

# Epidemiology of Traumatic Brain Injury in Neurosurgery Department of Tertiary Referral Hospital at North Sumatera, Indonesia

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## Abstract

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**Introduction** : Traumatic brain injury (TBI) is the most common problem that caused morbidity and mortality in the world. Epidemiology information of TBI is very important in understanding the causes and the risk factors of TBI, so that effective programs can be designed to prevent injury. This study purposed to provide overview of TBI pattern in tertiary referral hospital at North Sumatera with focus on epidemiological data of TBI pattern.

**Methods** : The design of this study is a retrospective, and it is done in general hospital H. Adam Malik from June-December 2018 with sample from all patient with traumatic brain injury that admitted in hospital. All medical records with diagnosis traumatic brain injury will be assessed for several variables as age, gender, etiology, severity, length of stay and outcome.

**Results** : During the period of study, 118 patients with traumatic brain injury were admitted in neurosurgery ward. The highest TBI cases was occurs in male patients with range age between 18-35 years old, and caused by traffic accident. Most patients admitted to Emergency department with GCS 13-15 and epidural hematoma was the most common lesion found in head CT scan. Length of stay in this research mostly between 1-5 days, and the mortality rate is about 16.9%, which is dominated by severe head injury.

**Conclusions** : Head injury mostly found in male with productive age, and traffic accident be the most common caused. Severe head injury still have quite high mortality rate.

## Introduction

Traumatic brain injury (TBI) is the most common problem that caused morbidity and mortality in the world. Morbidity caused by TBI is one of socioeconomic burden for family and country. TBI is prevalent in low, middle, and high-income country and can affects to all ages. TBI can be caused by many factors but the most common is falls, being struck by or against n object, traffic injury, and assaults.<sup>1,2</sup>

Incidence of TBI in worlwide was estimated 69 million lives with the highest in Western Pacific and Southeast Asia countries. The prevalence of TBI in Indonesia according to Rischesdas 2007 is 7,5% from all diseases and increase to 8,2% in 2013. Three provinces with the highest prevalence of TBI are Papua (1%), North Sumatera (0,9%), and Bangka Belitung (0,8%). According to National Center for Injury Prevention and Control, the highest rate of TBI was found in older adults (more than 75 years old) and dominated by male than female.<sup>2,3</sup>

Epidemiology information of TBI is very important in understanding the causes and risk factors so that effective programs can be designed to prevent and bring down injury. Various reports claimed that TBI

### Materials and methods

This was a retrospective study of all patients with head injury at neurosurgery department of H. Adam Malik general hospital from June to December 2018. The hospital is tertiary referral hospital located in Medan, North Sumatera, Indonesia with bed capacity of 720. North Sumatera has 14.42 million populations. This study was approved by the Health Research Ethical Committee Medical Faculty of Universitas Sumatera Utara / H. Adam Malik General Hospital.

All medical records of TBI patients from neurosurgery department were assessed for several variables as age, gender, etiology, severity, length of stay and outcome. The severity category was based on Glasgow coma scale (GCS) measurement in emergency department i.e mild TBI (GCS 13-15), Moderate TBI (GCS 9-12), and Severe TBI (GCS  $\leq$ 8). Exclusion criteria for this study as death on arrival and brain injury due to cerebrovascular disease, seizure, or psychiatric problems. All data will be presented descriptively as frequency and percentage in tables.

### Results

During the period of study, 118 patients with traumatic brain injury were admitted in neurosurgery ward. From all patients with TBI, 89 (75.4%) were males and 29 (24.6%) were female so the ratio is 3.1:1. Patients' age were ranged every 10 years with highest frequency of 43 (36.4%) was found in the age range of 18-35 years and followed by 27 (22.9%) in the age of >56 years. Based on etiology of TBI, the most common cause was road traffic accident (n= 95, 80.5%) then followed by falls (n= 15, 12.7%) and violence (n= 8, 6.8%).

Table 1. Characteristics of patients

The patients whose GCS category were stated mild TBI, which constituted 78 (66.1%) were the highest frequency, followed by moderate TBI constituted 29 (24.6%). Based on brain lesion, the highest frequency was epidural hematoma for 40 (3.9%) then followed by intraparenchymal hemorrhage for 33 (28%). The highest outcome of patients of study was

Epidemiological pattern has been changing lately. This study purposed to provide overview of TBI pattern in tertiary referral hospital at North Sumatera with focus on epidemiological data of TBI pattern.

discharged (n= 84, 71.2%) then followed by mortality (n= 20, 17%). Length of stay in this study were ranged every 5 days with highest frequency of 45 (38.1%) was found in the length stay of 1-5 days and followed by 37 (31.4%) in the length stay of 6-10 days.

### Discussion

Total of traumatic brain injury cases from neurosurgery department of H. Adam Malik general hospital in 2010 showed 1627 cases which 1021 cases are mild TBI, 444 cases are moderate TBI, and 162 cases are severe TBI. Compare to our data, there were significant reduction TBI cases from 1627 cases in 12 months to 118 cases in 6 months. North Sumatera only has 9 neurosurgeons in 2010 but in 2019 this amount have increased two times into 21 neurosurgeons. Enhancement of neurosurgery service in secondary healthcare at North Sumatera decreasing referral need to tertiary referral hospital.<sup>4</sup>

Several studies showed that TBI in both developing and developed countries dominated by male than female. This study also showed that males were more affected than females. While most of TBI found in productive age between 21-40 years. In this study, the highest frequency of TBI was also found in productive age, between 18-35 years. This might be caused by the fact that males with productive age are more active in daily activities that prone to head injury such as vehicle operation and working on heights.<sup>5,6</sup>

Road traffic accident has the highest frequency for the cause of TBI in this study. Traffic accident was also the most common cause of TBI in developing country. Meanwhile, fall and assault were the most prevalent cause of TBI in developed country. This can be caused by better road network and good implementation of traffic rules.<sup>6,7</sup> Mild Head injury has the highest frequency of TBI from this study and other studies also reported the same result.<sup>7,8</sup>

The mortality rate for TBI was declined significantly over decade from 39% in 1984 to 27% in 1996. Mortality rate in this study was 16,9% which mean better treatment over years but still two times higher than

US National Health Statistics Reports.<sup>9,10</sup> Length of stay in this study commonly under 10 days is 69,5% and under 15 days is 90.7%. Study from US and Canada reported different length of stay which average length of stay in US is 7.3 days and in Canada is 11.7%. Several important factors that can prolonged length of stay are age, gender, GCS, injury severity, and ventilator usage.<sup>10,11</sup>

Being a retrospective study could have loss of important information that might be relevant. This is limitations of present study. Retrospective study has disadvantage of poor recording due to

relied on accuracy of written records. This can happen because our record still paper based so poor keeping is common.

### Conclusion

TBI patients were dominated by male with range from 18-35 years. Traffic injury was the most common cause of TBI. Most of TBI patients were mild with length of stay less than 10 years. Mortality rate in our study is 16.8%.

### Conflicts of interest

There are no conflicts of interest

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Table 1. Characteristics of patients

Variable	Total	Percentage
Usia (tahun)		
0-17	22	18.6
18-35	43	36.4
36-55	26	22.1
>55	27	22.9
Gender		
Male	89	75.4
Female	29	24.6
Etiology		
Traffic injury	95	80.5
Fall	15	12.7
Violence	8	6.8
GCS		
Mild	78	66.1
Moderate	29	24.6
Severe	11	9.3
Lesion type		
Epidural Hematoma	40	33.9
Subdural Hematoma	15	12.7
Intraparenchymal Hemorrhage	33	28.0
Subarachnoid hemorrhage	7	5.9
Skull fracture	13	11
Mix lesion	10	8.5
Length of stay (days)		
1-5	45	38.1
6-10	37	31.4
11-15	25	21.2
16-20	4	3.4
21-25	1	0.8
26-31	6	5.1
Outcome		
Discharged	98	83.1
Died	20	16.9