. Etude épidémiologique rétrospective de 1671 observation recueillies à l'Hôtel-Dieu Beyrouth. *J Med Liban* 1996 ; 44 : 209-14.
20. Kellerman AI, Rivara FP, Rushforth NB et al. Gun ownership as a risk factor for homicide in the home. *N Eng J Med* 1993 ; 329 : 1084-91.
21. Murray J, Chen D, Velmahos G et al. Pediatric falls : is height a predictor of injury and outcome ? *Am Surg* 2000 ; 66 (9) : 863-5.
22. Plunkett J. Fatal pediatric heads injuries caused by short distance falls. *American Journal of Forensic Medicine and Pathology* 2001 ; 22 (1) : 1-12.
23. Chadwick D, Chin S, Salemo C et al. Deaths from falls in children : how far is fatal ? *Journal of Trauma* 1991 ; 31 (10) : 1353-5.
24. Nuwayhid I, Fayad R, Tamim H et al. Work-related injuries in Lebanon. Does nationality make a difference ? *Am J Industrial Med* 2003 ; 44 : 171-81.
25. Helling TS, Watkins ME, Wvans LL et al. Low fall : an under-appreciated mechanism of injury. *J Trauma* 1999 ; 46 : 453-6.
26. Amiri A, Sanaei-Zadeh H, Towfighi-Zavarei F et al. Firearm fatalities : A preliminary study report from Iran. *J Clinical Forensic Medicine* 2003 ; 10 : 159-63.
27. De Clercq C. Human Development in Lebanon : Status and opportunities. Beirut, Lebanon. United Nations Development Program, Lebanon Country Office ; 1998 : 1-5.
28. Nagy KK, Smith RF, Roberts RR et al. Prognosis of penetrating trauma in elderly patients : a comparison with younger patients. *J Trauma* 2000 ; 49 (2) : 190-3 ; discussion 193-4.