

## Public Health Care

### THE STRUCTURE OF TRAUMA PATIENTS, ITS MANAGEMENT AND HEALTH CARE IN THE UNIVERSITY HOSPITAL OF ALEXANDROUPOLIS

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### ЭПИДЕМИОЛОГИЧЕСКИЙ ПРОФИЛЬ ПАЦИЕНТОВ С ТРАВМАМИ - УНИВЕРСИТЕТСКАЯ БОЛЬНИЦА, Г. АЛЕКСАНДРОПОЛИС, ГРЕЦИЯ

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#### ABSTRACT

**OBJECTIVE:** The present study was designed to describe the patterns of trauma patients using a newly-introduced trauma registry, as well as retrospectively assess the management and outcome facts of these patients. **MATERIALS AND METHODS:** The study included 2346 patients (62.15% male) with a mean age of  $34.06 \pm 23.77$  years. Of these patients, 355 were multiple trauma patients. Privately owned vehicles were used as a mode of transportation for most of the trauma patients (96.65%). Data regarding patient demographics, arrival at the Emergency Department, mechanism of injury, injury severity, anatomical location and type of injury were collected and analyzed. **RESULTS:** Falls were the most prevalent mechanism of injury, accounting for 62.19% of the total admitted cases, with other causes (that also included occupational accidents and machinery trauma) being the second most prevalent, and MVAs – the third with a rate of 11.46%. The most commonly injured body regions were the extremities (50.26%), the head (42.50%), and the torso (19.39%). Fractures represented 11.46% of the injuries, while open wounds were much more frequent (29.41%). The mean abbreviated injury severity (AIS) score was  $1.78 \pm 1.48$  for all admitted patients and  $3.56 \pm 1.02$  for multiple trauma patients. A multi-disciplinary approach was required for 23% of the multiple trauma patients. The clinic admission rate for the whole patient sample was 13.55% and 48.96% for multiple trauma patients. The mean duration of stay for all clinic admissions was 2.7 days and 2.9 days for multiple trauma patients. **CONCLUSIONS:** With the epidemiology of trauma in Greece being rather poorly investigated, the present study manages to identify the major epidemiological patterns of trauma cases presenting to a tertiary regional hospital and addresses the need for development and implementation of injury prevention activities and policies.

**Key words:** trauma registry, multiple trauma patients, trauma epidemiology, mechanism of injury, injury-related admissions

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#### РЕЗЮМЕ

**Цель:** Исследование ставит себе целью описать эпидемиологический профиль пациентов с травмами, используя нововведенный регистр травматологических повреждений, а также сделать ретроспективную оценку лечения и исхода лечения у таких пациентов. **МАТЕРИАЛ И МЕТОДЫ:** В исследование включено 2346 пациентов (мужчины – 62.15%); средний возраст -  $34.06 \pm 23.77$  г.; пациенты с множественными травмами – 355. Транспортирование большинства пациентов с травмами осуществлялось личным транспортом (96.65%). Анализированы следующие параметры: демографическая характеристика пациентов, время поступления в отделение, причина травмы, тяжесть травмы, место и тип травмы. **РЕЗУЛЬТАТЫ:** Самая частая причина травматического повреждения - это падения – 62.19% всех поступивших в больницу; второе место по частоте отводится травмам, полученным по другим причинам (множественные травмы); за ними следуют травмы, полученные при инцидентах с моторными транспортными средствами (11.46%). Чаще всего наблюдаются травмы конечностей (50.26%), головы (42.5%), тела (19.39%). Фрактуры составляют 11.46% всех травм, а травмы с открытыми ранами – 29.41%. Средний индекс тяжести ран  $1.78 \pm 1.48$  для всех пациентов и  $3.56 \pm 1.02$  для пациентов с множественными травмами. В 23%

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всех случаев пациентов с множественными травмами применено мультидисциплинарное лечение. Частота поступления в больницу для всех пациентов – 13.55%, а для пациентов с множественными травмами – 48.96%. Средняя продолжительность пребывания в больнице для всех пациентов – 2.7 дня, а для пациентов с множественными травмами – 2.9 дня. **ЗАКЛЮЧЕНИЕ:** Принимая во внимание факт, что эпидемиологическая характеристика травм в Греции недостаточно изучена, настоящее исследование представляет опыт определить основные эпидемиологические модели травматологических случаев, обратывающихся в третестепенной окружной больнице с учетом будущей разработки и осуществления стратегии предотвращения травматических повреждений.

**Ключевые слова:** *регистр травмы, пациенты с множественными травмами, эпидемиология травм, причина травм, госпитализация пациентов с травмами*

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## INTRODUCTION

Trauma is widely recognized as one of the leading causes of morbidity and mortality worldwide<sup>1</sup>, with a major socio-economic impact. In the United States, trauma is considered a major public health problem in the last decade according to the Centers for Disease Control and Prevention (CDCP). Trauma is also the fourth leading cause of mortality for all ages and the number one cause by the age of 65.<sup>2</sup>

In Greece, it has recently been estimated that severe injuries account for 32000 of the annual hospital cases, of which 4500 are major trauma patients and 2500 deaths. Two thousand trauma patients are a result of motor vehicle accidents (MVAs).<sup>3,4</sup> Compared to epidemiological data from other European Countries, Greece has a higher rate of MVAs per registered vehicle, being double than that of France, Belgium and Ireland, and four times that of the United Kingdom and Italy.<sup>5</sup> Greece was ranked first in the Euro Union in fatal MVAs from 1991 to 2006, with 28424 deaths in this 14-year period.<sup>6</sup>

It has been well established that knowledge of the epidemiological characteristics of trauma is crucial for trauma care planning, prevention and systemic modernization, serving also as a useful baseline for determining health policy and legislation both locally and nationally.<sup>7</sup> However, despite the large impact of trauma accidents in Greece, there is a lack of trauma registry, and the data concerning the epidemiology and outcome of trauma patients are scarce. The aim of the present study, is to describe the patterns of trauma patients using a newly-introduced trauma registry, as well as retrospectively assess the management and outcome of these patients.

## MATERIALS AND METHODS

Our data were obtained by retrospectively studying

the trauma registry of the University Hospital of Alexandroupolis between February and July 2006. The University Hospital of Alexandroupolis is a tertiary hospital facility with three Surgical Clinics, a self-contained Emergency Department with a capacity of 504 beds at the time of the study. This particular 6-month time frame was chosen taking into account the fact that it covers equally the winter and summer seasons, in order to better describe the fluctuation in the epidemiological characteristics of the trauma patients.

Data collected included: 1) Patient demographics (age, gender, place of injury), 2) Arrival at the Emergency Department (date, means of transport), 3) Mechanism of injury (fall, MVA, burn, assault, other), 4) Anatomical location and type of injury (fracture, open wound, abrasion, ecchymosis, other), 5) Injury severity (Abbreviated Injury Scale (AIS) score), 6) Outcome (Hospitalization, length of stay, mortality). Statistical analyses were performed using the StatsDirect 2.7.2 statistical software (StatsDirect, Ltd., England, 2008). The study received appropriate approval from the Ethics Committee of the Hospital University of Alexandroupolis.

In this study, 2346 trauma patients were included. Among them, 335 were multiple trauma patients. The mean age was  $34.06 \pm 23.77$  years (range 2 months – 99 years). The median age was 29 years. Of the 2346 patients, 19.10% were in the 20-30 age group, while 65.52% of the patients were below 40 years old. Out of the total number of trauma patients studied, 62.15% of them were male and 37.85% were female (Table 1).

Most patients were admitted in July (20.67%) and June (18.97%). The actual rate of admissions constantly increased from February (12.62) towards the summer months with a mean rate of 1.34% per month. Weekdays seemed busier than weekends and holidays, and daily coverage had a random pattern.

**Table 1.** Patient demographics (n = 2346)

Age Group	Males	%	Females	%	Total	%
0 – 10	266	12.83	156	6.65	422	17.99
11 – 19	237	10.10	125	5.33	362	15.43
20 – 30	301	12.83	147	6.27	448	19.10
31– 40	204	8.70	101	4.31	305	13.00
41 – 50	120	5.12	72	3.07	192	8.18
51 – 60	111	4.73	77	3.28	188	8.01
61 – 70	84	3.58	69	2.94	153	6.52
71 – 80	79	3.37	85	3.62	164	6.99
80+	40	1.71	43	1.83	83	3.54
No age declared	16	0.68	13	0.55	29	1.24
Total	1458	62.15	888	37.85	2346	100.00

From the 2346 patients, 95.65% arrived at the Emergency Department in a private vehicle and only 4.14% arrived by ambulance. However, among the multiple trauma patients, these rates alter to 78.51% and 20.60% respectively. There was no air ambulance or cross-border transfer. More than half (60.71%) of the patients were residents of the city of Alexandroupolis, while there was also a patient inflow from neighboring prefectures, albeit all neighboring prefectures have tertiary hospitals. 37.68% of the multiple trauma patient ambulance transfers were conducted from other National Healthcare System facilities to the hospital.

## RESULTS

Falls were the most prevalent mechanism of injury, accounting for 62.19% of the total admitted cases, with other causes (that also included occupational accidents and machinery trauma) being second, and MVAs third with a rate of 11.46% (Table 2). Below the age of 40 were 75.46% of the MVA accidents. There was no case of child abuse. The most commonly injured body regions were the extremities (50.26%), the head (42.50%), and the torso (19.39%) (Table 2). Out of all the head injury patients, 24.67% were children below the age of 10, and 16.54% of head injury patients had other multiple injuries too.

Fractures represented 11.46% of the injuries; while open wounds were much more frequent (29.41%). Classified under the title of “Other” injuries were 53.53% of the patients, which included mild injuries without prominent physical findings, animal bites, and minor blunt or penetrating injuries

**Table 2.** Injury characteristics

	n	%
Leading causes of injury		
Falls	1459	62.19
MVA	269	11.46
Burns	83	3.54
Assault	76	3.24
Other	395	16.83
Not declared	63	2.74
Body Region		
Head injury	997	42.50
Other head and neck	345	14.71
Torso	455	19.39
Abdomen	209	8.91
Pelvis	180	7.67
Extremities	1179	50.26
Injury type		
Fracture	169	11.46
Open wound	690	29.41
Other injuries	1256	53.53
Abrasions	370	15.77
Ecchymosis	83	3.53

(Table 2). The mean AIS was  $1.78 \pm 1.48$  for all admitted patients, and  $3.56 \pm 1.02$  for multiple trauma patients (Table 3).

The 2346 admitted patients had 2350 X-ray studies. Half of the examinations (49.91%) were held for the evaluation of multiple trauma patients. Overall, 23% of the multiple trauma patients required a multi-disciplinary approach, while the

**Table 3.** Injury severity (AIS score)

	Multiple trauma		Total	
	n	%	n	%
AIS 1	0	0	1671	71.23
AIS 2	64	19.10	128	5.45
AIS 3	85	25.37	17	0.72
AIS 4	125	37.31	105	4.47
AIS 5	87	25.97	312	13.30
AIS 6	4	1.19	6	0.25
N/A	0	0	107	4.56
Total	335	100.00	2346	100.00

clinic admission rate was 13.55% for the whole patient sample and 48.96% for multiple trauma patients (Table 4). The majority of the patients

were admitted in one of the Surgical Clinics of the Hospital, and the mean duration of stay was 2.70 days for all clinic admissions and 2.90 days for multiple trauma patients (Table 5).

**DISCUSSION**

The care of the injured patient has been fundamental in the practice of medicine since recorded history. The term “Trauma” itself, derives from the Greek word for “wound”, and refers to any injury that requires any form of medical care. The morbidity and mortality caused by injuries have been persistent problems in all countries around the world, and despite the significant advances in prevention and clinical care, the better technology and better clinical practice, trauma is still a leading cause of death and disability worldwide.<sup>8,9</sup>

Epidemiology has been a very useful tool in the

**Table 4.** Outcome in trauma and multiple trauma patients

	Multiple trauma		Total	
	n	%	n	%
Discharged	128	38.21	1798	76.64
Declined hospitalization	12	3.58	107	4.56
Escaped from hospital	3	0.90	17	0.72
Referred to other Department	25	7.46	101	4.31
Admission to Clinic	164	48.96	318	13.55
Death	3	0.90	5	0.21
Total	335	100.00	2346	100.00

**Table 5.** Admission and hospitalization details

	Multiple trauma		Total	
	n	%	n	%
Clinic of Admission				
Surgery	124	75.61	195	61.32
Pediatric Surgery	6	3.66	57	17.92
Orthopedics and PRM Department	25	15.24	39	12.26
Other Surgery	7	4.27	25	7.86
Intensive Care	2	1.22	2	0.63
Total	164	100.00	318	100.00
Hospitalization				
Mean Length of Stay (days)	2.90*		2.70*	

\*p < 0.01.



hands of clinicians in order to improve healthcare of the trauma patient. In the era of evidence based medicine, data from trauma registries offer vast opportunities for research and are usually the best sources of data about nonfatal injuries.<sup>10</sup> Trauma experts have numerous highlighted the importance of establishing trauma registries and data collection standards, and there are quite a few prominent examples of how trauma registry data have helped trauma research and program development.<sup>11</sup>

The present study sought to investigate the epidemiological patterns of injury-related admissions in a Greek tertiary hospital. According to the National Health System practice in Greece, trauma patients are managed in the Emergency Departments (ED) of Health Centers and Hospitals. Once admitted, the patients are triaged by physicians and nurses that are assigned to assess the injured patients and forward them to the appropriate ED clinic. Trauma patients are almost exclusively treated by the staff of the Surgical ED, and, if needed, are referred to other departments before hospitalization or discharge. Life-threatening major trauma cases are treated in appropriate resuscitation rooms, while stable patients are seen at the ED exam rooms. However, despite the large impact of trauma in Greece, there are no precise figures for trauma epidemiology, management and outcome, mainly due to the absence of a standardized registry protocol.

Our results provide a comprehensive overview of the patients admitted to the biggest hospital in the prefecture of Evros, North-Eastern Greece. A relatively large proportion of our patients were in the 20-30 age group, similar to the epidemiological data reported by other researchers.<sup>12</sup> Falls and MVAs were the most common mechanism of injury, like most countries across Europe<sup>13,14</sup> with three quarters of the MVA victims being under the age of 40. The extremities were the most frequent anatomical region of injury, with head injuries being second and the chest being third.<sup>15</sup> However, our data on mortality rates, due to the low number of fatal outcomes, do not allow meaningful statistical approach as far as mortality is concerned.

Like any trauma registry data study, some limitations apply herein, too. First of all, the retrospective design of the study may preclude the quality of the data. Secondly, as it has been highlighted by experts in the field of trauma care, results from a single center cannot be safely generalized about all trauma patients, especially when comparing with results from studies in different locations worldwide.<sup>16</sup> However, we feel that the strictly

population-based approach, in the geographically well-defined prefecture of Evros, along with the fact that during reassessment of patient records we did not encounter missing information problems, substantially add to the value of the study.

To recapitulate, this descriptive study, by reporting the epidemiological data on trauma patients, outlines the importance of developing a national registry, in a country that shows substantial data gaps in disease registries, compared to other European countries. The improvement of population level information on the incidence, prevalence and states of health associated with trauma, should be a priority for the national health agency.<sup>17</sup>

The valuable information that will be extracted from such studies will aid in understanding the exact burden of trauma in Greece, and will assist focusing on specific cost-effective prevention programs, in a country with a limited funding pool.

## CONCLUSIONS

The present study identifies the major epidemiological patterns of trauma cases presenting to the University Hospital of Alexandroupolis. These findings not only address the need for further trauma related research in Greece, but also represent an important stepping stone for development and implementation of injury prevention activities and policies.

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