

Original Article

The Profile of Road Traffic Injury-Related Fracture Patient in the Emergency Department of H. Damanhuri Barabai General Hospital

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ABSTRACT

Background: Road traffic injuries (RTIs) are a major cause of fractures, posing significant challenges for healthcare systems especially in rural areas. Based on data from to Traffic Corps of the Indonesian National Police published by the Ministry of Transportation, the number of traffic accidents in Indonesia reached 103,645 cases in 2021. Understanding the profile of RTI-related fracture patients is crucial to improve emergency care and guide preventive strategies. This study aims to identify the profile of the RTI-related fracture patient in the emergency department of H. Damanhuri Barabai General Hospital.

Methods: This study was retrospective observational. We analysed the medical records of RTI-related fracture patients in Emergency Department of H. Damanhuri Barabai General Hospital during March – July 2023. We observed gender, age, mode of injury, type of fracture and bone involved.

Results: There were 91 RTI-related fracture patients from 146 orthopaedic patients recorded. Male had a higher incidence (74%). The highest incidence was observed in 41 – 60 ages group (32%) and 21 - 40 ages group (31%). The most common mode of injury was double traffic injuries (65%) involving motorcycle vs motorcycle (41%). The primary type of fracture was identified as closed fracture (63%). The bone most involved was tibia (27%).

Conclusions: Fractures are common among males during their productive years as a result of traffic injuries. This study provides insights that advance understanding to the prevalence of RTI-related fractures. Additional research is required to develop further overview of RTI-related fractures.

Keywords: Age; Fracture; Gender; Mode of injury; Traffic accidents

INTRODUCTION

A fracture signifies a breach in the structural coherence of bone tissue.¹ Individuals across all age groups are susceptible to incurring road-related fractures. However, the specific type of fracture and the particular bone affected can differ based on various factors, mainly the condition of the individual's bones and the nature of the traumatic incident.² Fractures are commonly caused by trauma or physical activity where there is excessive pressure on the bone.³ Trauma from

road traffic accidents is regarded as the most prevalent origin of fractures, leading to a rise in the overall fracture incidence rate.⁴

RTI (road traffic injuries) are recognised as a major public health problem worldwide, being among the leading causes of morbidity and mortality. Roughly 1.19 million people lose their lives to RTI annually, comprising a quarter of the 5.8 million total global deaths.^{1,5}

According to certain studies, RTI are the major cause of mortality for individuals between the ages of 5 and 29 years. Additionally, two-



thirds of road traffic fatalities occur among people of working age (18-59 years).⁴ Other study showed that around 174 persons out of 100,000 died in Europe due to RTI.⁶ RTI have a particular severe impact on young people, as they are among the top three leading causes of mortality for individuals aged 5 to 44 years worldwide.¹ The highest rates of road traffic deaths and serious injuries occur among young adults aged 17 to 23.¹ Moreover, men face a higher risk approximately three times greater of being killed in road traffic accidents compared to women.¹

Over half of all road traffic fatalities involve vulnerable road users including pedestrians, cyclists and motorcyclists.^{1,5} Motorcyclists are the most prone to being involved in RTI.⁷ In addition to their growing use, motorcycles are commonly utilized in the labour force as motorcycle taxi or deliveries. Owning a motorbike provides advantages over other forms of transportation, including the capability of navigation through crowded roads or cramped alleyways, low acquisition and upkeep expenses, and fuel economy.⁷

Indonesia's economic expansion has led to a surge in both the demand and the ownership of vehicles for transportation due to its high population.⁸ Due to bad driving conduct, extraordinarily high growth rates of motorcycle user have also made traffic management become more challenging. Motorcycles utilization will inevitably rise as recently the public considered them as a "way out" due to poor infrastructure and unavailability of public transportation. It has become more and more common among society, not just for short- and long-distance transport but also for visits within cities. Based on data from Traffic Corps of the Indonesian National Police published by the Ministry of Transportation, the number of traffic accidents in Indonesia reached 103,645 cases in 2021. The number is higher compared to the data from 2020, which recorded 100,028 cases.⁹

Hulu Sungai Tengah regency is located in South Borneo province with total area of 1.770,77

km², total population projections of 260.754 in 2021, total length of roads reached 724.98 km, and total vehicles of 57.432.¹⁰ The objective of this study is to characterize the profile of patients sustaining fractures associated with RTI in Emergency Department of H. Damanhuri Barabai General Hospital in order to enhance the treatment and management of the orthopaedic injuries.

METHODS

Study Design and Ethical Approval

This study employed a retrospective observational design. Ethical approval was received from the ethics review board at H. Damanhuri Barabai General Hospital with Number: 445/106/RSUD/2024.

Data Source and Patient Selection

Medical record data from the period of March to July 2023 were reviewed. There were 146 orthopaedic patients admitted to the Emergency Department of H. Damanhuri Barabai General Hospital during this period. Total of 91 patients with RTI-related fractures were identified and included in the study.

Data Collection

Variables recorded from medical record of 91 patients with RTI-related fractures were (i) Gender, (ii) Age, (iii) Mode of injury, (iv) Type of fracture (closed or open), and (v) Bone involved.

Data Analysis and Presentation

The collected data were analysed using Microsoft Excel software. The findings of the analysis were subsequently presented in tabular and graphical format to illustrate the distribution of the observed variables within the study population.

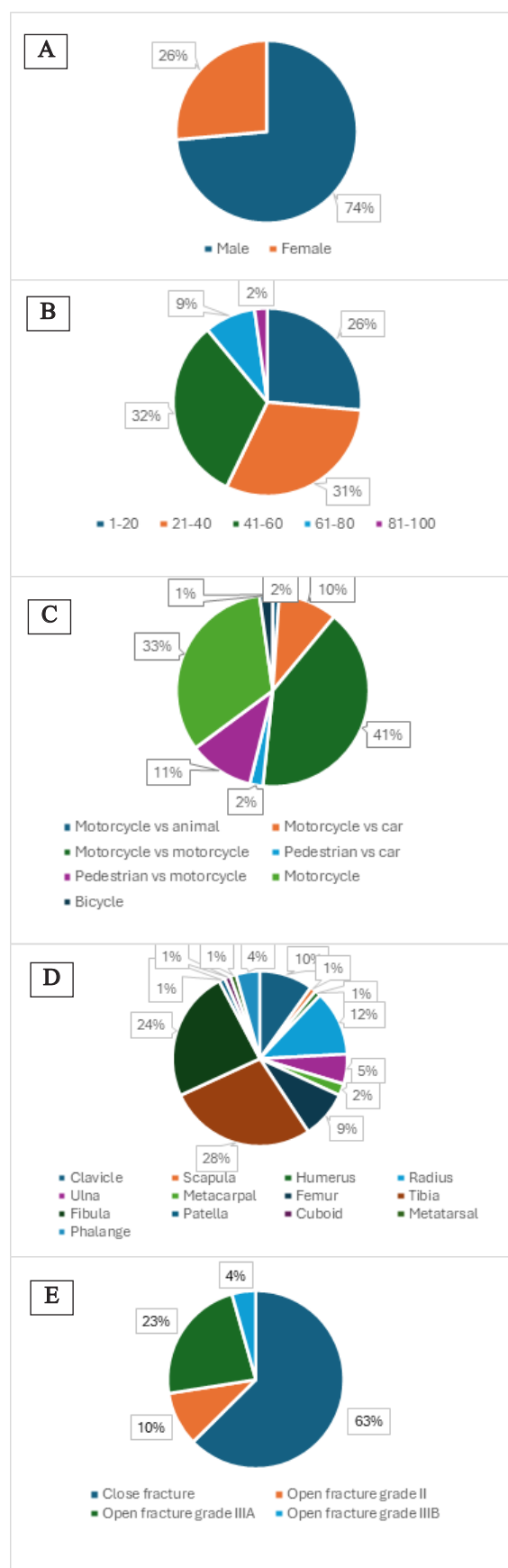
RESULTS

We recorded 91 RTI-related fracture patients



Table 1. The distribution of statistics among RTI-related Fracture at Emergency Department of H. Damanhuri Barabai General Hospital in March to July 2023.

	Number	%
Demographic data		
Gender		
Male	67	74
Female	24	26
Age Group		
0-20	24	26
21-40	28	31
41-60	29	32
61-80	8	9
81-100	2	2
Mode of Injury		
Double		
Motorcycle vs animal	1	1
Motorcycle vs car	9	10
Motorcycle vs motorcycle	37	41
Pedestrian vs car	2	2
Pedestrian vs motorcycle	10	11
Single		
Motorcycle	30	33
Bicycle	2	2
Bone involved		
Upper Extremity		
Clavicle	9	10
Scapula	1	1
Humerus	1	1
Radius	11	12
Ulna	5	6
Metacarpal	2	2
Lower Extremity		
Femur	8	9
Tibia	25	27
Fibula	22	24
Patella	1	1
Cuboid	1	1
Metatarsal	1	1
Phalange	4	4
Type of fracture		
Close fracture	57	63
Open fracture grade II	9	10
Open fracture grade IIIA	21	23
Open fracture grade IIIB	4	4

**Figure 1.** (A) Statistic of gender; (B) Statistic of age group; (C) Statistic of mode of injury; (D) Statistic of bone involved; (E) Statistic of type of fracture

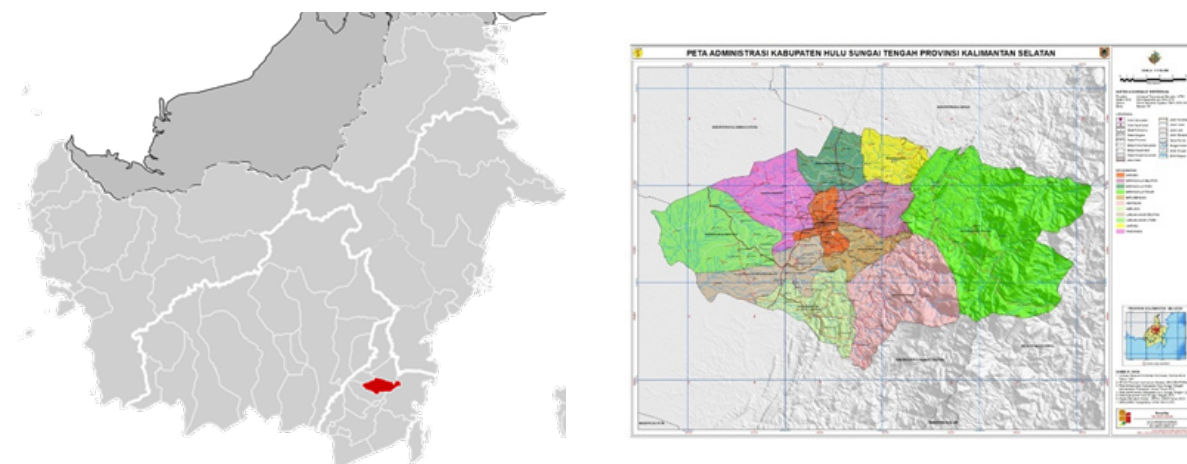


Figure 2. Location of Hulu Sungai Tengah Regency: (A) on Borneo Island, and (B) Map of Hulu Sungai Tengah Regency.

from all 146 orthopaedic patients administered to Emergency Department of H. Damanhuri Barabai General Hospital during March-July 2023. Male had a higher incidence (74 % ; n = 67). The highest incidence were observed in 41 – 60 ages group (32 % ; n = 29) and 21 - 40 ages group (31 % ; n = 28). The biggest mode of injury was double traffic injuries (65 % ; n = 59) involving motorcycle vs motorcycle (41 % ; n = 37). The most common type of fracture was closed fracture (63 % ; n = 57). The bone most involved was the tibia (27 % ; n = 25) (Table 1).

DISCUSSION

Hulu Sungai Tengah Regency is located in the province of South Kalimantan. Hulu Sungai Tengah Regency has an area of 1.770,77 km² (Figure 2).¹⁰ Population of Hulu Sungai Regency based on population projections in 2021 is 260,754 people consisting of 131,045 male population and 129,709 female population.¹⁰ In 2021, the total length of roads in Hulu Sungai Tengah Regency reached 724.98 km.¹⁰ Based on road conditions, 350.04 km of district roads are in good condition, 204.3 km of roads are in moderate condition, 49.85 km are in damaged condition and 120.79 km are in severe condition.¹⁰ There are 6447 cars, 46 light trucks, 532 trucks, and 50,407 motorcycles registered in Hulu Sungai Tengah Regency.¹⁰ Based on the data from Health Department of

South Borneo in 2020, there are 229 incidents of road traffic injuries (136 males and 93 females) in Hulu Sungai Tengah Regency.

We found that males made up 74 % of the patients with RTI-related fracture during the period of this study. According to Jhonet's research, 67% of patients with fractures caused by RTI between 2017 and 2020 were male.¹¹ Sembiring discovered that 77,9% of patients with fractures connected to RTI were male.³ Males are more likely to be seen on the road, either as drivers or passengers, attempting to provide for their families. It is found that younger male individuals are more likely to sustain open fractures due to sport-related activities, falling from elevated heights, traffic incidents, and direct physical trauma or assaults.¹²

Males are at greater risk of RTI due to several factors. Studies have consistently shown that that male individuals exhibit an elevated risk of sustaining severe and life-threatening injuries across various modes of transportation and road environments.¹³ Additionally, males in African, Asian, and Arab countries, tend to engage in more risk-taking behaviours, which are associated with higher rates of mortality and injury.¹⁴ Young males, in particular, have been found to make more traffic violations, which are linked to elevated rates of traffic-related accidents.¹⁵ Furthermore, young male drivers have been found to have the highest predicted violation scores, indicating a



higher propensity for risky driving behaviours.¹⁶ These findings suggest that gender is a substantial factor affecting the risk of road traffic injury, as males are being more prone to engaging in risky behaviours that increase their likelihood of being involved in crashes.

We found that RTI-related fractures are most common in the age group of 41-60 years old (32%) and 21-40 (31%). We found a consistent finding with another similar studies. According to Duhita, the most prevalent age group was 17-25 (42,1%).¹⁷ According to Alhadhoud, 65% of traffic-injuries-related fracture patients were in the 19-49 age range.¹⁸ The highest rates of road traffic deaths and serious injuries occur among young adults aged 17 to 23 (Table 2).¹ The most economically engaged members of society are in this age bracket, which could have a detrimental effect on the nation's emerging economy.

Age is a crucial factor in RTI-related fractures, as the young adults and the elderly are being particularly vulnerable. Young adults are often involved in RTI due to factors such as risk-taking behaviour, alcohol or drug use, and distracted driving.¹⁹ On the other hand, older adults are at a higher risk of RTI-related fractures due to factors such as decreased physical function, reduced reaction time, and age-related changes in vision and hearing.²⁰

We found that double traffic injuries (65%) involving motorcycle vs motorcycle (41%) are the leading cause of traffic-related fractures. Numerous studies indicated that fractures are most frequently caused by RTI.^{3,11,17} Poor infrastructure, such as the lack of road dividers, broken roads, and inadequate lighting, can increase the risk of injuries. Poor driving habits, such as using a mobile phone while driving, not using a rear-view mirror or turn signal, speeding, not driving in the proper lane, and overtaking without signalling, can also lead to traffic injuries.

Motorcycles have a higher risk for traffic injuries due to several factors. Firstly, motorcycle

users are widely recognized as one of the most prone road user populations, which increases their susceptibility to injuries.²¹ Secondly, young motorcyclists, especially high school students, have been found to engage in risky riding behaviours such as breaking speed limits and riding without helmets, which contribute to a higher number of injuries.²² Improper user behaviours, including exceeding speed limits, have been identified as the biggest influence on the chance of an injury.²³ Additionally, factors such as the mileage travelled and the number of motorcycles owned also play a role in the incidence of motorcycle injuries.²⁴ Finally, motorcycles have the highest prevalence rate injuries compared to other mode of transportations, and the increase of motorcycle ownership has been linked to a corresponding rise in road traffic injuries.²⁵ The World Health Organization (WHO) predicts that injuries from violence and traffic crashes would rank higher than other causes of mortality, with traffic crash deaths likely to ascend to the fifth place by 2030.¹

Furthermore, the incidence of RTI-related fractures is influenced by socioeconomic factors and the quality of road safety infrastructure.²⁶ Countries with lower and middle levels of economic development have a higher incidence of these fractures compared to developed countries.²⁷

The most prevalent type of fracture encountered was closed fracture (63 %) followed by open fracture grade IIIA (23%). This classification is based on the Gustilo-Anderson classification, which characterizes open fractures according to the extent of associated soft tissue damage. The most common anatomical sites for RTI-related fractures include the lower extremities (such as the femur, tibia, and fibula) and the upper extremities (such as the clavicle, humerus, and radius/ulna).²⁸

Several studies showed that close fracture is more common than open fracture.²⁹⁻³¹ Interestingly, there were no incidences of grade IIIC open fractures during the study period. This may occur from patients never being referred



Table 2. Another current studies about profile of traffic-injuries-related fracture

Author	Duration	Gender	Age	Mode of Injury	Open vs Close	Bone
Jhonet, 2022 ¹¹	2017-2020 (48 months)	Male (67%)	20-60 (8.7%)	High energy (89.6%)	Open (50.4 %) Close (49.6%)	Tibia middle
Duhita, 2021 ¹⁷	January 2018-June 2019 (18 months)	Male (23.6%)	17-25 (42.1%)	Not mentioned	Open (31.6%) Close (68.4%)	Metacarpal
Sembiring, 2022 ³	2016-2018 (36 months)	Male (77.9%)	18-60 (80.8%)	High energy (100%)	Open (32.7%) Close (67.3%)	Femoral shaft
Noorisa, 2017 ²⁹	2013-2016 (48 months)	Male (72%)	15-24 (36%)	High energy (92%)	Open (29%) Close (71%)	Femoral shaft
Widhianto, 2019 ³⁰	2013 – 2017 (48 months)	Male (77%)	41-60 (57%)	RTI (41%)	Not mentioned	Vertebrae Thoracal
Ewari, 2021 ³¹	2020 (12 months)	Male (56%)	18-59 (56%)	RTI (64%)	Not mentioned	Tibia Fibula (70%) Tibia (27%)
Ramad-hani, 2019 ³²	2017 (12 months)	Male (73%)	Not mentioned	RTI (50%)	Open (15%) Close (85%)	Lower extrem- ity
Alhadhoud, 2022 ¹⁸	January 2018 – Feb- ruary 2020 (26 months)	Male (78%)	19-49 (65%)	RTI (37.9%)	Not mentioned	Spinal
Court-Brown, 2012 ¹²	1995 - 2009	Male (69.1%)		Crush (30.5%) RTI (15.9%)		Phalange (45.7%)

from the area or from patients dying from acute bleeding on roadside haemorrhages.

We found that the tibia is the most fractured bone in road traffic injuries (27%), followed by fibula (24 %) and radius (12 %). We assume that this is because of the way the patients try to protect themselves by using their forearm and leg, so those parts of bodies sustain the most energy during a traffic injury. According to several studies, the most often fractured bones in traffic injuries were the tibia and fibula.^{11,31-32} Other studies showed that the most common bone involved in fracture due to traffic injuries is the femur fracture.³³ This type of fracture is most frequently occurred in individuals who ride motorbikes or cycles.³⁴ Other common fractures include tibia fractures, radius fractures, humerus fractures, and fractures of the cranial vault.³⁵

High morbidity and mortality rates due to traffic injuries have been of concern for decades.³⁶ The breakdown does not only impact the casualties but also the environment nearby.³⁷ Sudden

disability and death on site could happen in any traffic injuries, while massive-scale injuries may wreak havoc around the scene. Many factors influence the occurrence of traffic injuries and the injuries dealt with.

Human error has become the main risk factor due to traffic injuries.⁶ Most drivers tend to increase their vehicle speed without being alert to their surroundings.³⁸ Studies have found that the risk of death is high for both pedestrians struck by the front of vehicles and vehicle occupants involved in side-impact collisions between vehicles when the average speed is 65 km/h. Higher average vehicle speeds are strongly associated with an increased probability of traffic injuries occurring as well as more severe consequences from resulting collisions.⁵ Non-driving activities were found in many car injuries.³⁹ A car crash is around four times more likely to occur when a driver is using a mobile device. Operating a mobile device while driving has been shown to



diminish reaction times, especially in regard to braking manoeuvres and the ability to respond to traffic control devices. Keeping the correct lane and following distances becomes more challenging as well. However, certain studies suggest that using hands-free phones as a replacement for hand-held ones provides minimal safety benefits, and engaging in text-based communication still significantly elevates the probability of traffic-related injuries occurring.⁵ Fatigued drivers may have delayed reactions due to decreased perceptual processes and receiving information. This may cause by irregular driver shifts, brief or lengthy delays, and feeling tired at the start of the work week.^{6,38} Many drivers are underage and lack experience using any vehicle, which increases the risk of injuries.³⁸ Furthermore, it is not unusual to find traffic injuries caused by drunk drivers or people under the influence of drugs. People with some medical issues are not recommended to drive on their own.⁴⁰

Another factor contributing to traffic injuries is infrastructure problem. The main roads connecting cities in developing nations are frequently in poor condition.³⁷ Incorporating the safety needs of diverse road users should be a key consideration in the design of roadway infrastructure to provide appropriate facilities and accommodations. Implementing traffic calming strategies, such as designated pedestrian crossing points, bicycle lanes, and pedestrian pathways, could be crucial for mitigating risks to diverse road users.⁵ Lack of parking space may cause people to lay their vehicles on the side road or traffic lanes inappropriately.⁴¹ Low lightning areas are responsible for traffic injuries by night-time drivers.³⁸ Inadequate road traffic signs can be dangerous especially at highland or ridge areas.⁴² Brake system dysfunction is commonly found in traffic injuries which makes routine vehicle check strongly recommended to ensure no mechanical failure or any defect exists.³⁹ Properly utilizing protective headgear has been demonstrated to decrease the likelihood of sustaining

brain injuries and reduce the risk of fatality from traffic-related accidents. Employing seatbelts and age-appropriate child safety restraints has been shown to halve the risk of fatality for vehicle passengers.⁵ Further preparation is necessary when driving in bad weather. Factors that determine safe weather while driving are visibility, temperature, wind speed, precipitation and moistness.³⁹ Furthermore, according to some research, reducing the frequency of traffic injuries or minimizing the damage caused requires an understanding of the risk factors and the appropriate enforcement of traffic regulations. Vehicles designed with robust safety measures are imperative for reducing the occurrence of collisions and diminishing the potential for catastrophic injuries. Implementing vehicle safety regulations as manufacturing and production standards could potentially save a vast number of lives. Requiring automotive manufacturers to adhere to front and side impact safety standards, incorporate electronic stability control to prevent excessive steering, and ensure all vehicles are equipped with airbags and seatbelts could potentially reduce the occurrence of traffic-related injuries. In the absence of these fundamental guidelines, the likelihood of traffic-related injuries to both vehicle occupants and pedestrians is substantially increased.^{5,43}

CONCLUSION

This study assessed the profile of the RTI-related fracture patient in emergency department of H. Damanhuri Barabai General Hospital from March to July 2023. Men are more likely to sustain fractures from RTI. Individuals in the 41-60 age group are more susceptible to sustaining fractures from RTI. Motorcyclists involved in collisions with other motorcycles were more likely to sustain fractures from RTI. The most common type of fracture identified is the closed fracture. The tibia was the most frequently injured bone in traffic-related injuries. This study provides profiles of RTI-related fracture in emergency department of H. Damanhuri Barabai General Hospital



which give important insights that advance understanding to the prevalence of fractures related to road traffic injuries. Additional research is required to develop a more complete overview of fractures caused by road traffic incidents.

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Due to privacy restrictions, the raw data cannot be made publicly available. However, aggregated and anonymized data are available from the corresponding author upon reasonable request.

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