

## On traumatic brain injury epidemiological data collected from a county hospital in Romania and an estimation of psychiatric consequences thereof

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**Abstract:** Introduction: Many aspects justify the increasing attention upon TBI and post TBI sequels. *Material and Methods:* The paper resumes statistics on traumatic brain injury (TBI) from a Romanian country district, collected throughout five years. Statistics in the literature that demonstrated the link between TBI and psychiatric disorders are extrapolated. *Results:* TBI is considered to be a risk factor for psychiatric disorders. As consequence, estimation of some post TBI psychiatric sequels is computed aiming to emphasize the need for psychiatric support and treatment in more organized multidisciplinary neuro-trauma management teams. *Conclusions:* TBI is considered to be a risk factor for psychiatric disorders which are a major cause of post TBI disability. The size of these psychiatric sequels in accordance with the existing literature can be approximated in a given population. TBI epidemiology analysis reveals hazardous impact on the overall health condition of patients.

**Key words:** psychiatric sequels, aetiology.

### Introduction

Traumatic brain injury (TBI) has been identified and established as a real public health problem. It is shown that approximately 6.6% results in death in the case of TBI patients, of which 91.4% less than 7 days after TBI. [1] A percentage of 3.5% to 4% of TBI cases of all patients who have survived a TBI, are followed by permanent disability with socio-economic impact, most of these cases

involving psychiatric disabilities. [2]

Corroborating recent data, it is found that every two minutes one EU citizen dies of an injury and annually approximately one million EU people remain permanently disabled due to an injury, [3] most of which are TBI.

In the geographical area targeted by our paper (i.e. Bihor county, Romania), it was determined a ratio of 1/5 of the incidence of severe TBI versus moderate TBI, for

hospitalized patients, and 1/22 of the moderate TBI versus uncomplicated TBI. [6]

It is known that a psychiatric sequel post TBI can occur even after a longer period of time. [4]

Establishing a causal relationship between psychiatric disorders and TBI is especially important for understanding the pathophysiology of such possible sequels, in order to treat these diseases. Also, it contributes to understand the pathogenesis and define the causality of mental suffering in general. If the psychiatric disorders highlight the causes of psychiatric morbidity, this should alert physicians to consider the TBI-psychiatric sequel causality and to try to prevent such consequences. Such a finding regarding causality would be more important in the case of legal disputes concerning the consequences of TBI compared to simple situations when an individual presents only post TBI motor difficulties.

Frequently reported, psychiatric disorders after TBI are greater than on general population and prospective follow-up studies have found that the most common post TBI psychiatric disorders are depression and anxiety, although the causality association remains unclear. [5] The occurrence of generalized anxiety disorder was associated with post TBI greater physical and emotional problems, with negative impact on the active role in social life and general health.

Numerous definitions and measures were used to assess "successful outcome" of TBI treatment, including return to work or social functional recovery.[4; 5] The result of the treatment is multi-dimensional and complex

and cannot be comprehensively understood by a single score achieved on certain scales (such as the Glasgow outcome scale). Causality of psychiatric sequel after TBI is not fully elucidated. Approaches to explaining the causality could account on the high incidence of somatic sequels after TBI. In order to improve the outcome after TBI, it is important to have an overview of epidemiological data on TBI and their psychiatric impact. The analysis of locally adapted epidemiological data provides the opportunity to form a more realistic idea of the size of the studied pathology and guides the clinician in the decision making for treatments. Therefore an epidemiological analysis of TBI, in a given district and correlation with data from the literature on the psychiatric consequences of post TBI, both provide an overview of the pathological phenomenon in question.

## Material and Methods

This paper presents the analyze of TBI cases in the Bihor county, Romania, reported in the city of Oradea, at Emergency Regional Hospital, for 5 years along. It consists of a retrospective study on demographic and clinical data.

It was followed parameters like TBI etiology, patient age, health status at discharge... All patients treated in the neurosurgery department of this county hospital, on which a chart of the patient was drawn, were included in statistics. Data processing method involved coding information in a database and then processed in Excel management database (for each year a file was filled in, and the years submitted for analysis are 2005, 2006, 2007, 2008 and 2009).

**Results**

Various diagrams are presented below by means of which we intend to highlight the evolution of TBI casuistry, reported at Emergency Regional Hospital, Bihor County, and various characteristics of their prevalence and incidence. The total number of TBI cases varied over the five years, [6] see Table 1. The number of patients, diagnosed with TBI, reported in rural versus urban area is balanced, Table 1. Analysis by gender, shown in Table 2, highlights the following observation: women represent a smaller percentage of cases, compared with men.

**TABLE 1**

**Patients diagnosed with TBI, reported in rural versus urban residential area**

Year	2005	2006	2007	2008	2009
All patients	608	603	628	640	597
Rural	261	250	269	322	306
Urban	347	353	359	318	291

**TABLE 2**

**Number of patients by gender, admitted to the neurosurgery department of the county hospital, diagnosed with TBI**

Year	2005	2006	2007	2008	2009
All patients	608	603	628	640	597
Men	405	397	432	456	412
Women	203	206	196	184	185

Computing the association of TBI with multiple trauma (since it complicate the treatment and may be marks of more important lesions), for 2005, the percentage is 4.23% from TBI total cases, for 2006 the percentage is 3.98%, for 2007 the percentage is 15.29%, for 2008 the percentage is 5.78% and for 2009 it is 1.84%.

The number of post TBI deaths is relatively small, so per each year the percentages of TBI fatal cases were as follows: 2.96%; 2.82%; 3.98%; 4.36%; 4.52%. The distribution of cases by the TBI in relation with age was determined for the age groups, according to the following data, as shown in Table 3.

The etiology of TBI has a diversified distribution, as shown in Table 4.

The association with alcoholism is of interest because of the increased susceptibility regarding those patients to be victims of accidents and incidents with cerebral adverse consequences. The percentage of those patients with alcoholism is about 7%, for the five years studied. The alcoholism is a risk factor for TBI ( $p=0.1$ ) and the evolution of patient after TBI treatment is not favorable ( $p=0.05$ ).

Analyzing the patients' post TBI health condition at discharge from hospital, we find several patients with post traumatic deficits, especially neuro-motor deficit, see table 5 below. The favorable development is conventionally defined as an intact neurological status.

**TABLE 3**  
**Distribution of TBI cases by age groups**

year:	2005	2006	2007	2008	2009
aged < 1 year	0	1	0	4	3
aged 1 to 4	3	5	10	14	18
aged 5 to 14 old	36	39	27	32	30
aged 15 to 18	62	63	48	54	38
aged 18 to 24	59	54	45	45	31
aged 25 to 34	83	76	92	73	76
aged 35 to 54	81	69	94	82	66
aged 45 to 54	86	87	94	105	92
aged 55 to 64	82	80	99	79	87
aged 65 to 74	55	62	67	84	83
aged 75 to 84	52	59	41	54	61
aged > 85	9	8	11	14	12
<i>all patients</i>	608	603	628	640	597

**TABLE 4**  
**Etiology of TBI, for whole time analyzed (%)**

Aetiology	2005	2006	2007	2008	2009
accidentally hitting with a blunt object	7.50%	7.30%	11.20%	8.80%	7.03%
traffic accidents	9.10%	8.60%	12.60%	6.70%	16.42%
fall from same level	53%	60%	43.60%	61.60%	39.87%
fall from height	12.40%	8.50%	5.40%	4.10%	0.84%
aggression	11.60%	9.30%	12.90%	9.20%	10.55%
unspecified	5.40%	5.30%	8.30%	5.90%	20.26%
fall from bike	0.50%	0.70%	3%	2.80%	2.68%
horse kick	0.50%	0.30%	0.30%	0.20%	0.00%
fall from tram	0.00%	0.00%	0.50%	0.00%	0.00%
fall from motorcycle	0.00%	0.00%	1.40%	0.00%	0.00%
sports accident	0.00%	0.00%	0.00%	0.20%	1.51%
accident at work	0.00%	0.00%	0.00%	0.50%	0.84%

**TABLE 5**

**Patients post TBI health status at discharge from hospital, concerning patients with TBI (%)**

Patients health status	2005	2006	2007	2008	2009
improved	2.06%	1.91%	1.84%	6.41%	87.60%
slow progressive	84.39%	85.03%	82.03%	84.84%	4.36%
favorable development	7.63%	7.48%	7.22%	4.06%	1.84%
surgical intervention healed	0.93%	0.32%	3.84%	1.09%	1.51%
transferred to another hospital	0.52%	0.64%	0.61%	0.47%	0.50%
discharged on request	3.92%	3.98%	3.84%	2.81%	3.85%
deficit neuro-motor	0.55%	0.64%	0.61%	0.31%	0.34%

**TABLE 6**

**Number of deaths per year (during 2005-2009)**

Year	Number of severe TBI	Number of deaths	Deaths in total patients with severe TBI (%)	Total number patients with TBI	Deaths in total patients with TBI (%)
2005	98	18	18.37%	608	2.96%
2006	95	17	17.89%	603	2.82%
2007	83	25	30.12%	628	3.98%
2008	74	26	35.14%	640	4.36%
2009	63	27	42.86%	597	4.52%

**Discussions**

Traumatic brain TBI is a significant cause of hospitalizations and remains a major cause of death, especially in the case of young people. The highest number of patients with TBI is included in this age group, i.e. aged 15 to 24 years old, see Fig.1, (per each year of the five years study time span, i.e. 2005-2009).

The number of deaths in patients who have had TBI is shown in Table 6.

The probability of survival after severe TBI, considering the first 7 days (the majority of deaths occurred in this period) is represented in the Figure 2 below, considering Kaplan-Meier method, (after one day 94.18% of

patients survive having severe TBI, 89.35% after two days, after three days the rate of survival was 84.99%, and 81.84% after another day).

The mortality graph, after severe TBI, is represented in Figure 3 below (after the first day 5.82% of the patients with severe TBI deceased, 10.65% deceased after two days, with a daily death rate increase as follows: 15.01%; 18.16%; 20.82%; 23.24%; 25.42%; 27.36%).

The percentage of total number of deaths, recorded after the first seven days from a severe TBI, was 7.08%.

A TBI case may have devastating consequences. [7- 10]

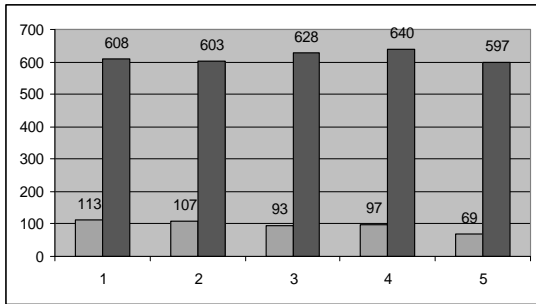


Figure 1 - TBI cases number of patients aged 15 to 24 years old

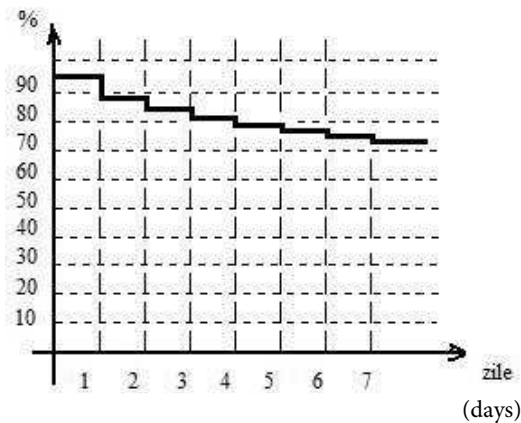


Figure 2 - Graph of survival after severe TBI (Kaplan-Meier curve)

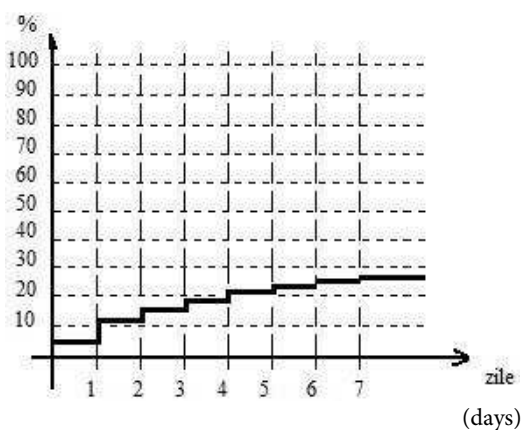


Figure 3 - Graph on mortality after severe TBI (Kaplan-Meier curve)

Most post TBI disability involves psychiatric disorders. For example about 70% of cases were followed by a post TBI depression. Among post TBI psychiatric disorders, one could list the following ones (see Table 7 below): major depression in more than 14% of TBI cases; bipolar disorder in more than 2% (and up to 17%) of the TBI cases; generalized anxiety disorder in more than 3% (and up to 28%) of the TBI cases; panic disorder in more than 4% of the TBI cases; phobic disorders in more than 1% TBI cases; obsessive-compulsive disorder in more than 2% TBI cases; post-traumatic stress disorder (PTSD) in more than 3% TBI cases; substance abuse or dependency in more than 5% of patients who have suffered a TBI, and schizophrenia in about 1% of TBI cases. [4, 10] It is shown [10] that the headaches occur in more than 25% (up to 90%) of TBI cases; dizziness or vertigo, as the second incidence of sequel after TBI, has been reported to occur in more than 24% (up to 78%) of TBI cases; sleep disorders or drowsiness in up to 73% of TBI cases, compared with 32% in the general population. Tiredness was reported in up to 73% of patients who have suffered a TBI, [10] with negative implications for social integration, activities, productivity and quality of life.

Considering the number of patients with post TBI psychiatric sequels or other post TBI health problems, and based on this epidemiological data of the patients from Bihor county treated in the Emergency Regional Hospital, the expected number of patients presenting post TBI psychiatric sequels was estimated, see Table 7 below.

**TABLE 7**  
**Estimates on the number of patients with possible post TBI psychiatric sequels or other post TBI health problems, based on the literature**

Name of post TBI disorder	Specified percentage value	Estimated number of possible patients
post TBI sleep disorders and sleepiness	41%	1011
post TBI tiredness	73%	1,801
post TBI migraine (headaches)	25%	617
post TB vertigo I	24%	592
post TBI depression	70%	1,827
post TBI major depression	14%	345
post TBI bipolar disorder	2%	49
post TBI generalized anxiety disorder	3%	74
post TBI panic disorder	4%	98
post TBI phobic disorders	1%	24
post TBI obsessive-compulsive	2%	49
post TBI PTSD (Post Traumatic Stress Disorder)	3%	74
post TBI substance dependence	5%	123
post TBI schizophrenia	1%	24

The estimated total number of TBI psychiatric sequel or other post TBI health problems is more than 6700 new cases. In various studies, [3; 7] the causality (though less explicit in pathophysiological mechanisms) between TBI and some psychiatric disorders was proved.

The neuro psychiatric consequences of TBI are numerous in terms of life quality impact or results at workplace e.g. return to job when compared to others disorders; therefore the prevention, rapid detection and effective treatment are highly recommended. [7; 8]

At the moment, there is no standard psychiatric management algorithm for acute and sub-acute TBI. So far, this study aimed to

emphasize the importance of psychiatric component in the treatment of traumatic brain injury (TBI).

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