

## Original Research Article

# The pattern of foot and ankle injury in a tertiary referral hospital in Indonesia: magnitude of traffic accident

Ananto S. Pradana\*, Edi Mustamsir, Hary W. Agustono, Ganang D. Cahyono,  
Muhammad H. Bimadi, Ray A. H. Pandiangan, William P. Sukmajaya,  
Krisna Y. Phatama, Mohamad Hidayat

Department of Orthopaedic and Traumatology, Faculty of Medicine, Brawijaya University-Saiful Anwar General Hospital, Malang, East Java, Indonesia

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**\*Correspondence:**

Dr. Ananto S. Pradana,

E-mail: [satyapradana88@ub.ac.id](mailto:satyapradana88@ub.ac.id)

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### ABSTRACT

**Background:** One of the contributing factors for foot and ankle injury was traffic accidents. A high incidence of foot and ankle injury need to be considered. There is still no adequate information about the epidemiology of foot and ankle injury in Indonesia. This study aims to describe the pattern of foot and ankle injury in Saiful Anwar General Hospital Malang, a tertiary referral hospital in Indonesia. We focused on the distribution of population demography, type of injury, site of injury, the mode of injury, and the treatment of foot and ankle injury.

**Methods:** This cross-sectional study collected the data from the orthopaedic and traumatology department from January 2017 to January 2018. Orava modification classification was used to classify the injury type. The inclusion criteria were trauma patients. The exclusion criteria were the patients who passed away, non-traumatic foot and ankle pathology, refused definitive/all treatment, and unspecified injury site.

**Results:** A total of 304 patients have met the inclusion criteria. Male patients dominated the number of foot and ankle injuries. The majority cause of the injury was traffic accidents (93.4%). The most common injury in this study was fracture (50.3%). Moreover, forefoot was the most common injured site (60.7%).

**Conclusions:** In Indonesia, traffic accidents contribute to foot and ankle injury. The traffic regulation needed to curb the menace of traffic accidents in foot and ankle injury. However, further studies with more databases from multiple centers and evaluate the severity of the injury, the treatment, and the outcome are needed to provide a better study.

**Keywords:** Descriptive epidemiology, Foot and ankle, Traffic accidents

### INTRODUCTION

Foot and ankle have an essential role in supporting the body during daily activities. Each year, an estimated one million people present to physicians with acute ankle injuries.<sup>1</sup> Thus, the high number of foot and ankle injuries in the population should be concerned. The cause of the injury may vary from sports to traffic accidents.<sup>2-4</sup> The mechanisms of injury were varying in different countries; falls cause more foot trauma in United Arab Emirates (UAE), injury at home is the most common cause in the

United States of America (USA), while road traffic accidents cause most foot trauma in India.<sup>5-7</sup> Indonesia as a developing country has a high number of traffic accidents due to inadequate public transportation and lack of compliance to traffic regulation. Moreover, motorcycles are a transportation mode most widely used in Indonesia, although the safety standards are low.<sup>8-12</sup> There are two options for foot and ankle injury treatment; those are surgery and conservative. Surgery seemed to give better objective stability and reduced range of motion. However, conservative treatment is still a preferable option for the surgeon because most trials reported a shorter time to

return to normal activities, low complication risk, and lower cost. On the other hand, Kerhoffs et al compared conservative treatment with surgery in meta-analysis data and failed to show which treatment was superior.<sup>13</sup>

To the author's knowledge, there is no foot and ankle injury epidemiology study in Indonesia. Hence, the authors want to report the epidemiology of foot and ankle injury in Saiful Anwar General Hospital Malang, focusing on the distribution of population on patient's gender and age, type of injury, and treatment of foot and ankle injury.

## METHODS

This descriptive study included the foot and ankle injury patient's records collected from the orthopaedic and traumatology department of Saiful Anwar General Hospital Malang database in 1 year (January 2017 to January 2018). The inclusion criteria were trauma patients, and the exclusion criteria were the patients who got the non-traumatic foot and ankle pathology or refused definitive/all treatment or passed away.

We grouped the patient's age into eight groups: below 10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, and >70. Injury sites were classified anatomically: the forefoot, midfoot, hindfoot, and ankle. The forefoot composed of the phalanges to the metatarsals. The midfoot included naviculocuneiform joint and tarsometatarsal (lisfranc) joint to the navicular bone. The hindfoot consisted of the chopart joint until the talus. The Achilles tendinopathy and rupture classified as hindfoot injuries. The ankle is a talocrural joint until distal tibia and fibula.<sup>14,15</sup>

We applied the Orava modification of injury classification as the tools to simplify the type of injury in this study, which is shown in Table 1.<sup>16</sup>

The treatments of the patient were divided into conservative and operative. The mechanisms of injury elucidated into three groups: traffic accidents, sports, domestic falls, and others. The data was analyzed using Microsoft excel 2013 and statistical package for the social sciences (SPSS) 25.

**Table 1: Orava modification of injury classification.**

Type of injury	Definition
<b>Traumatic</b>	
<b>Sprain</b>	Acute distraction injury of ligaments or joint capsules
<b>Strain</b>	Acute distraction injury of muscle and tendons
<b>Contusion</b>	Tissue bruise without concomitant injuries classified elsewhere
<b>Fracture</b>	Traumatic break of the bone
<b>Dislocation</b>	Partial or complete displacement of the bony parts of a joint
<b>Other</b>	Injuries not classified elsewhere. Examples: wound, concussion, and others
<b>Overuse</b>	Pain syndrome of the musculoskeletal system with insidious onset and without any known trauma or disease

## RESULTS

A total of 304 patients of foot and ankle injury met the inclusion criteria. Male patients with 71.8% were more commonly involved than females. The patient's age ranged from 2-80, with the mean age being 34.5. Age group '11-20' dominated the foot and ankle injury accounting for 24.6%. The most significant difference in sex ratio (4.76: 1) was in 'below 10' age group. However, overall males sustained 2.5 times foot and ankle injury compared to females; the data is presented in Table 2. One hundred of 304 patients had multiple injuries, which make the total number of foot and ankle injuries were 519 injuries. More than half of the total injuries (60.7%) were

located at the forefoot. Fractures dominated the type of injury with 50.3% occurrence and specifically were the most common injury in the ankle, forefoot, midfoot, and hindfoot. The majority of the sprain involved the ankle (n=36), while strain occurred mostly in the forefoot (n=80). Contusion mainly affected in the forefoot (n=2). Most dislocation injury found in the forefoot (n=22), and there was no overuse injury. The data is presented in Table 3.

The most common mechanism of injury were traffic accidents (93.4%). The data is presented in Table 4. The operative treatment (71.1%) was applied more frequently compared to conservative treatment (28.9%).

**Table 2: Age and sex distribution of foot and ankle injury.**

Age group (years)	Total	Sex		Sex ratio (M: F)
		Male	Female	
<b>Below 10</b>	14 (4.61)	11	3	3.67: 1
<b>11-20</b>	75 (24.67)	49	26	1.88: 1
<b>21-30</b>	67 (22.04)	47	20	2.35: 1
<b>31-40</b>	38 (12.5)	30	8	3.75: 1

Continued.

Age group (years)	Total	Sex		Sex ratio (M:F)
		Male	Female	
41-50	41 (13.49)	28	13	2.15: 1
51-60	43 (14.14)	32	11	2.91: 1
61-70	18 (5.92)	13	5	2.60: 1
>70	8 (2.63)	5	3	1.67 :1
<b>Total</b>	304 (100)	217 (71.8)	87 (28.2)	2.49: 1

Figures in parenthesis show percentage

**Table 3: Distribution of foot and ankle injury diagnoses.**

	Ankle	Forefoot	Midfoot	Hindfoot	Total
<b>Sprain</b>	36	0	2	0	38 (7.3)
<b>Strain</b>	12	80	10	9	111 (21.4)
<b>Contusion</b>	0	2	0	0	2 (0.4)
<b>Fracture</b>	52	183	16	10	261 (50.3)
<b>Dislocation</b>	11	22	5	3	41 (7.9)
<b>Other</b>	33	28	0	5	66 (12.7)
<b>Overuse</b>	0	0	0	0	0
<b>Total</b>	144 (27.7)	315 (60.7)	33 (6.4)	27 (5.2)	519 (100)

\*multiple responses; figures in parenthesis show percentage

**Table 4: Type of injury based on mechanism of injury.**

	Domestic fall	Traffic accident	Sport	Total
<b>Sprain</b>	25	13	0	38
<b>Strain</b>	0	111	0	111
<b>Contusion</b>	2	0	0	2
<b>Fracture</b>	4	257	0	261
<b>Dislocation</b>	1	40	0	41
<b>Other</b>	2	64	0	66
<b>Overuse</b>	0	0	0	0
<b>Total</b>	34 (6.6)	485 (93.4)	0 (0)	519 (100)

\*multiple responses; figures in parenthesis show percentage

## DISCUSSION

This study reveals that males are more prone to foot and ankle injury than females, with the overall ratio is 2.49: 1. It reflects that males have high activities level and tend to do high-risk activities. However, females are more involved in indoor activities due to our culture to keep the woman safe. The highest number of foot and ankle injuries is in the '11-20' age group followed by '21-30' age group. This result is quite similar to the study conducted by Singh et al who found that the highest number of foot and ankle injuries is in the '21-30' age group.<sup>5</sup> Rolison et al discovered that young adults have the highest traffic accidents number of any age group, probably associated with their inexperience, skill level, and risky riding behavior.<sup>17</sup> Indonesia had around 100,000 incidents in 2017, according to data from the statistic center of Indonesia, supporting the finding of traffic accidents as the highest motion of injury in this study (93.4%).<sup>8</sup>

The forefoot is the most frequent site of injury in this study. Sharma et al found that forefoot is the most common site of foot and ankle injury as well.<sup>4</sup> Also, the forefoot

indeed is prone to have complex or multiple injuries by traffic accidents.<sup>18</sup> Moreover, in this study, motorcycles are involved in all traffic accidents. The motorcyclists often travel at high speeds while steering dangerously through heavy traffic on congested roads. Lack of compliance in traffic regulations and low awareness of safety ridings, such as wearing inadequate foot guards, increasing the risk to sustain foot and ankle injury.<sup>5,18-20</sup>

We found fractures to be the most common type of injury at almost all injury sites. Sprain dominantly involved ankle (95%), which categorized into three grades: mild sprain (grade I), moderate sprain (grade II), and severe sprain (grade III). In this study, 73.9% of all ankle sprain is grade 2, which mostly caused by domestic fall. According to another study, the most common ankle sprain is grade 1, with sports injury as the leading cause.<sup>21</sup> The dislocation frequently found in the forefoot involving interphalangeal and metatarsophalangeal joints. The majority cause of these injuries was traffic accidents. Moreover, 'other' injury consists of wounds, such as excoriation, abrasion, and open wound.

Operative treatment 71.1% were conducted more often comparing to conservative treatment 28.9%, because of the high number of fracture injury, which required operative treatment. Based on a meta-analysis study by Kerhoffs et al there is no superior treatment between operative and conservative treatment. Each treatment has its advantages. Operative treatment offers better objective stability, while conservative treatment has unreduced ranges of motion and shorter time to return to normal activities.<sup>13</sup>

Furthermore, to the author's knowledge, this is the first foot and ankle injury epidemiology study in Indonesia. The authors acknowledge the limitations of this study. As the authors used the hospital medical record database to collect the data, the main limitations are related to this database. First, the data cannot be used to depict the incidence rate in a region because it is only from one hospital database. It will be a significant breakthrough if there is an epidemiological study using databases from multiple centers. Second, it is debatable about the classification of the different anatomic regions and different injury types. For instance, it is likely that the diagnosis of sprains and strains in this database is not a very specific category but commonly used for emergency department patients presented with lower extremity pain without a fracture or other specific diagnosis. The percentage of these patients with an identifiable torn ligament or tendon is unknown, which less than 100%. Finally, this study did not analyze the severity of the injury, the treatment, and the outcome. Further study may be needed to understand the recovery time between injury severity and treatment outcome.

## CONCLUSION

Traffic accidents contribute to foot and ankle injury in Indonesia. The traffic regulation needed to curb the menace of traffic accidents in foot and ankle injury. However, further studies with more databases from multiple centers and evaluate the severity of the injury, the treatment, and the outcome are needed to provide a better study.

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