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Incidence report of traumatic brain injury in Mimika Public Hospital Papua



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Kevin Kristian Putra^{1,4*}, Putu Ayu Indra Shanti Wardani², I Wayan Nirvana³¹Internship at Mimika Public Hospital, Mimika, Papua;²Department of Surgery and Anesthesiology, Mimika Public Hospital, Mimika, Papua;³Department of Neurosurgery, Sanglah General Public Hospital, Denpasar, Bali;⁴Faculty of Medicine, Universitas Udayana;

*Corresponding author:

Kevin Kristian Putra;

Internship at Mimika Public Hospital, Mimika, Papua;

Faculty of Medicine, Universitas Udayana;

kevinkristianputra@gmail.com

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ABSTRACT

Introduction: Traumatic brain injury is a functional brain disorder caused by an external force, which giving persistent consequences, progressive, long-term care, and rehabilitation might be needed. It is also called a "silent epidemic" due to the increased global incidence rate, socio-economic burden, and quality of life. The major cause of TBI was road traffic injury, fall, and blunt trauma.

Methods: This research was conducted with a descriptive research design using a prospective cross-sectional design. The research sampling was using medical records in accordance with inclusion and exclusion criteria from 2018 to 2019.

Keywords: Traumatic brain injury, incidence rate, mechanism of injury, Mimika.

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Result: The collected sample was 393 cases. There were 66.16% and 67.18% cases occurred to man and productive age with incidence rate 178.89 in 100.000 people. The major cause of TBI was road traffic injury and intentional injury with 58.52% and 24.17% consecutively. The involvement of alcohol in TBI cases was found in 24.42% of cases. The usage of the helmet was not found in 96.6% of cases of RTI.

Conclusion: The majority of TBI patients at Mimika Public Hospital in 2018-2019 occurred in men and in the productive age, which was majorly caused by road traffic injury and intentional injury.

INTRODUCTION

Trauma is defined as an injury or damage caused by external force and becoming a major cause of morbidities and mortality rates in both developed and developing countries. The usual cases were road traffic accidents (RTA), falls from height, occupational injuries, and assault.^{1,2} According to WHO, RTA was the 8th leading cause of death in all ages and the highest cause of death for children and young adults 5-29 years of age. The death rate was three times higher in low-income countries than in high-income countries.³ The greatest contributor to death and disability among all trauma-related injuries is traumatic brain injury (TBI), often noticed as a "silent epidemic" that remains a major public health concern due to the effect on socio-economic and quality of life. When there are changes in cerebral physiology caused by external forces like mechanical, chemical, electrical, or thermal heating to the skull structure, it is called TBI. The effect was persistence,

progressive, and long-term rehabilitation might be needed. TBI was classified into three severity levels, which are mild, moderate, and severe, which are based on the level of consciousness measured by the Glasgow Coma Scale (GCS). The severity of TBI can determine the management, intervention, and outcome for the patients. The use of other diagnostic tools, like CT-Scan or ultrasonography, are used to determine other causes or effects that might cause before or occur after trauma. The main purpose of TBI management is to prevent upcoming secondary brain injury.^{2,4}

In general, the incidence rate related to brain trauma reported worldwide in the meta-analysis study was 295 per 100.000 people per year. The incidence across Europe with 287.2 per 100.000 hospital admissions/year and the United States with 787.1 per 100.000 emergency department visits/year were higher than the incidence reported in the Middle East Region with 45 per 100.000 hospital

admissions. Correspondingly in Europe, the patients were majorly older, with a mean age of 50 years, and falls from height were the common cause of injury.^{5,6} In 2016, the proportion rate of TBI in Indonesia was 11.9% trauma patients in the last year. Gorontalo, Papua, and North Sulawesi Province had the highest proportion rate with 17.9%, 16.5%, and 15.5%, respectively.⁷

Indonesia has more than 250 million people across the 17.000 islands of their archipelago. Papua Province is located in the east of Indonesia. In 2019, Statistics of Papua recorded that there were 3.379.302 people. Geographically, Papua has abundant natural resources, forests, mountains, and hills. However, the transportation access between regions is limited and difficult, especially by road due to vast and extreme natural conditions.⁸ Mimika had five general hospitals, of which three are located in the same subdistrict, the downtown, and the other is located in different subdistricts

with limited access of transportation. The health resources are very limited, especially in Mimika Public Hospital, although it is located downtown. Overall, in Mimika, there were no neurosurgeon, orthopedic, or trauma surgeons available. The Radiology facility downtown only had plain x-ray and ultrasonography. CT-Scan was available in late 2019. Mimika is the densest region in Papua province with 95.50 People per km² with 219.689 people.⁹ In this dense population, the use of private transportations, like cars and motorcycles, has increased rapidly, unlike the availability of public transportation. The use of safety protocols also lacked data. The increased use of transportations and the application of the safety protocol, which is still questionable, were contributing to the increased number of patients with TBI. Despite the increased case of TBI, there was a lack of evidence that might explain the increase of TBI patients. Understanding the key factors of the increased TBI cases might be the keystone to the intervention in management and prevention in public health to reduce the burden of TBI, especially in rural or limited health resources areas.^{2,5,10} This study aims are to give the basic and appropriate data of characteristics and causes of TBI in Mimika.

METHODS

The data was collected retrospectively from trauma patients between December 2018 and November 2019 at Mimika Public Hospital. Medical record data were collected using the ICD-10 code for

Traumatic Brain Injury (S06) from the patient registration list. Then the hardcopy from the selected medical record number was collected and selected according to the inclusion and exclusion criteria. The analysis of the final selected sample was done with SPSS version 20. The sample size was determined by consecutive method sampling. The inclusion criteria are patients who are diagnosed with TBI with all severity, mild, moderate, and severe TBI. The exclusion criteria are the medical record that cannot fulfill the necessary variables. The variables that were collected are the demographic data like age and gender, mechanism of injury, the severity of TBI, use of the helmet (motorcycle-related injuries), and alcohol involvement. The collected sample is 393 samples. This study had been reviewed and accepted by the ethical clearance committee of the Medical Faculty of Universitas Udayana with ethical clearance No. 416/UN14.2.2.VII.14/LP/2020.

RESULTS

Sample

Based on the data collected, we found 507 cases that were recorded with the ICD-10 code for TBI (S06). After sampling, 393 cases that met all the study criteria were collected for final analysis. From the collected data, there were 66.16% of males, and 33.84 females with 260 and 133 cases of TBI were reported, respectively. According to the data, we also found various ages, which occur from 6 months old baby to 80 years old elderly. The average age was 25.35 years old (95%CI: 23.889–

26.812; $p < 0.05$). The age variable was then divided into three groups, based on the productive age, into not yet productive, productive age, and unproductive age, with respectively 0-17 years, 18-64 years, above 65 years old. The TBI commonly occurred in the productive age followed by the not-yet productive age group with respectively 67.18% and 31.3%.

Demographic and Incidence Rate

In 2018-2019, there were 393 reported cases of TBI. Based on sex profile, reported TBI cases were dominantly by men, with 66.16% cases. Followed by age profile, the productive age group was dominant with 67.18%. The mean age was 25.35 years which is also classified into productive age. Traumatic Brain Injury was classified into three groups of severity: mild TBI, moderate TBI, and severe TBI. The classification was divided based on the Glasgow Coma Scale (GCS) score. Overall, Mild TBI was the highest case of TBI with 91.35%, and only 2 cases of severe TBI were reported. Mimika had 219.689 people. Based on the 393 reported cases in 2018-2019 and the population of Mimika, the incidence rate of TBI in Mimika was 178.89 in 100.000 cases.

Mechanism of Injuries

The mechanism of injury was divided into three groups, such as road traffic injuries (RTI), Intentional injuries, and Unintentional injuries. Road traffic injuries were single and multiple vehicle accidents, including the pedestrian who might be involved in the accident. Intentional

Table 1. Variable characteristics of TBI in 2018-2019

Variables	Mild		Moderate		Severe		Total	
	Σ	%	Σ	%	Σ	%	Σ	%
Gender								
Male	227	63.2	31	96.9	2	100	260	66.16
Female	132	36.8	1	3.1	0	0	133	33.84
Age								
0-17 years	114	31.8	8	25	1	50	123	31.29
18-64 years	239	66.6	24	75	1	50	264	67.18
≥ 65 years	6	1.7	0	0	0	0	6	1.53
Mechanism of injury								
Road traffic injury	202	56.3	26	81.2	2	100	230	58.52
Unintentional injury	66	18.4	2	6.2	0	0	68	17.3
Intentional injury	91	25.3	4	12.5	0	0	95	24.17

Table 2. Mechanism of injury of TBI in Mimika 2018-2019

Variables	Road traffic injury		Unintentional injury		Intentional injury		Total	
	Σ	%	Σ	%	Σ	%	Σ	%
Gender								
Male	159	69.1	44	64.7	57	60	260	66.2
Female	71	30.9	24	35.3	38	40	133	33.8
Age group								
0-17 years	73	31.7	37	54.4	13	13.7	123	31.3
18-64 years	154	67	28	41.2	82	86.3	264	67.2
≥ 65 years	3	1.3	3	4.4	0	0	6	1.5
Alcohol								
Yes	69	30	3	4.4	24	25.3	96	24.4
No	161	70	65	95.6	71	74.7	297	75.6
Helmet								
Yes	8	3.5	-	-	-	-	-	-
No	222	96.5	-	-	-	-	-	-

injuries consisted of assault and abuse. Unintentional injuries consist of falls, work-related and sports-related injuries. We found the most common cause of TBI was RTI with 58.52% cases followed by Intentional injury with 24.17%. TBI caused by RTI and intentional injuries had a higher case with the productive age with 67% and 86.3%, respectively. However, Unintentional injury commonly occurred in not-yet productive age with 54.4% of cases. However, the cause of severe TBI was RTI. The use of alcohol and helmet during or before injuries were collected. At least 24.4% of TBI cases were involved with alcohol usage, and 96.5% of RTI cases were not using helmets.

DISCUSSIONS

This study is the first study to describe the incidence of traumatic brain injury in Mimika, Papua. We evaluate and collect the data from a public hospital located downtown of Mimika. Mimika is located in Papua, Indonesia, which has limited access to transportation compared to other developed cities in Indonesia. The health resources were also limited. The experts in certain fields of medicine such as neurosurgeon, orthopedic, radiographer, paramedic, and emergency system, were not yet available or limited. Other diagnostic modalities such as MRI were also not available until the CT Scan in late 2019. Mimika is also the densest population in Papua. The increased population usually paralleled the rapid use

of transportation. However, the exact data, safety protocol, and availability of public transportation have a lack of data. This study was to report the incidence rate of TBI in Mimika, evaluate the demographic status, severity, mechanism of injuries, and others that involve the severity of TBI, such as alcohol usage and helmet in RTI cases.

The sample collected was 393 cases that met the inclusion and exclusion criteria. Traumatic brain injury was commonly found in males with 66.16% cases and productive age with 67.18% cases. The average age was 25.35 years old. It was supporting the data that TBI mostly occurred in productive age and not-yet productive age groups, with 67.18% and 31.3%, respectively. In this study, we evaluate the severity of TBI based on the GCS score, which 14-15 is mild TBI, 8-13 is moderate TBI, and below 8 is severe TBI. We found that 91.35% of cases were Mild TBI, and only 2 cases were reported of TBI. The overall incidence rate in 2018-2019 was estimated at 178.89 in 100.000 people.

This finding was similar in Lombok and Europe, which stated that the age group of 11-30 years and less than 25 years had the highest case of TBI. Although, in other studies, mean age was found varied, and this variation might occur due to the different analysis as well as inclusion criteria.⁵ The incidence rate was significantly higher than the whole country of Israel but less than Europe with 31.8 in 100.000 people and 260 in 100.000

people respectively. The TBI incidence rate in Mimika cannot be neglected. Because the incidence rate in one rural area in Indonesia had almost six times higher than in Israel, a developed country in middle-east of Asia with more than 8 million people.^{11,12}

The cause of TBI had to be followed. The mechanism of injury of TBI was divided into three groups, such as RTI, intentional injury, and unintentional injury. Road traffic injuries were vehicle-related injuries, either it was single and/or multiple vehicles that happened in the traffic. Pedestrians that could be involved were also included. For example, such as a single and/or multiple accidents by motorcycle or car or pedestrian that got hit by a vehicle, all the victims that were injured were included and caused by RTI. Intentional injuries such as assault and abuse. Usually, these types of injuries might have alcohol and drug involvement. Although in this study, the use of the drug was not recorded. Unintentional injuries were the type of injuries that happen due to involuntary accidents, such as falls, work, and sport-related injuries.^{5,11,12}

From the study, we found the common cause of TBI was RTI followed by intentional injury with 58.52% and 24.17%, respectively. TBI caused by RTI in productivity has commonly occurred with 67% cases. However, we found 54.4% of cases of unintentional injury occurred in the not yet productive age group. The severe TBI was 100% caused by RTI. The result studies in Lombok, Indonesia, Iran,

and India all stated that RTI was more common than Falls or physical assault injuries. Meanwhile, CDC reported that the common cause of TBI were unintentional falls, unintentionally struck by or against objects, and motor vehicle crashes, with 47.9%, 17.1%, and 13.2%, respectively. TBI cases caused by falls were most common among the elderly, and RTI was highest among 15-24 years of age. RTI was the 8th leading cause of death for all ages and the leading cause of death for 5-29 years of age. The strong association between risk of RTI death and income level of countries were reported with three times the risk than the high-income countries. Africa and South-East Asia have regional rates of RTI death higher than the global rate with 26.6 and 20.7 in 100.000 people, respectively.^{3,6,10,12}

The use of safety equipment and alcohol was also recorded because the use of helmets as safety equipment and alcohol might decrease and increase the severity of TBI. We collected the data and found 24.42% of TBI cases had alcohol involvement. Overwhelmingly, 96.6% of RTI cases were not using the helmet as part of safety equipment. In recent studies in the pedal cycling community, the use of helmets was associated with a reduction in severe TBI and a lower rate of TBI cases.¹³

This study had several limitations. First, this study of TBI in Mimika, Papua, Indonesia, which was one of many high dense populations in Indonesia with limited health resources, was unable to be described as a full condition of TBI in Indonesia. Indonesia had many regions, different natural challenges, and different healthcare resources. To present characteristics of TBI in Indonesia, different methods and analytical techniques are required to fully represent Indonesia. Second, the data collection of TBI using medical records might not give the detailed characteristics of TBI, such as the onset of injury, how long the patient takes to get into the emergency room, and patient outcome. Third, recollecting the medical record in storage was quite complicated. Each hospital had different storage, possibly different systems in storing the medical record. The medical record for patients whose alive and dead might be stored differently. Furthermore,

based on the author's knowledge, this was the first study that describes the characteristic of TBI in Mimika. Hopefully, this study might help other authors to further study the characteristics of TBI in Mimika, Papua.

CONCLUSIONS

Traumatic brain injury is a "silent epidemic" that remains a major public health concern because of the high burden of socio-economic status for the patient and families. The finding of this study showed that the majority of TBI patients in Mimika Public Hospital in 2018-2019 were men with 66,16% cases and in the productive age with 67.18%. The major cause of TBI was road traffic injury and intentional injury, with 58.52% and 24.17%, respectively. The incidence rate of TBI in Mimika was 178.89 in 100.000 people. Alcohol involvement was reported in 24.42% of cases. The use of helmets was recorded, with 96,6% of cases of RTI were not using the helmet. Hopefully, these findings may give new insights, whether in clinical and epidemiology of TBI, or in government regulation to reduce the high socio-economic burden of TBI in the community. Further research is necessary to evaluate others and detailed characteristics of TBI.

ETHICAL STATEMENT

This study had been reviewed and accepted by the ethical clearance committee of the Medical Faculty of Universitas Udayana with ethical clearance No. 416/UN14.2.2.VII.14/LP/2020.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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AUTHORS CONTRIBUTION

All authors contributed to the study drafting and design. Preparation, data collection, and analysis were performed by all authors. All authors read and approved the final manuscript.

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