

Article

# Profile and Description of Injury Victims Died due to Traffic Accidents on Motorcycle Riders at the Forensic Section of Dr. RSUP. M. Djamil Padang Year 2018 – 2019

Rika Susanti<sup>1</sup>, Anggi Rahmi Rusadi<sup>2</sup> Fory Fortuna<sup>3</sup>

<sup>1</sup> Andalas University Faculty of Medicine, Padang

<sup>2</sup> Forensic Department, Faculty of Medicine, Andalas University, Padang

<sup>3</sup> Department of Surgery, Faculty of Medicine, Andalas University, Padang

## SUBMISSION TRACK

Received: January 26, 2021  
Final Revision: June 05, 2021  
Available Online: June 28, 2021

## KEYWORDS

Traffic accidents, victims who died, motorcyclist

## CORRESPONDENCE

Phone: +628116690818  
E-mail: [anggirahmi40@gmail.com](mailto:anggirahmi40@gmail.com)

## A B S T R A C T

**Backgrounds:** Fatalities and injuries in traffic accidents are a serious problem of the world and show that will continue to occur in the future. The cause of injury in traffic accidents mostly occurs in motorcyclists.

**Objectives:** To know the profile and patterns of injury in victims who died due to accidents on motorcyclist at the Forensic Department of RSUP Dr. M. Djamil Padang 2018 – 2019

**Methods:** This is a retrospective descriptive study with a total population sampling design. Data of the victims was taken from secondary data in the Forensic Department of Dr. M. Djamil Hospital, Padang for the period 2018 – 2019.

**Results:** The study showed that a total of 74 victims who died mostly found in men (89.2%) and in the 22-40 year age group (28.4%). Based on the location and types of the injury, the most common injuries were to the head (31%), and abrasions (62%). The location of the victim's death was mostly found in the scope of the hospital with the most length of stay, namely 0 - 3 days and types of acceptance were the reference victims.

**Conclusion:** Victims who died mostly found in males and ages from 22 to 40 years, so it is necessary to conduct socialization on the dangers of death to motorcyclists as well as outreach efforts to the community, especially young people, about traffic awareness and behavior

## I. INTRODUCTION

Deaths and injuries from traffic accidents are a serious problem worldwide and are likely to indicate that this will continue to happen in the future.<sup>1</sup> Injuries in traffic accidents are the 8th leading cause of death for all ages and the leading cause of death in children and young adults aged 5-29 years.<sup>2</sup> The risk of death is three times higher in low-income countries than in high-income countries with an average of 8.3 deaths per 100,000 population. Based on the Global Status Report on Road Safety, it is said that worldwide more than 1.25 million people die from traffic accidents and 50 million people are seriously injured per year. Of these, 90% occur in developing countries.<sup>3</sup> The death rate from traffic accidents continues to increase and reaches 1.35 million victims in 2016. Countries in Africa and Southeast Asia have an average death rate from traffic accidents that is higher than the world average of 26.6 and 20.7 deaths per 100,000 population.<sup>2</sup> If there is no continuous action, then road traffic accidents are estimated to be the 7th leading cause of death in 2030.<sup>2</sup>

Motor vehicle accidents are the leading cause of death in adolescents and young adults worldwide. The head and extremities are the most frequently injured body parts due to traffic accidents. Most of the victims who suffered injuries as a result of traffic accidents suffered permanent disability, amputation, head injury or spinal cord injury.<sup>4</sup> A study conducted in Addis Ababa Ethiopia, limb fractures in adults due to traffic injuries accounted for almost half of limb injuries.<sup>5</sup>

According to law no. 22 of 2009 concerning Traffic and road users, a traffic accident is an incident on the road that is unexpected and unintentional involving a vehicle with or without other road users resulting in human casualties and/or property loss. Based on the 2018 Basic Health Research (Riskesdas), the causes of injuries in traffic accidents mostly occur in motorcycle riders.<sup>6</sup> In Indonesia, the economic loss resulting from injuries in traffic accidents is estimated at 2.9% of Gross Domestic Product (GDP).<sup>7</sup>

According to police data, in Indonesia, it is said that an average of 3 people die every hour due to traffic accidents. Based on these data, it was found that the magnitude of the accident rate was caused by several factors, including: 61% of accidents were caused by human factors related to the ability and character of the driver, 30% caused by inadequate infrastructure and environmental factors, and 9% caused by vehicle factors related to the fulfillment of roadworthy requirements and techniques.<sup>8</sup>

In West Sumatra in 2017 the number of traffic accidents was 2,871 cases and the incidence in the city of Padang was 536 cases with 42 deaths, 259 serious injuries and 492 minor injuries.<sup>9</sup> The number of traffic accidents in the city of Padang in 2018 increased by 663 cases with 71 deaths, 100 serious injuries and 808 minor injuries.<sup>10</sup> This study was aimed to determine the profile and description of the injury victims died from traffic accidents on motorcycle riders in the Forensic Section of Dr. RSUP. M.Djamil Padang in 2018 – 2019.

## II. METHODS

The type of research used in this study is a retrospective descriptive study. The data were taken from the results of the post-mortem et repertum of the corpse at Dr. RSUP. M. Djamil

Padang. The population of this study were all the bodies of victims of motorcycle accidents recorded at the Forensic Section of Dr. RSUP. M. Djamil Padang from January 2018 to December 2019.

The sample in this study was taken by total sampling technique with samples that have met the inclusion and exclusion criteria. The inclusion criteria were victims of traffic accidents on motorcycle riders who died and an external examination of the bodies was carried out at the Forensic Section of Dr. RSUP. M Djamil Padang in 2018-2019. Exclusion criteria were victims who did not have complete data such as location of injury, type of injury, age, gender, type of hospital admission, length of stay and location of death.

The data collection procedure was carried out using medical records of accident victims on motorcycle riders who died in the Forensic Section of Dr. RSUP. M. Djamil Padang in 2018-2019 who met the inclusion and exclusion criteria. The data recorded were age, gender, location of injury, type of injury, type of acceptance of the victim at the hospital, location of death, and length of time the victim was hospitalized. The data analysis used is univariate analysis which is intended to analyze each of the existing research variables descriptively by calculating the frequency distribution.

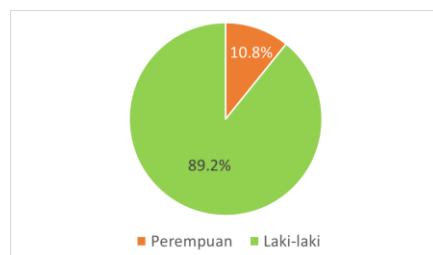
### III. RESULT

This study is a retrospective descriptive study using secondary data in the form of visum et repertum from victims who died due to traffic accidents on motorcycle riders in the Forensic Section of Dr. RSUP. M. Djamil Padang for the period January 2018 – December 2019. During this period, a sample of 74 visum et repertum data were obtained from victims who met the inclusion and exclusion criteria.

**Table 1. Distribution of deaths due to accidents among motorcyclists by age**

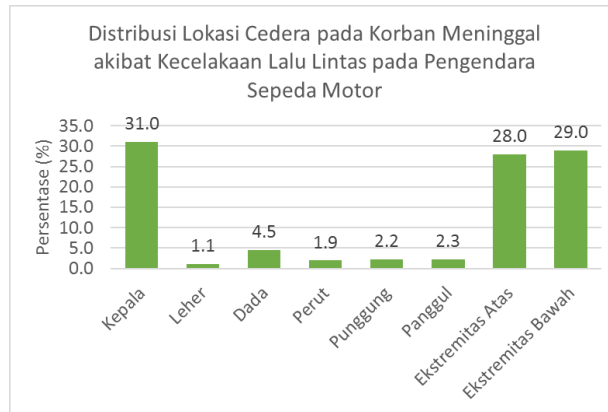
Age	n	%
12 years	1	1.4
13 – 17 years old	11	14.9
18 – 21 years	15	20.3
22 – 40 years	21	28.4
41 – 60 years	14	18.9
> 60 years old	12	16.2
<b>Total</b>	<b>74</b>	<b>100</b>

In table 1 it can be seen that of the 74 samples found the most in the age group 22-40 years by 28.4% (21 people).



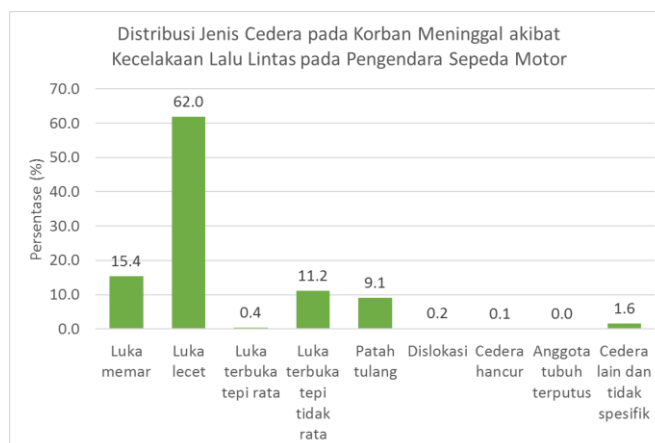
**Diagram 1. Distribution of death toll from traffic accidents among motorcyclists by gender**

Based on 1. it can be seen that the distribution of victims who died due to traffic accidents on motorcycle riders by gender was mostly found in men with 66 people (89.2%) compared to women, which amounted to 8 people (10.8%) with 8.25:1 ratio.



**Diagram 2. Distribution of locations of injuries to victims who died due to accidents on Motorbikes**

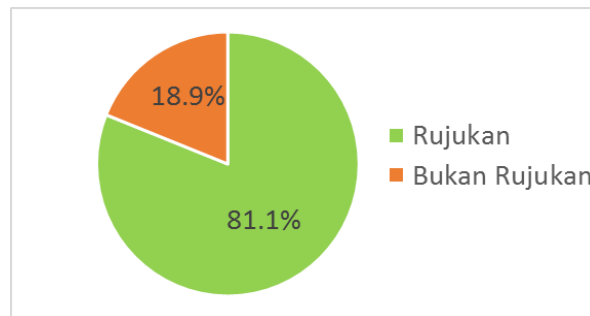
Based on diagram 2. it can be seen that the distribution of the location of injuries to victims who died due to traffic accidents on motorcycle riders was mostly found in the head with 258 injuries (31%), followed by the lower extremities with 241 injuries (29%), the upper extremities with 233 injuries (28%), chest as many as 37 injuries (4.5%), hip injuries as many as 19 (2.3%), back as many as 18 injuries (2.2%), stomach injuries as many as 16 (1.9%), and neck as many as 9 injuries (1.1%).



**Diagram 3. Distribution of types of injuries among victims who died due to accidents on motorbikes**

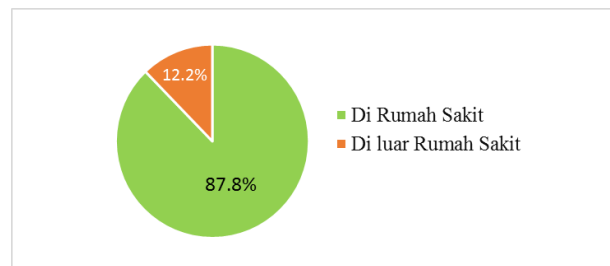
Based on diagram 3. it can be seen that the distribution of types of injuries to victims who died due to traffic accidents on motorcycle riders was the most common, namely injuries

515 abrasions (62%), followed by contusions 128 (15.4%), 93 uneven edges (11.2%), fractures 76 (9.1%) , other and unspecified injuries were 13 (1.6%), flat edge open wounds were 3 (0.4%), dislocations were 2 (0.2%), and crushed injuries were 1 (0, 1%).



**Diagram 4. Distribution of types of receipts for victims who died due to accidents on motorbikes**

Types of receiving victims in hospitals are grouped into two, namely referrals from other health facilities and non-referrals from other health facilities. Based on the results of the study which can be seen in diagram 4.4, it was found that the most victims died due to accidents on motorbikes, namely referrals from other health facilities as many as 60 people (81.1%), while victims who were not referred were 14 people (18.9%) with a ratio of 4.3 : 1.



**Diagram 5. Distribution of the location of deaths of victims who died due to accidents on motorbikes**

Based on diagram 5. it was found that the location of deaths of victims who died due to accidents on motorbikes occurred more in the scope of the hospital with a total of 65 people (87.8%) compared to outside the scope of the hospital as many as 9 people (12.2%) with a ratio of 7.2: 1.

**Table 2. Distribution of length of stay in hospital for victims who died from traffic accidents****on motorcycle riders**

<b>Length of stay in hospital</b>	<b>N</b>	<b>%</b>
0 – 3 days	53	71.6
4 – 7 days	11	14.9
8 – 14 days	7	9.5
15 – 30 days	3	4
31 days	0	0
<b>TOTAL</b>	<b>74</b>	<b>100</b>

Based on table 2. it can be seen that the length of time the victim was treated in the hospital for victims who died from traffic accidents on motorcycle riders from 74 samples was obtained at the most in the 0-3 day time group of 71.6% (53 people), and the most slightly in the 15 – 30 day time group, which is 4% (3 people)

**IV. DISCUSSION**

The results of this study indicate that the victims who died from traffic accidents on motorcycle riders from 74 samples were found to be most common in the age group of 22-40 years, namely 21 people (28.4%) with an average age of 27 years. This is in accordance with the results of a study conducted by Riandini IL, et al who also looked at the distribution of the age frequency of victims who died in traffic accidents in the Forensic Section of Dr. RSUP. M. Djamil Padang in the period July 2010 to June 2012 was mostly in the age group 19-35 years with the category of road users in which the victims who died the most were motorcycle riders, namely 40 cases.<sup>11</sup>This shows that in general the distribution of victims who died due to traffic accidents among motorcyclists based on age in Dr. RSUP. M. Djamil Padang remains the same.

The results of this study are also in line with research conducted by Sae-Tae N, et al in Thailand which found that the distribution of victims who died among motorcycle riders was mostly found in the age group of 25-44 years by 33.7%.<sup>12</sup> This is also in accordance with the WHO report which states that more than half of traffic accidents occur in young adults with an age range of 15-44 years.<sup>13</sup>

This study shows that death due to traffic accidents among motorcyclists tends to be a lot at a young age, this is because motorcycle riders among young people have risky behaviors such as speeding habits, drinking alcohol, the desire to seek sensation and lack of experience in controlling the vehicle.<sup>14,15</sup>Risky driving behavior can also be influenced by uncontrolled emotions. According to statistical reports in most countries of the world, the main causes of traffic accidents are aggressive driver behavior, stress, emotional instability, depression and insecurity while driving.<sup>15</sup>

This study also shows that the number of deaths due to traffic accidents among motorcyclists is more in men than women. In Indonesia, this is in line with the results of research conducted at Dr. RSUP. Sardjito Yogyakarta who stated that the number of deaths in traffic accidents was more in men (72.1%) with the percentage of motorcycle riders being 80.6%.<sup>16</sup> This is also in line

with the research conducted by Barzegar A, et al in Iran during the period 2011-2017 that deaths due to motorcycle accidents were more in men (95.3%) than women (4.7%).<sup>14</sup>

Based on the WHO statistical report which states that men from a young age are more likely to be involved in traffic accidents and about three quarters (73%) of all road traffic deaths occur in men.<sup>17</sup> Female drivers often drive with greater caution in dangerous situations.<sup>18</sup> In addition, motorcyclists usually require physical exertion to control the motorcycle safely. Women are usually not as strong as men so the chances of fatal injury in an accident are lower.<sup>19</sup> Men tend to be more involved in activities outside the home due to their responsibilities as the main breadwinner in the family.<sup>14,20</sup> In addition, men are the largest road users and prefer motorcycles. Male drivers tend to show emotional characteristics of irritability, impatience, desire to drive fast and aggressively, and inattention to danger.<sup>12,21</sup>

The anatomical location of the body with the most injuries in the victims who died from motorcycle accidents was the head with 258 injuries (31%). This is in line with research conducted at RSUP Dr. Sardjito Yogyakarta that the distribution of injuries to victims who died from motorcycle accidents was mostly in the head area, which was 49%.<sup>22</sup> Research conducted by Barzegar A, et al in Iran in the period 2011 – 2017 found that head injuries are more common and are the main cause of death for motorcyclists. Head injury was the leading cause of death in 16,724 cases (59.0%), followed by multiple fractures and mixed causes.<sup>14</sup> Head injuries often occur in motorcycle accidents due to lack of compliance in driving such as the use of head protection/helmets, the application of traffic signs for safety and high speed while driving.<sup>23</sup>

Trauma to the head is common and is the leading cause of death for motorcyclists.<sup>14</sup> This is because the head is the location of the most vulnerable injury which is very fatal in motorcycle accidents, especially in the use of bad helmets. Research conducted by Feduyile F, et al showed that the majority of victims died from craniocerebral injuries (traumatic brain injury).<sup>24</sup> This is also in line with research conducted by Saunders RN, et al. that the most common cause of death in motorcycle accidents is traumatic brain injury as much as 42.3% followed by bleeding as much as 26.8%.<sup>25</sup>

The most common types of injuries found in victims who died from traffic accidents on motorcycles were abrasions as many as 515 pieces (62%). This is in line with research at Sanglah Hospital Denpasar that the most common type of injury found in victims who died from motorcycle accidents was abrasions with a percentage of 97.3%.<sup>26</sup> This study is also in line with the results of research conducted by Faduyile F, et al, where the most common type of injury was abrasion, which was 52.72%.<sup>24</sup>

Scratches or abrasions are often found in motorcycle accidents because when falling from a motorcycle, motorcyclists will usually be dragged by the repulsive force between two objects, it can be due to friction between the road surface, clothing, and skin, causing abrasions on the body parts that come into contact. live.<sup>27</sup> Motorcycle accident victims generally have at least one type of injury and suffer many injuries, both from the type and location of the injury.<sup>28</sup> The types of injuries found in victims are generally caused by blunt force so that injuries to internal organs or bleeding cannot be evaluated from the outside. The mechanism of blunt trauma generally affects organs such as the brain, liver, spleen, and kidneys so that they tend to have a higher severity of injury and risk of death.<sup>29</sup> Trauma to the head which is likely to cause brain injury is found and is the main cause of death for motorcyclists, but the cause of death in this study could not be evaluated because only external examination of the corpse was carried out.

Distribution of locations of deaths of victims who died due to traffic accidents on motorcycle riders at Dr. RSUP. M.Djamil Padang happens a lot in the scope of the hospital. This is in line with research conducted by Barzegar A, et al where it was found that deaths due to motorcycle accidents often occur in hospitals, which are 49.9% followed by deaths at the scene of the incident by 41.9% and during the trip by 7.4%.<sup>14</sup>

Based on a hospital-based study conducted by Woyessa AH, et al, it was found that of all patients injured in traffic accidents, 38.8% of them died and 13.6% were discharged with permanent disability. A total of 36.1% of victims came dead with a distribution of 20.4% died on the spot and 15.7% died on the way. Furthermore, 31.5% of the victims died in the ER, and 13% of deaths occurred in the ward/ICU.<sup>30</sup> Hospital mortality increased for every additional hour a patient spent in the ED, with 8.3% of patients staying in the ED between 4 hours and 5 hours eventually dying.<sup>31</sup> Meanwhile, motorcycle riders with findings of severe head injuries are more prone to die at the scene due to high energy trauma mechanisms and not wearing a helmet resulting in no protection for the head during a collision. However, motorcycle riders who are hospitalized with a head injury are also at risk of dying due to other severe trauma discovered during hospitalization.<sup>32</sup>

The results of the study on the distribution of types of victim acceptance in the hospital to victims of motorcycle accidents at Dr. M.Djamil Padang found as many as 60 victims (81.1%) were referrals from other health facilities, while as many as 14 people (18.9%) victims came alone or were not referrals. This is in line with the statistical report from the West Sumatra provincial police that most traffic accidents occur outside the city of Padang, which is 90.8%, while in the city of Padang it is 9.2%.<sup>33</sup>

The length of time the victim died due to an accident on a motorcycle rider at Dr. M. Djamil Padang was mostly in the 0 – 3 day period, namely 53 victims (71.6%) and none was more than 31 days with an average length of stay for the victim, which was 3.2 days before death. The results of this study are not much different from the study at a tertiary trauma center in Singapore conducted by Cheong HU, et al. It was found that the average length of stay for motorcycle accident victims before death was 3.6 days.<sup>34</sup> This is not much different from the research conducted by Rebollo-Soria MC, et al that most of the injured victims of motorcycle accidents died in the hospital (91.4%), among those who survived more than 24 hours had hospitalization for 4 days.<sup>35</sup>

Length of stay in the hospital can be influenced by age, gender, mechanism of traffic injury, infection, type of injury, and the ISS (Injury Severity Score) value of the victim.<sup>36</sup> Adolescent motorcycle riders are the main population of patients hospitalized for trauma care because this population tends to show a higher severity of injury than other trauma patients and a different pattern of bodily injury than adult motorcyclists.<sup>37</sup> This indicates the need to emphasize the use of protective equipment, especially helmets, to reduce the severity of injuries.<sup>38</sup>

Patients who die most often result from advanced complications of infection.<sup>31</sup> This is in accordance with research conducted by Shafi S, et al. which showed that the most important determinant of length of stay was the occurrence of complications. Complications are also the only potentially modifiable determinant of length of stay. Better resuscitation and improved bleeding control techniques that reduce mortality can reduce treatment costs by reducing complications. Complications such as infection, pulmonary embolism, cardiovascular, and respiratory complications are the most important determinants of length of stay. Several non-



clinical factors that can affect the length of hospitalization include insurance status, family support, or functional status before the injury.<sup>39</sup>

## V. CONCLUSION

Based on the results of this study, it can be concluded that the number of victims who died from traffic accidents on motorbikes was mostly male and in the age group 22-40 years with the most distribution of locations and types of injuries, namely in the head and abrasions. The location of the death of the most victims is within the scope of the hospital with the length of time the victim was treated before dying in the hospital at most in the range of 0 – 3 days and the average length of stay was 3.2 days. The most common type of receiving victims in hospitals is referrals from other health facilities.

## REFERENCES

1. World Health Organization. Update WHO Projections of Mortality and Causes of Death 2016-2060. 2013.
2. World Health Organization. Global Status Report on Road Safety 2018. 2018: 20-80.
3. World Health Organization. Global Status Report on Road Safety 2015. 2015: 32-80.
4. Seid M, Azazh A, Enquesselassie F, Yisma E. Injury characteristics and outcome of road traffic accident among victims at Adult Emergency Department of Tikur Anbessa specialized hospital , Addis Ababa , Ethiopia : a prospective hospital based study. *BMC Emerg Med.* 2015;15(10):1-9.
5. Admassie D, Yirga T, Wamisho B. Adult limb fractures in Tikur Anbessa hospital caused by road traffic injuries. *Ethiop J Heal.* 2010;24(1):1-3.
6. Ministry of Health of the Republic of Indonesia. Main Results of Riskesdas 2018. 2018: 123-133.
7. Djaja S, Widyastuti R, Tobing K, Lasut D, Irianto J. OVERVIEW OF TRAFFIC ACCIDENTS IN INDONESIA, YEAR 2010-2014 Description of Traffic Accident in Indonesia, Year 2010-2014. *J Ecol Health.* 2016;15(1):30-42.
8. Bureau of Communication and Public Information of the Ministry of Transportation. Transportation Statistics. 2017.
9. BPS. Land Transportation Statistics. (SS Transport, ed.). BPS RI. 2018: 12-59.
10. BPS. Traffic Accident Data that Occurred in West Sumatra. [https:// solokkota.bps.go.id /statictable/2018/09/27/518/data-kecelakaan-traffic-yang-terjadi-di-provinsi-sumaterabarat-2017.html](https://solokkota.bps.go.id/statictable/2018/09/27/518/data-kecelakaan-traffic-yang-terjadi-di-provinsi-sumaterabarat-2017.html) - Accessed October 2020
11. Riandini IL, Susanti R, Yanis A. Description of the Injuries of Traffic Accident Victims Conducted Examination at Dr. RSUP. M. Djamil Padang. *Andalas Health Journal.* 2015;4(2):502-508.
12. Sae-Tae N, Lim A, Dureh N. Determinants of severe injury and mortality from road traffic accidents among motorcycle and car users in Southern Thailand. *Int J Inj Contr Saf Promot.* 2020;27(3):286-292.
13. Paden M, R. S, D. S, et al. World Report on Traffic Injury Prevention. WHO. 2004;10(4):255.
14. Barzegar A, Ghadipasha M, Forouzesh M, Valiyari S, Khademi A. Epidemiological study of traffic crash mortality among motorcycle users in Iran (2011–2017). *Chinese J Traumatol - English Ed.* 2020;23(4):219-223.
15. Hassanzadeh K, Salarilak S, Sadeghi-bazargani H, Golestani M. Motorcyclist risky riding behaviors and its predictors in an Iranian population. *J Inj Violence Res.* 2020;12(2):161-170.

16. Istiqomah NP. Assessment of Livor Mortis in Traffic Accident Cases with Death Victims at the Forensic Medicine Installation of Dr. RSUP. Sardjito for the period 2011-2015: an analysis of post mortem interval predictions from a tanatological point of view (thesis). Yogyakarta: Gajah Mada University
17. WHO. Road Traffic Injuries. World Health Organization. <http://www.who.int/mediacentre/factsheets/fs358/en/> - Accessed March 2021.
18. Kashani AT, Jafari M, Bondarabadi MA, Dabirnejad S. Factors affecting the accident size of motorcycle-involved crashes: a structural equation modeling approach. *Int J Inj Contr Saf Promot.* 2020;28(1):16-21.
19. Chang YH, Li CY, Lu TH, Artanti KD, Hou WH. Risk of injury and mortality among driver victims involved in single-vehicle crashes in Taiwan: Comparison between vehicle types. *Int J Environ Res Public Health.* 2020;17(13):1-9.
20. Elachi I, Yongu W, Odoyoh OO, Mue D, Ogwuche E, Ahachi C. An epidemiological study of the burden of trauma in Makurdi, Nigeria. *Int J Crit Illn Inj Sci.* 2015;5(2):99.
21. Delamou A, Kourouma K, Camara BS, et al. Motorcycle Accidents and Their Outcomes amongst Victims Admitted to Health Facilities in Guinea: A Cross-Sectional Study. *Adv Prev Med.* 2020;2020:1-7.
22. Setiawan E. Proportion of Deaths in Motorcycle Accidents in Forensic Medicine Installation, Dr. RSUP. Sardjito Yogyakarta (thesis). Yogyakarta: Gajah Mada University: 2012.
23. Arifin MZ. Head of Injury Management. Vol. 856; 2020:1-28.
24. Faduyile F, Emiogun F, Soyemi S, Oyewole O, Okeke U, Williams O. Pattern of injuries in fatal motorcycle accidents seen in lagos state university teaching hospital: An autopsy-based study. *Open Access Maced J Med Sci.* 2017;5(2):112-116.
25. Saunders RN, Dull MB, Witte AB, et al. The danger zone: injuries and conditions associated with immediately fatal motorcycle crashes in the state of michigan. *Am J Surg.* 2018:1-13.
26. Octavianti PH. Prevalence and Description of Injury Patterns for Motorcycle Accident Victims at the Forensic Installation of Sanglah Hospital Denpasar in 2013. *Director of Open Access Journals.* 2016;7(1):33-41.
27. Lulie Y, Hatmoko JT. Analysis of the relationship between speed and recommended helmet thickness. *J Civil Tech.* 2006;6(2):4-15.
28. Riyadina W, Puspitasari I. Profile of the severity of injuries in motorcycle accident victims at the Emergency Installation of Fatmawati Hospital. *Universa Med.* 2007;26(2):64-72.
29. Kraonual S, Lim A, Ueranantasun A, Kakchapati S. Patient and injury characteristics associated with road traffic mortality in general hospitals in southern Thailand. *Asian Biomed.* 2019;13(2):71-77.
30. Woyessa AH, Heyi WD, Ture NH, Moti BK. Patterns of road traffic accident, nature of related injuries, and post-crash outcome determinants in western Ethiopia - a hospital based study. *African J Emerg Med.* 2020;11(1):123-131.
31. Mowery NT, Dougherty SD, Hildreth AN, Holmes JH, Miller PR. Emergency Department Length of Stay Is an Independent Predictor of Hospital Mortality in Trauma Activation Patients. 2011;70(6):1317-1325.
32. Leijdesdorff HA, Siegerink B, Sier CFM, Reurings MCB, Schipper IB. Injury pattern, injury severity, and mortality in 33,495 hospital-admitted victims of motorized two-wheeled vehicle crashes in the Netherlands. *J Trauma Acute Care Surg.* 2012;72(5):1363-1368.
33. Nelfira N, Saputra H, Jelita S. Web-Based Geographic Information System Mapping Accident Prone Areas in West Sumatra. *Indonesia J Comput Sci.* 2018;7(1):1-18.

34. Cheong HS, Tham KY, Chiu LQ. Injury patterns in elderly cyclists and motorcyclists presenting to a tertiary trauma center in Singapore. *Singapore Med J.* 2020;51(1):1-1.
35. Rebollo-Soria MC, Arregui-Dalmases C, Sánchez-Molina D, Velázquez-Ameijide J, Galtés I. Injury pattern in lethal motorbikes-pedestrian collisions, in the area of Barcelona, Spain. *J Forensic Leg Med.* 2016;43:80-84.
36. Kashkooe A, Yadollahi M, Pazhuheian F. What factors affect length of hospital stay among trauma patients? A single-center study, Southwestern Iran. *Chinese J Traumatol - English Ed.* 2020;23(3):176-180.
37. Hsieh C, Liu H, Hsu S, Hsieh H, Chen Y. Motorcycle-related hospitalizations of the elderly. *Biomed J.* 2017;40(2):121-128.
38. Liang CC, Liu HT, Rau CS, Hsu SY, Hsieh HY, Hsieh CH. Motorcycle-related hospitalization of adolescents in a Level I trauma center in southern Taiwan: A cross-sectional study. *BMC Pediatrics.* 2015;15(1):1-8.
39. Shafi S, Barnes S, Nicewander D, et al. Health care reform at trauma centers — mortality, complications, and length of stay. *J Trauma.* 2010;69(6):1367-1371.