

Comparison of the Admission Characteristics and Outcomes of Indian Severe TBI Cohort with Earlier Epidemiologic Studies of Developed Nations

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Abstract

From policymaking and research point of view, our aim is to compare data of patients with severe traumatic brain injury (TBI) with developed settings, where health care facilities are much enhanced as compared to developing settings. In this retrospective study, we described and compared demographic, clinical, secondary insult related characteristics, and outcomes at 6-months (based on Glasgow outcome scale) of our patients with severe TBI; based on emergency department Glasgow coma scale, admitted to neurosurgery Intensive Care Unit at Jai Prakash Narayan Apex Trauma Centre (JPNATC), AIIMS, New Delhi, during May 2010–July 2012; with famous studies from developed settings using descriptive statistics. We found that there is a huge burden of young patients, mostly males with severe TBI in India as compared to developed settings. Follow-up data for 6-months outcome were very much lesser and outcome as death was in high proportion as compared to developed settings. In case of severe TBI, this information can be valuable in formulation of policies and programmes at centre/national/international level, increasing public awareness, developing new action plans.

Keywords: Epidemiology • Glasgow outcome scale • Head injury • Mortality • Outcome • Traumatic brain injury

Introduction

Traumatic Brain Injury (TBI) is the main cause of one-third to one-half of all trauma deaths and the leading cause of disability in people under forty, severely disabling 15–20/100,000 populations per year globally [1]. The World Health Organization estimated that almost 90% of deaths due to injuries occur in low- and middle-income countries (LAMICs), where 85% of population live, and this situation will continue to represent an important global health problem in the upcoming years [2]. It is a leading cause of mortality, morbidity, disability, and socioeconomic losses in Indian subcontinent as well. For reducing the burden of TBIs, India and other developing countries are facing the major challenges of prehospital care, prevention, and rehabilitation in their rapidly changing environments. However, for policymaking and research, there is a lack of reliable and larger data in these settings.

Jai Prakash Narayan Apex Trauma Centre (JPNATC), All India Institute of Medical Sciences (AIIMS), New Delhi (India) is the largest tertiary trauma care centre in India and it is currently working as one of the best integrated level 1 trauma centres in India [3]. A study was conducted using data from this centre, which was the first of its kind to document the epidemiology, clinical characteristics, and outcomes of a large cohort of patients with TBI along with 6-months functional outcome [4]. Using this study, there is a great

potential to carry out a number of further studies and secondary analyses using multivariate techniques to evaluate the predictors of outcomes in TBI [5-7]. From policymaking and research point of view, it would be very interesting to compare this study with developed settings, where health care facilities are much enhanced as compared to developing settings. The primary causes of TBI may vary by sociodemographic and socioeconomic factors, geographic region, and health care facility, so any planned interventions must take in consideration this variability.

Discussion

Table 1 depicts the comparison of the characteristics and outcome of Indian severe TBI cohort based on a single centre of developing nation (present study) with earlier epidemiologic studies based on multi-centre of developed nations [8-18]. In comparison to present study, all studies have a smaller number of patients with severe TBI except study based on International data bank full series (n=2978), although duration of study period of International data bank full series (n=2978) was much longer (about 17 years) as compared to present study (2 years). The USA National Traumatic Coma Data Bank (TCDB) study had also longer duration of study period (Jan 1984-sep 1987), but they enrolled only 746 patients with severe TBI into four major trauma hospitals in the United States. The number of enrolled patients during study period at JPNATC reflect the burden and volume of severe TBI in the capital city of India with larger number of younger patients as compared to western population (excepting the TCDB study). Although the proportion of alcohol involvement at the time of injury have not been reported in our study, it ranges from 25% to 40% in other reported studies. The TCDB is the youngest cohort having more road traffic accidents possibly due to drink and drive practice. Surprisingly, severe TBI due to assault in present study was significantly lower (3%) as compared to other developed nations. The retrieval times were shorter in the studies from developed nations reflecting the greater retrieval distances in India compared with other western population, and the potential for adverse

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Table 1: Comparisons of epidemiology, treatment and outcome of severe TBI with international studies

Study	Jennett et al., 1977; Murray et al., 1999a)*	Foulkes et al., 1991; Marshall et al., 1983, 1991b)	Murray et al., 1999a,b)	Murray et al., 1999a)	Myburgh et al., 2008	Leitgeb et al., 2007; Rosso et al., 2007; Rusnak et al., 2007	Andriessen et al., 2011	Present study
Databank	Int. databank	TCDB	GB4	EBIC	ATBIS	Austria	POCON	JPNATC
Patients	2978	746	988	583	363	492	339	1281
Period	1988-1985	Jan 1984-Sep 1987	1986-1988	Feb-Apr2000	Apr-Sep2000	Oct 1999-Mar 2004	June 2008 -2009	May 2010-July2012
Centres	5 (UK, NLD, USA)	6 (USA)	4 (GB)	67 (Europe)	16 (AUS, NZL)	5 (AUT)	5 (NLD)	1 (India)
Age	Any	Any	Any	≥ 16 years	≥ 16 years	Any	≥ 16 years	Any
Admission	None	<48 h	<72 h	<24 h	None	None	<72 h	None
GCS	Coma (E=1, V≤2, M≤5) > 6h	≤8 post-resuscitation or after deterioration	Coma (E=1, V≤2, M≤5) > 6h or EML	≤8 at NSU admission ^a	≤8 at ED ^a	≤8 post-resuscitation or within 48 h	≤8 at ED admission	≤8 at ED admission
Age (years) [mean±sd (range)]	36±21(0-89)	30± -	34±21(0-87)	41±20(2-92)	39±19	49±21	46±20	32±16 (1-90)
Median (IQR)	32(18-53)	25(-)	29(17-51)	35(23-58)	-	-	-	30(22-41)
Gender (Male)	79%	77%	75%	73%	74%	72%	70%	87%
GCS [mean±sd or median (IQR)]	-	-	-	-	-	6±3	3 (3-4)	6±2 or 6 (4-7)
Cause of Injury								
RTA	56%	75%	57%	57%	60%	44%	51%	66%
Fall	22%	16% [@]	19%	21%	24%	40%	37%	25%
Assault	7%	5%	7%	4%	8%	-	4%	3%
Others	15%	-	17%	18%	8%	-	8%	6%
Major Extracranial Injury (Yes)	33%	-	39%	41	-	-	47%	25%
Alcohol involved	35%	40%	39%	-	-	36%	25%	-
Pupil Reactivity								
Both	-	-	-	-	-	68%	54%	70%
One	-	-	-	-	-	21%	8%	10%
None	-	-	-	36%	-	11%	32%	20%
ICP Monitoring (Yes)	35%	37%	31%	43%	45%	64% ^a	38%	39%
Hypoxia	-	-	-	27%	8%	-	25%	-
Hypotension (Yes)	-	-	-	22%	14%	-	28%	28%
% CT	42%	97%	99%	99%	87%	84%	94%	100%
MLS (mm)>5	-	-	-	-	-	-	22%	37%
Subdural Hematoma (Yes)	-	24%	-	-	-	48%	43%	47%
Epidural Hematoma (Yes)	-	6%	-	-	-	21%	11%	16%
Diffuse Edema	-	-	-	-	-	39%	24%	17%
Basal Cistern Effaced (Yes)	-	24%	-	-	-	-	40%	19%
tSAH (Yes)	-	39%	-	47%	37%	56	46%	37%
Contusion	-	-	-	-	-	69	54%	61%
Cratotomy (% Yes)	47%	37%	39%	37% ^e	42% ^d	67%	23%	53%
% follow-up	99%	100% ^f	99%	83%	92%	84% ^h	85-90% ⁱ	71%
Outcome (% 6 month GOS)								
Dead	49%	36%	39%	40%	32%	44%	46%	63%
Vegetative state	2%	5%	1%	4%	1%	7%	1%	2%
Severe disability	13%	16%	17%	16%	22%	9%	13%	6%
Moderate disability	15%	16%	16%	19%	29%	12%	18%	9%
Good recovery	20%	27%	24% ^g	21%	16%	27%	20%	20 %

Int. Databank: International data bank full series; TCDB: The USA National Traumatic Coma Data Bank; GB4: The British Four Center Study; EBIC: European Brain Injury Consortium Survey of Head Injuries; ATBIS: Australian Traumatic Brain Injury Study; AUSTRIA: Austrian Severe Traumatic Brain Injury Study; POCON: Prospective Observational Cohort Study Neurotrauma; AUT: Austria; AUS: Australia; CT: computed tomography; ED: Emergency Department; GB: Great Britain; GCS: Glasgow Coma Scale; GOS: Glasgow Outcome Scale; GR: good recovery; ICP: intracranial pressure; NLD: Netherlands; NSU: Neurosurgical Unit; NZL: New Zealand; ISAH: traumatic subarachnoid hemorrhage; std: standard deviation; USA: United States of America.
*If NSU admission GCS was unavailable, the GCS had to be ≤ 8 at the injury scene, first hospital (in case of secondary referral) and at post-resuscitation. ^aPatients were admitted to ICU or died at ED or operating room. ^cOnly operations within 24 h. ^dPre-ICU admission. ^eData available in 415 (84.3%) patients. ^fAssessed 11–1198 days post-injury. ^g3% classified as good/moderate recovery (not shown here). ^hAssessed 90–360 days post-injury. ⁱ85% follow-up for GOS and 90% follow-up for survival. Additional analyses on datasets done in (Murray et al., 1999a); [@]Fall under alcohol influence; -: Not reported.

secondary brain injury. This may be one of the reasons that the proportion of patients with secondary insult i.e., hypotension (28%) at the time of admission in our study were greater in number than other given studies, resulting in higher mortality and morbidity. Follow-up data for 6-months outcome in patients with severe TBI were in much lower percentage than studies from western settings, which can be improved to promote long-term outcome research in TBI. The outcome as good recovery at 6-months for some of the studies were similar to present study. However, present study enrolled younger patients than other studies. This is an important difference because younger age is associated with better outcomes in case of TBI.

Conclusion

In case of severe TBI, this information can be useful in formulation of policies and programmes at centre/national/international level, increasing public awareness, developing new action plans and for placing neurotrauma on the public health agenda.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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