Original Research
Event profile of ankle sprain injury at athletesin East Java Puslatda

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Abstract

Background: Ankle injuries are the most common injuries in sports and often cause chronic pain, swelling, and functional instability. Ankle injuries (sprains) are acute injuries that athletes often experience. This acute injury is caused by a pressure force, for example, when making a sudden turning motion. Sprains can affect the ankle's side and damage the outside (lateral) ligament; ankle injuries were reported at the Sports Clinic RSUD Dr. Soetomo Surabaya.
Aims: To understand the profile of ankle injuries suffered by East Java Puslatda athletes and investigate the risk factors for these injuries.
Material and methods: The study was conducted using a retrospective approach with an analytic observational design in the form of cross-sectional study and made observations and secondary data profiling. The sample used in this study was the medical records of Puslatda East Java athletes who attended health screening at RSUD Dr. Soetomo Surabaya throughout 2020.
Result: 109 atheletes data were collected in this study, we found that most Puslatda East Java athletes who carried out health screening at Dr. Soetomo hospital aged 17-25 years (78.9%), female (51.4%), never experienced an injury (90.8%), normal IMT (61.5%), normal ROM ankle (100.0%), abnormal laxity (87.2%), normal flat foot (100.0%), and have ideal exercise frequency (60.6%). The athletes who had ankle injuries were 54 athletes (49.5%), with the most occurring in the late adolescent age range, which is 17-25 years (35.8%), female (27.5%), and normal IMT (30.3%).
Conclusions: There is no relationship between extrinsic and intrinsic factors on the risk of ankle injury for Puslatda East Java athletes.

Keywords: *Ankle sprain, athletes, injuries, risk factors.*

INTRODUCTION

Ankle injuries are the most common injuries sustained in sports and often cause chronic pain, swelling, and functional instability. In 1983, it was estimated that moderate to severe ankle injuries occurred in 2 million people per year in the United States (USA) with a proportion ranging from 14% to 33% of all sports-related injuries. Most (40%) individuals with a history of ankle injury were found to have symptoms of chronic functional instability and repeated injuries to the same ankle. Recurrent ankle injuries and ongoing disability have created a large burden of medical expenses in the US. In a study conducted by researchers at Harvard, the estimated aggregate annual spending cost of moderate to severe ankle injuries was $2

billion; adjusted for inflation, this figure is equivalent to $3.65 billion in the current economy (1).

MATERIAL AND METHODS

The research was conducted using a retrospective approach with an analytic observational design in the form of a cross sectional study because the researchers did not provide intervention to the research subjects and only made observations and secondary data profiling. Researchers will analyze the estimated risk of ankle injury in coni athletes at the East Java Regional Training Center. The sample used in this study was the medical records of Puslatda East Java athletes who attended health screening at RSUD Dr. Soetomo Surabaya throughout 2020.

RESULT

This chapter will describe the results of research and discussion based on data collection at the Sports Clinic Dr Soetomo Hospital Surabaya throughout 2020. From the research results obtained data about the respondents (age, sex, body mass index, history of injury, range of motion, laxity and flat foot) and the results of the analysis of risk factors for ankle injury in athletes from the East Java regional training center (Puslatda) who conducted screening health at Dr Soetomo Surabaya Hospital throughout 2020.

Table 1. Distribution of the frequency of ankle injuries

Ankle Injury	Frequency	Precentage
Yes	54	49,5
No	55	50,5
Total	109	100,0

Table 1 indicates that the majority of the athletes who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 did not experience ankle injuries, as 55 respondents (50.5%) reported no such injuries.

Table 2. Age distribution

Age	Frequency	Precentage
12-16 years old	2	1,8
17-25 years old	86	78,9
26-35 years old	21	19,3
Total	109	100,0

The age distribution of the athletes who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 is presented in Table 2. The majority of respondents were aged 17-25 years, with 86 respondents (78.9%) falling within this age range.

Table 3. The gender distribution

Gender	Frequency	Precentage
Male	53	48,6
Female	56	51,4
Total	109	100,0

Table 3 shows the gender distribution of athletes who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020. It was found that 56 respondents (51.4%) were female, while the rest were male.

Table 4. Distribution of BMI

BMI	Frequency	Precentage
Severly underweight	1	0,9
Underweight	3	2,8
Normal	67	61,5
Overweight	21	19,3
Obesity	17	15,6
Total	109	100,0

Table 4 indicates that the majority of the athletes who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had a normal body mass index, with 67 respondents (61.5%) in this category.

Table 5. Distribution of athlete's injury history

Injury history	Frequency	Precentage
Yes	10	9,2
No	99	90,8
Total	109	100,0

Table 5 shows that almost all the respondents who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had never experienced an injury, with 99 respondents (90.8%) reporting no history of injuries.

Table 6. Distribution of athlete ROM

ROM ankle	Frequency	Precentage
Normal	109	100,0
Unnormal	0	0

Table 6 indicates that all the respondents who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had a normal category ankle range of motion (ROM) profile, with 109 respondents (100%) falling into this category.

Table 7. Distribution of laxity

Laxity	Frequency	Precentage
Normal	14	12.8
Unnormal	95	87.2
Total	109	100.0

Table 7 shows that almost all the respondents who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had an abnormal laxity profile, with 95 respondents (87.2%) in this category.

Table 8. Distribution of flat foot athletes

Foot shape	Frequency	Precentage
Normal	109	100,0
Flat foot	0	0

Table 8 indicates that all the respondents who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had a flat foot profile falling in the normal category, with 109 respondents (100%) in this category.

Table 9. Distribution of the frequency of athlete training which conducts health screening at Dr Soetomo Surabaya Hospital around 2020.

Training frequency	Frequency	Precentage
Ideal	66	60,6
Unideal	43	39,4
Total	109	100,0

The majority of the respondents who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had an ideal exercise frequency (150–300 minutes per week and muscle strengthening exercise 2–3 times a week), with 66 respondents (60.6%) indicating this in Table 9.

Table 10. Age cross table with ankle injuries

	Ankle injury	
	Yes	**No**
Age		
Early teenager (12-16 years old)	1 (0,9%)	1 (0,9%)
Late teenager (17-25 years old)	39 (35,8%)	47 (43,1%)
Early adult (26-35 years old)	14 (12,8%)	7 (6,4%)

p = 0,108

Table 10 shows the age cross table with ankle injuries in athletes at the East Java regional training center (Puslatda) who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020. The majority of respondents who were 17-25 years old did not experience ankle injuries, with 47 respondents (43.1%) reporting no such injuries. A Chi-square test was conducted, and the results showed no relationship between age and ankle injury in athletes at the East Java regional training center (Puslatda) who underwent health screening at Dr. Soetomo Hospital Surabaya throughout 2020, with a p-value of 0.108.

Table 11. Cross-sex table with ankle injuries

	Ankle injury	
	Yes	**No**
Gender		
Male	23 (21,1%)	30 (27,5%)
Female	31 (27,5%)	25 (22,9%)

p = 0,291

According to the findings from cross table 11, only a small proportion of those who underwent health screening at Dr. Soetomo Surabaya Hospital in 2020 were female. Out of the respondents, 31 individuals (28.4%) suffered from ankle injuries. The results of the Chi-square test indicated that gender was not associated with ankle injuries among athletes at the East Java regional training center (Puslatda) who underwent health screening at RSUD Dr. Soetomo Surabaya in 2020 (p=0.291). In Table 12, it was discovered that almost half of the respondents who underwent health screening at Dr. Soetomo Surabaya Hospital throughout 2020 had a normal BMI category.

Table 12. Cross table of BMI factors with ankle injuries

	Ankle injury	
	Yes	**No**
BMI		
Severly underweight	0 (0%)	1 (0,9%)
Underweight	2 (1,8%)	1 (0,9%)
Normal	33 (30,3%)	34 (31,2%)
Overweight	12 (11%)	9 (8,3%)
Obesity	7 (6,4%)	10 (9,2%)

p = 0,610

Additionally, 34 respondents (31.2%) did not experience ankle injuries. However, the Chi-square test revealed that there was no relationship between BMI and ankle injuries in athletes at the East Java regional training center (Puslatda) who underwent health screening at RSUD Dr. Soetomo Surabaya in 2020 (p=0.610).

DISCUSSION

From the results of data collection and analysis, it was found that ankle injuries in East Java Puslatda Athletes most often occur in the late adolescent age range (17-23 years), which is as high as 35.8%. Which is then followed by early adulthood (26-35 years) as much as 12.8% and finally followed by early adolescents (12-16 years). This is unlike a study in the emergency department of 4 municipal health districts in England, (2) reported that the highest ankle injury was observed among women between 10 and 14 years of age (12.8 per 1000 person-years), whereas the peak of ankle injuries for boys occurs between the ages of 15 and 19 years. Similar observations have been reported in the United States, (3) calculated an ankle sprain rate of 2.15 per 1000 person-years. The highest incidence of ankle sprains occurs in those aged between 15 and 19 years, with an estimated injury incidence of 7.2 per 1000 person-years. It is estimated that this occurs because the majority of the population data taken are late adolescents (78.9%). So this also causes the correlation analysis of the data to show a small positive significance.

The distribution of data on the sex of Puslatda East Java athletes is quite balanced, namely 48.6% male and 51.4% female. The incidence of ankle injuries in women and men is also the same, where 21.1% of men and 27.5% of women experience ankle injuries. Meanwhile,

27.5% of men and 22.9% of women did not experience any injuries. The chi-square statistical test also shows that there is no significant relationship between gender and ankle injury. This is in line with studies in collegiate athletes, where the incidence of injury was among males (0.78 per 1000 person-days) and women (1.15 per 1000 person-days) (4). Results were similar among SMA athletes (men = 0.78 per 1000 person-days, women = 0.90 per 1000 person-days). Likewise in an epidemiological study by (5) which found that there was no difference in the incidence of ankle injuries in the same sport.

The results of BMI data collection showed that most of the East Java Puslatda athletes were in the normal BMI category (61.5%). The chi-square significance test also did not show a significant correlation between BMI and ankle injuries. The results contradict research by (6) who assessed 100 professional soccer players and found that BMI was an independent predictor of ankle injury. In addition, in other studies, BMI is also a significant risk factor for ankle injuries, with a risk for normal BMI of 0.52 (95% CI = 0.1, 1.6), 1.05 (95% CI = 0.3, 2.5) for players who are at risk of being overweight, and 2.03 (95% CI = 0.8, 4.2) for players who are overweight (7).

From a history of ankle injuries, it was found that at least 90.8% of East Java Puslatda athletes had never experienced an ankle injury, half of these figures came with an injury. Athletes who had experienced an ankle injury made up 10.2% of the sample, and half of them came with an injury. This is thought to cause the significance of the chi-square test to be insignificant (p=1,000). Another study shows that a history of injury is one of the main risk factors for recurrent ankle injuries (8). In a prospective study by (9) a history of injury was found to be twice as likely to re-injure.

The results of data related to ROM from East Java Puslatda athletes showed that as many as 109 respondents (100%) did not have abnormal ROM function. Of all these respondents, 50.5% had normal ROM and did not experience ankle injuries. Another 49.5% had normal ROM but had

an ankle injury. Because all respondents had normal ROM, there were cells with a frequency value of 0 so that the correlation test between ROM and ankle injury could not be carried out. Research by (10) tested the ankle ROM of gymnastic athletes and its correlation to the incidence of ankle injuries. The results found that there were 20.59 injuries per 100 athletes in a year, but no significant relationship was found between ankle ROM and the incidence of ankle injuries. However, several studies support the relationship between ROM and ankle injuries. (11) found a significant relationship between ankle dorsiflexion ROM and anterior reach ($p<0.001$) so that according to this study, ankle dorsiflexion ROM disorders can increase the risk of ankle injury due to affected dynamic movements. People with less ankle dorsiflexion ROM will show a more upright landing posture and greater ground reaction forces so that it can be a mechanism of injury (12).

For the laxity variable, it was found that 44 respondents (40.4%) had ankle injuries and had abnormal laxity. However, respondents who have normal laxity and do not only 4 people (3.7%) experienced ankle injuries, and a large number of respondents who had abnormal laxity but did not experience ankle injuries, namely 51 people (46.8%). As a result, the chi-square test showed that there was no relationship significant difference between laxity and ankle injury ($p=0.079$). The same thing was found in a study by (13) also found no correlation between generalized joint laxity and ankle injuries ($p=0.739$). Research by (14) found no relationship between generalized joint laxity and the incidence of ankle injuries in both women ($p=0.340$) and men (p -), but ankle laxity specifically, through the talar tilt test , had a significant relationship to the incidence of ankle injuries ($p=0.002$). Based on this explanation, it can be concluded that it is likely that ankle joint laxity will have more influence on the incidence of ankle injuries than joint laxity in general. The different significance results can be caused by the use of clinical examinations and the tools used to evaluate joint laxity, so further research is needed.

Based on the results of flat foot data on Puslatda East Java athlete respondents, it was found that 100% of the respondents did not have flat feet and passed the health screening test at RSUD Dr. Soetomo. As many as 50.5% of the respondents did not have flat feet and did not experience ankle injuries, while the other 49.5% did not have flat feet but experienced ankle injuries. Because all respondents did not have flat feet, there were cells with a frequency value of 0 so that the correlation test between flat feet and ankle injuries could not be carried out. Previous research by (15) found that there was no relationship between flat feet and ankle injuries in athletes (p>0.390), even though the ankle was the part of the body most often involved. As many as 14.1% of the number of athletes who experienced ankle injuries had flat feet, but the number of athletes who did not experience ankle injuries but have more flat feet, namely 17.9%. Similar findings were presented by (16), where flat feet were not associated with an increased risk of injury regardless of the method of measuring the height of the arch of the foot. In fact, it was found that the risk of injury increased with increasing arch height, indicated by a significantly increasing linear trend [adjusted OR = 6.12 (2.17, 17.30).On the other hand, the meta-analysis by (17) found that both flat foot and high arch had a significant relationship to lower extremity injuries compared to normal foot types, but the strength of the relationship was weak (OR = 1.23).However, this relationship included lower extremity injuries in general, not specific for ankle injury.

In terms of training frequency, 33 respondents (30.3%) East Java Puslatda athletes had an ideal training frequency and did not experience ankle injuries, while 21 respondents (19.3%) had non-ideal training frequencies and experienced ankle injuries. From the results of the test using the chi-square, the value of p = 0.906 was obtained, which indicated that there was no significant relationship between exercise frequency and ankle injury. This significant result is possible because the number of respondents who have an ideal exercise frequency but still experience ankle injuries is the same as those who do not experience

ankle injuries (30.3%). To date, there has been no research linking exercise frequency with the incidence of ankle injuries in athletes. However, exercise-based rehabilitation reduced the risk of re-injury to the ankle when compared with usual therapy without exercise (OR, 0.87; 95% CI, 0.48-1.58 at 3-6 months; OR, 0.53; 95% CI, 0.38-0.73 at 7 months). -12) (18).

The same results were found by (19), where preventive efforts using exercise reduced the overall injury risk significantly by 27% in athletes (p=0.005), and specifically by 17%-22% in ankles indirectly. significant (p=0.327). According to the results of a study conducted by (20), the more physical activity and exercise that is done beforehand, the more a person is protected from injury related to the exercise that will be undertaken.

CONCLUSION

East Java Puslatda athletes conducting health screening at RSUD Dr. Soetomo Surabaya throughout 2020 has a gender-balanced number of athletes with a higher number of women, namely 51.4% are women and 48.6% are men. The highest age range for athletes in the East Java Puslatda is 17-25 years old, which is 78.9%, The incidence of ankle injuries occurred in as many as 50.5% of Puslatda East Java athletes in 2020, and None of the intrinsic injury profiles have a significant relationship to the incidence of ankle injuries, with the respective significance values as follows: p age = 0.108; p gender = 0.291; p BMI = 0.610.

DISCLOSURES

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Conflict of interest

All authors have no conflict of interest.

Author Contribution

All authors have contributed to all processes in this research, including preparation, data gathering and analysis, drafting and approval for publication of this manuscript.

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