



Epidemiological and Clinical Characteristic of Road Traffic Crashes Related Thoracic Traumas in Rural Area: A 3-year Observational Study

Hari Wahyu Patrihady^{1,*}, Maz Isa Ansyori²

¹General Practitioner at West Nusa Tenggara General Hospital, Mataram, Indonesia

²Department of Thoracic Surgery Medical Faculty of Mataram University, West Nusa Tenggara General Hospital, Mataram, Indonesia

Email address:

wahyoeph@gmail.com (H. W. Patrihady)

*Corresponding author

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Abstract: Background: Thoracic trauma is one of the major causes of morbidity and mortality in both developed and developing countries. Thoracic trauma can become a life-threatening condition if the treatment doesn't immediate and appropriate. This study aimed to review and analyzed the demographic and clinical characteristic of road traffic crashes related (RTCR) thoracic injuries in West Nusa Tenggara Province General Hospital. Methods: Clinical records of patients with thoracic trauma admitted to thoracic surgery department between May 2018 and May 2021 were retrospectively retrieved and reviewed. Patient's profile and clinical characteristics were comparatively analyzed between road traffic crashes caused injury and other injury mechanism. Results: The study included 42 thoracic trauma patient with most often in patients aged between 20 and 60 years (n=71,4%), of whom 85,7% were male. Most of the patients (38,1%, n=16) had rib fracture. Road traffic crashes was responsible for 78,6% (n=33) of the injuries. Most of patients had treated with chest tube insertion presented in 14 patients (33,3%). Operative chest tube insertion were required in 12 (36,36%) patients RTCR chest trauma, while the majority of non-RTCR thoracic injuries were managed operative thoracotomy + chest tube insertion (44,44%, n=4). Conclusions: RTCR contributed for a considerable number of traumatic chest injury in this study, which usually affects productive age males with rib fractures were the most pattern of injuries.

Keywords: Thoracic Trauma, Chest Injury, Road Traffic Crashes, Ribs Fracture

1. Introduction

Trauma is a leading cause of death, hospitalization, and long-term period disabilities in all age groups. Worldwide, 10% of all trauma admission and 25% of trauma related death are attributable to chest injury. Motor vehicle crashes are the most common cause of chest trauma. The cause and pattern of chest injury vary from one part of the world to another because of the variations in infrastructure, economic status, culture, and behavior. The proper identification of a patient at high risk for major chest injury is essential in order to avoid management delays that may result in worse outcomes. Therefore, aggressive management of chest trauma together with the prompt treatment of associated injury is necessary for optimal outcome [1-5].

Less than 10% of blunt chest injury and only 15% to 30%

of penetrating chest injury require operative intervention. Hypoxia, hypercarbia, and acidosis often result from chest injury. Tissue hypoxia result from the inadequate delivery of oxygen to tissue because of hypovolemia (blood loss), pulmonary ventilation/perfusion mismatch (e.g., contusion, hematoma, and alveolar collapse), and changes in the intrathoracic pressure relationship (e.g., tension pneumothorax and open pneumothorax). This hypoperfusion lead to metabolic acidosis. Hypercarbia with resultant respiratory acidosis most often follows inadequate ventilation caused by changes in the intrathoracic pressure relationships and depressed level of consciousness [6].

Similar to many other countries, road traffic crashes is the most common injury mechanism for chest trauma. Road traffic crashes are the eight leading cause of death for people

of all ages, and the number one killer of people aged 5-29 years. Furthermore, 93% of the fatalities on the road occur in low and middle income countries, the risk of dying in a road traffic crash is more than 3 times higher in developing countries than in developed countries. The number of motorized vehicle in West Nusa Tenggara Province at 2007 was 524,793 units. This number has been increase more than tripled where 1,553,181 motorized vehicle at 2017. The growth in the number of traffic accidents in West Nusa Tenggara Province at 2017 recorded has decreased from 2016 from 1,824 to 1,433 accidents. Seeing this phenomenon should be promoted road safety program because the death toll in 2017 of 550 souls increased compared to death toll in 2016 which recorded as many as 543 inhabitants [7, 10].

Therefore, the present study is aimed to review and described the demographic and clinical characteristics of road traffic crashes related (RTCR) thoracic injury and non-RTCR in West Nusa Tenggara General Hospital.

2. Methods

This study was conducted at West Nusa Tenggara Province General Hospital. The study was conducted by reviewing patient registry from May 2018 to May 2021.

2.1. Study Design

A hospital-based retrospective cross-sectional study design was conducted to asses characteristics of chest injury at West Nusa Tenggara Province General Hospital.

2.2. Study Population

All patients attended and diagnosed with traumatic chest injury between May 2018 to May 2021 were enrolled in the study. The diagnosis of chest injury was made after obtaining the clinical history, physical examination, and radiological imaging in patients who sustained blunt or penetrating injury. Thoracic injuries involved injury to the chest wall and/or the contents of the thorax, e.g., pleura, lungs, lower respiratory tract, heart, and great vessels. Associated injuries were managed according to the type of injury.

2.3. Inclusion and Exclusion Criteria

All patients diagnosed with traumatic chest injury and received treatment at West Nusa Tenggara Province General Hospital between May 2018 – May 2021 regardless of its type and severity levels were included to the study. Patient with incomplete medical records were excluded from the study. In addition, traumatic chest injury patients who died immediately at the time of their arrival to the hospital before receiving health care was excluded from this study.

2.4. Data Collection Instrument and Procedure

The list of patients diagnosed with traumatic chest injury was identified from patient registry of West Nusa Tenggara Province General Hospital. Then, the record of each patient were accessed from record office based on the identified list.

3. Result

The study include a total 42 patients with chest trauma during the study period. There were 36 (85,7%) male and 6 (14,3%) female (Table 1). Chest trauma was observed most frequently in patients aged between 20 and 60 years (n=71,4%) (Table 2). Road traffic accidents was the common cause of the traumatic chest injury (n=78,6%) followed by fall (21,4%). The majority of patients had blunt chest injury (Table 3). Rib fractures was the most common (38,1%) type of thoracic trauma patients treated at West Nusa Tenggara General Hospital over three year period followed by hemothorax + rib fracture (26,2%) (Table 4). Chest tube was inserted in the majority (33,3%) of patients. Advanced procedures such as thoracotomy to rib fixation were done for (26,2%) of the chest injury patients respectively (Table 5).

Table 1. Sex Distribution.

Sex	N=42	Frequency %
Male	36	85,7
Female	6	14,3

Table 2. Age Distribution.

Age in years	N	Frequency %
2 – 10	1	2,4
11 – 19	1	2,4
20 – 60	30	71,4
>60	10	23,8
Total	42	100

Table 3. Distribution According to Mechanism and type of Injury.

	N	Frequency %
Mechanism of chest injury		
Traffic Accident	33	78,6
Fall	9	21,4
Type of injury		
Blunt	42	100%
Penetrating	0	

Table 4. Pattern of Injury.

No	Pattern of Injury	N	Frequency %
1	Rib fractures	16	38.1
2	Hemothorax	5	11.9
3	Pneumothorax	3	7.1
4	Hemothorax + Rib Fracture	11	26.2
5	Pneumothorax + Rib Fracture	3	7.1
6	Pulmonary Contusion	1	2.4
7	Hemopneomothorax + Rib Fracture	2	4.8
8	Hemopneumothorax	1	2.4
	Total	42	100

Table 5. Type of procedure done for chest injury patients.

Treatment	n	Frequency %
Operatif thorakotomi	11	26.2
Operatif chest tube insertion	14	33.3
Konservatif	6	14.3
Operatif torakotomi + chest tube insertion	11	26.2
Total	42	100.0

Patient characteristics – road traffic crashes related chest injury versus non-road traffic crashes related chest injury.

The RTCR chest injury patients profile in comparison with non-road traffic accident related thoracic traumas are shown in Table 6. Road traffic accident is the most common injury mechanism, accounted for 78,57% (33 out of 42) of all chest injuries. Another injury mechanism, such as falls were responsible for the rest patients (n=9, 21.43%).

Approximately 85% (n=28) of the RTCR chest injury affected male, whereas 89% (n=8) of the non RTCR chest trauma patients were male. The incidence of rib fracture were significantly higher in RTCR patients compared non-RTCR patients (14 vs 2). On the other hand, among 9 cases in non-RTCR, hemothorax (n=5) was the highest case.

Table 6. Clinical characteristics of road traffic crashes related thoracic injuries in comparison with non-road traffic crashes related chest traumas.

	RTCR Chest Trauma (n=33)	Non-RTCR Chest Trauma (n=9)
<i>Injury Type</i>		
Rib fractures	14	2
Hemothorax	5	
Pneumothorax	3	
Hemothorax + Rib Fracture	6	5
Pneumothorax + Rib Fracture	3	
Hemopneumothorax + Rib Fracture	1	
Hemopneumothorax	1	1
Pulmonary Contusion		1
<i>Gender (n)</i>		
Male	28	8
Female	5	1

Table 7. Treatment of traffic crashes related thoracic injury patients in comparison with non-traffic crashes related chest traumas.

Treatment	RTCR Chest Trauma (n=33)	Non-RTCR Chest Trauma (n=9)
Operatif thorakotomi	10	1
Operatif chest tube insertion	12	2
Conservative	4	2
Operatif torakotomi + chest tube insertion	7	4

Treatment road traffic crashes related versus non traffic accident related.

The treatment and clinical outcomes were compared between road traffic crashes related chest trauma patients and thoracic trauma patients with other injury mechanism. As shown in Table 7.

4. Discussion

This is the first study on West Nusa Tenggara. This study reports the frequency and characteristic of traumatic chest injury at West Nusa Tenggara Province General Hospital period May 2018 – May 2021. There are several key findings in this study. The most exposed age to traumatic chest injury is between 20 and 60 years, which was the most productive age. Male and young people were predominantly affected by chest trauma in our study. In agreement with this finding, previous studies report similar results [8, 12, 13].

Road traffic accident was the leading cause of traumatic chest injury in this study (78,6%) followed by fall. This findings was consistent with the result of study in China, Pakistan, Brazil and India. The increase in the number motorized vehicle had associated with more traffic accidents and more associated with morbidities and mortalities. Furthermore, chest trauma caused by road traffic crashes accident are usually more severe, often necessitate surgical management, intensive care and mechanical ventilator support. These findings highlight the significance of public efforts on road safety awareness, associated policy making and enforcement, road design, and other targeted preventions.

Similar to other nation, credits would be given to authorities effort for continuously promoting public safety awareness, enforcing the use helmets and seat-belts, combatting speeding and drunk driving, and advocating for safer vehicles over the years [2, 8, 12-14].

Blunt chest trauma was more dominant in this study. This finding was consistent with previous studies from Ethiopia and Pakistan. Concerning the type of chest injury, majority the patients sustained rib fracture (38,1%). This finding was in line with the study conducted in China, Nigeria, Brazil and India. It is widely accepted that the number of fractured ribs indicate the severity of trauma and closely correlates with morbidity and mortality. Fligel et al. reported the increase of mortality, pneumonia, Acute Respiratory Distress Syndrome (ARDS), pneumothorax, empyema, ICU LOS, and hospital LOS for each additional rib fracture on over 730,000 patients. Children's rib fracture are less common than adult because they have more elasticity of their bone than adults, however rib fracture occur it indicate severe trauma in children and associates with high rates of thoracic and extrathoracic injury. Follow up is essential for all patients who had the diagnosis of rib fracture. Most rib fracture cases are associated with other thoracic injury mainly hemothorax and pneumothorax. Tube thoracostomy was the main treatment modality for the majority (33,3%) of patients in this study. This finding was in line with the study conducted in China [1, 4, 8, 9, 11-15].

A limitation of this study is the limited number of samples. These limitations should be the focus of attention and development in future studies.

5. Conclusions

The increase in the number motorized vehicle had associated with more traffic accidents and more associated with morbidities and mortalities. In this study shows that road traffic accidents remain to be the common cause of thoracic trauma, cause significant damage than any mechanisms of injury. Productive aged males are the highest number of thoracic trauma, with rib fractures were the highest number of diagnoses caused by chest trauma.

Ethical Approval

The reported was approved by the Ethics Committee of West Nusa Tenggara General Hospital.

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