

## Epidemiology of injuries in amateur soccer players

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### 1. Introduction

Relationship between athletes and injuries are not separate in all sports. Many epidemiological studies have been done in soccer all over the world.<sup>1</sup> Fuller et al<sup>2</sup> published a consensus statement on injury definition and data collection in 2006, number of injury researches have increased and determined accurate information for researchers, medical staff, athletes, and team staff.<sup>3,4</sup> Epidemiological research data can use to determine injury pattern for each sport, position, and injury prevention. Injury prevention is the key for all athletes due to elude from an injury risk and possibly enhance their performance.<sup>1,3,5-8</sup> According to previous researches, the most common soccer related injury was sprain, contusion, and muscle strain.<sup>5,7</sup> Most soccer related injuries were occurred lower extremities especially ankle, knee, thigh, and foot/toe.<sup>5,9</sup> During game, overall injury incidences were reported more than practice.<sup>1,5,8-10</sup> In addition, another important content is severity of injury. Injury severity was defined as how many days unable to participate full scheduled team activities and divided to four compartments (minimal, mild, moderate, and severe).<sup>8,11</sup>

Epidemiological study has defined injury into three categories as any physical complaints, medical attention, and time loss.<sup>9,10</sup> Any physical complains is including all injury incidences from soccer activities and all needed medical attentions.<sup>10</sup> Medical attention states that any injury is received medical attention from a medical institution.<sup>10</sup> Time loss injury definition is the traditional sports injury surveillance.<sup>3,10,11</sup> Time loss definition can use un-medical trained person as coaches, managers, and athletes themselves.<sup>3</sup> When an injury occurred, an athletic trainer or other medical staff recording the injury.<sup>11</sup> The day1 is counting as the day after the incidence of injury occurred and unable to participate full practice or game. The last day of the missing practice or game is the last day of the time loss injury.<sup>3</sup>

Many of previous researches have been researched professional soccer players or elite level in the worldwide.<sup>1,4,5,7,12,13</sup> However, the target of amateur players' injury researches was less than

professionals. The purpose of this study was to determine amateur soccer players' injury type, injury location, and injury severity by using time loss injury definition.

## 2. Methods

### 2.1. Subjects

Twenty-two male field soccer players (average age:  $20.0 \pm 2.0$  years, average height:  $172.0 \pm 4.3$  cm, average weight:  $63.0 \pm 5.5$  kg) who played in a regional league participated in this study. Goal keepers were excluded due to physical load and practice details were different from other fielded players and the number of goal keepers were few in the team.

### 2.2. Data collection

All data was collected from January 2017 through September 2017. This team's coach was reported all schedules and practice and game days details as a previous research for this study (Figure 1).<sup>11</sup> This experimental period was divided to game phase and preparation phase in periodization method.<sup>11</sup>

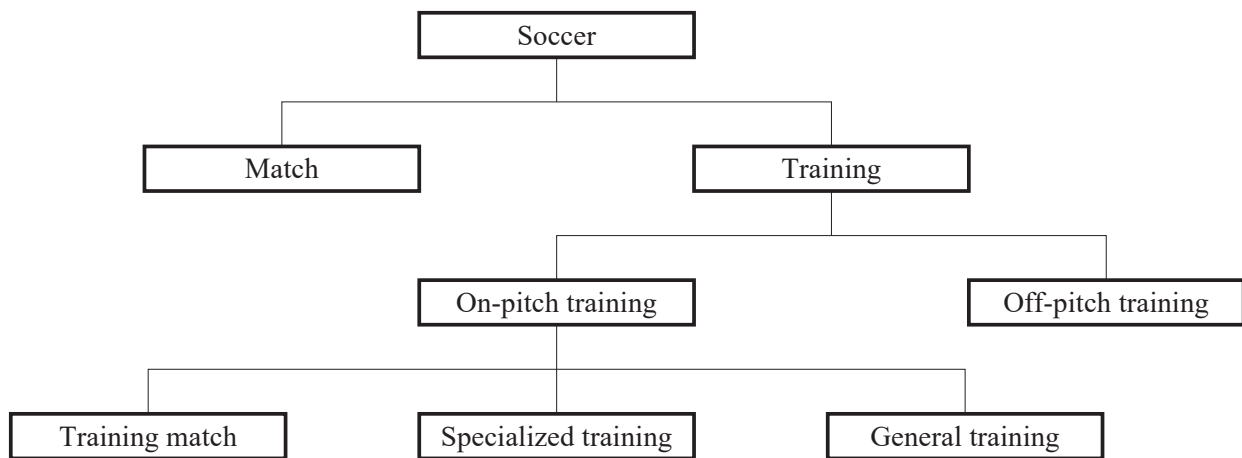


Figure 1 Classification of physical load type

### 2.3 Classification of injury

A classification of injury was used time loss definition. Any injury was occurred during game or practice and the player was unable to participate the next day of the entire scheduled event.<sup>2,11</sup> Injury needs to be classified “acute” or “chronic” depend on mechanism of injury. Acute injury caused by one-time trauma and chronic injury was gradually affected over time with unknown mechanism.<sup>2,11</sup> Any of injury occurred, the team athletic trainers contacted to the player and recorded the contents of injuries as mechanism of injury, type of injury, body region, and history of injury. Type of injury and body region were based on International Olympic

Committee's injury surveillance and other previous researches.<sup>11,14,15</sup>

## 2.4 Severity of injury

Injury severity was determined how many days missed their scheduled practice or games. An incidence of injury occurred was day "zero" and un-counting. Last day of miss or partially participate team activity was the end of reporting the injury.<sup>2,5,6</sup> Severity of injury was determined as follows: minimal (1-3 days), mild (4-7 days), moderate (8-28 days), and severe (>28 days).<sup>2,5,6</sup>

## 2.5 Statistical analysis

Injury incidence rate (1000 player hours: PH) calculated by dividing the number of injury occurrences by exposure (PH) and expressed with 95% confidence interval (95%CI).<sup>7,11,14</sup>

# 3. Results

## 3.1 Exposure and road of soccer

Overall exposure was 6598.7 hours. (game phase: 4264.8 hours, preparation phase: 2333.9 hours). Game phase was 4264.8 hours (72.4%) including 21 days of matches and preparation phase was 2333.9 hours (27.6%).

## 3.2 Injury

Total of 29 injuries were reported from 22 players (Table 1). Acute injuries were 23 (79.3%) and 3.5 injuries/ 1000PH (95%CI: 2.1-4.9) and chronic injuries were 6 (20.7%) and 0.9 injuries/1000PH (95%CI:0.2-1.6). Using a periodization method, all acute and chronic injuries were divided into game and preparation phases (Table 2). During game phase, 15 acute injuries (3.5 injures/1000PH, 95%CI: 1.7-5.3) and 4 chronic injuries (1.7 injuries/1000PH, 95%CI: 0.0-3.4) were occurred. Preparation phase had 8 acute injuries (1.9 injuries/1000PH, 95%CI: 0.6-3.2) and 2 chronic injuries (0.9 injuries/1000PH, 95%CI: -0.3-2.0). All types of injury showed table 3, the most common type of injury was sprain (9 injuries, 1.4 injuries/1000PH, 95%CI: 0.5-2.3) and contusion and others which including groin pain and low back pain (7 injuries, 1.1 injuries/1000PH, 95%CI: 0.3-1.8 respectively) were the second common injuries in this study. 23 injuries were reported during game phase and groin pain and low back pain were occurred only preparation. The most common location of injury was ankle (31.0%), knee was the second (13.8%) (Table 4). All ankle rerated injuries were reported as acute injuries.

Table 1 Injury Incidence rate (PH)

	<b>Number of Injury (%)</b>	<b>Incidence rate (PH)</b>	<b>95%CI</b>
Acute	23 (79.3%)	3.5	2.1 - 4.9
Chronic	6 (20.7%)	0.9	0.2 - 1.6
<b>Total</b>	<b>29</b>	<b>4.4</b>	<b>2.8 - 6.0</b>

Table 2 Injury Incidence rate (PH) in Periodization

	<b>Number of injury (%)</b>	<b>Incidence rate (PH)</b>	<b>95%CI</b>
<b>Acute</b>			
Game	15 (65.2%)	3.5	1.7 - 5.3
Preparation	8 (34.8%)	1.9	0.6 - 3.2
<b>Total</b>	<b>23 (100%)</b>	<b>5.4</b>	<b>3.2 - 7.6</b>
<b>Chronic</b>			
Game	4 (66.7%)	1.7	0.0 - 3.4
Preparation	2 (33.3%)	0.9	-0.3 - 2.0
<b>Total</b>	<b>6 (100%)</b>	<b>2.6</b>	<b>0.5 - 4.6</b>

Table 3 Type of injury (PH)

<b>Type of injury</b>	<b>Number of injury (%)</b>	<b>Incidence rate (PH)</b>	<b>95%CI</b>
Ligament	3 (10.3%)	0.5	-0.1 - 1.0
Tendon	1 (3.4%)	0.2	-0.1 - 0.4
Sprain	9 (31.0%)	1.4	0.5 - 2.3
Contusion	7 (24.1%)	1.1	0.3 - 1.8
Dislocation	1 (3.4%)	0.2	-0.1 - 0.4
Strain	1 (3.4%)	0.2	-0.1 - 0.4
Others	7 (24.1%)	1.1	0.3 - 1.8
<b>Total</b>	<b>29 (100%)</b>	<b>4.4</b>	<b>2.8 - 6.0</b>

Table 4 Body region (PH)

<b>Body region</b>	<b>Number of injury (%)</b>	<b>Incidence rate (PH)</b>	<b>95%CI</b>
Face	1 (3.4%)	0.2	-0.1 - 0.4
Shoulder	1 (3.4%)	0.2	-0.1 - 0.4
Lower back	3 (10.3%)	0.5	-0.1 - 1.0
Groin	3 (10.3%)	0.5	-0.1 - 1.0
Thigh	3 (10.3%)	0.5	-0.1 - 1.0
Knee	4 (13.8%)	0.6	0.0 - 1.2
Lower leg	2 (6.9%)	0.3	-0.1 - 0.7
Ankle	9 (31.0%)	1.4	0.5 - 2.3
Foot/Toe	3 (10.3%)	0.5	-0.1 - 1.0
<b>Total</b>	<b>29 (100%)</b>	<b>4.4</b>	<b>2.8 - 6.0</b>

### 3.3 Severity of injury

In terms of severity of injury, the most reported severity was moderate (12 injuries, 52.2%) and followed by five minimal injuries in acute (21.7%) (Table 5). Half of chronic injuries was reported in severe (50.0%).

Table 5 Severity of injury (PH)

	Number of severity (%)	Incidence rate (PH)	95%CI
<b>Acute</b>			
Minimal	5 (21.7%)	1.2	0.1 - 2.2
Mild	3 (13.0%)	0.7	-0.1 - 1.5
Moderate	12 (52.2%)	2.8	1.2 - 4.4
Severe	3 (13.0%)	0.7	-0.4 - 1.3
<b>Total</b>	<b>23 (100%)</b>	<b>5.4</b>	<b>3.2 - 7.6</b>
<b>Chronic</b>			
Minimal	1 (16.7%)	0.4	-0.4 - 1.3
Mild	2 (33.3%)	0.9	-0.3 - 2.0
Moderate	0 (0.0%)	0.0	-
Severe	3 (50.0%)	1.3	-0.2 - 2.7
<b>Total</b>	<b>6 (100%)</b>	<b>2.6</b>	<b>0.5 - 4.6</b>

## 4. Discussion

Over the experimental, 4.4 injuries/1000PH (29 injuries, 95%CI:2.8-6.0) were reported in this study. According to professional male soccer players injury studies from Europe, 6.2 injuries/1000 PH and 5.65 injuries/1000PH were reported respectively.<sup>5,13</sup> This study's injury incidence rate was almost the same as other professional level. In professional teams have more game than amateur teams; as a result, our finding of injury incidence rate is lower than other studies. Therefore, amateur athletes also need to effort to prevent their injuries as professional level.

Acute injury (79.3%) was occurred more than Chronic injury (20.7%) and game phase (23 injuries, 5.4 injuries/ 1000 PH) had reported more injury than preparation phase (6 injuries, 2.6 injuries/ 1000PH). The ratio of reporting acute and chronic injuries was not different between this study and previous studies.<sup>11,14</sup> Other studies showed that range of 66.5 to 89.6 % of injuries involved in lower extremity<sup>5,6,9,13</sup> as similar as the most of injuries were occurred lower extremity (93%) in this study.

According to Japanese professional soccer study<sup>9</sup>, sprain (32.2%) was the most common injury, followed by contusion (27.0%) and muscle strain (18.4%). In this study, sprain (31.0%, 1.4 injuries/1000PH) was the most reported injury and the second reported injuries was contusion

(24.1%, 1.1 injuries/ 1000PH). By contrast, strain (3.1%) was not occurred as much as other studies.<sup>5,9,13</sup> The most common injured body region was ankle (1.4 injuries/ 1000PH), followed by knee (0.6 injuries/ 1000PH), and groin, low back, thigh, and foot/toe (0.5 injuries/ 1000PH respectively). Many of previous researches showed that the common injured region was ankle, knee, thigh, and groin as our study.<sup>5,9,13</sup>

Severity of injury, about half of acute injuries were moderate (52.2%), chronic injuries were reported the most in severe (50.0%). Injuries in Portuguese youth soccer players research,<sup>6</sup> the author reported that an average of missed participation was 18.0 days in aged under 19 group. The number of day categories in moderate in our study. Our subjects' average age was  $20.0 \pm 2.0$  years; therefore, the severity of injury was similar to the previous study.<sup>6</sup> Another elite level study showed that the most frequently occurred injuries was minimal (35.7%) and mild (26.8 %). Severe injury was reported only 8% of overall injuries.<sup>5</sup>

Time loss definition is easy to use un-medical trained team staff or athlete; however, some limitations have been reported. One of the limitations is unable to measure an accuracy of entire injury incidence. Some athletes participate full practice with limited function or lower performance level.<sup>3</sup> Another limitation is inappropriate to describe sever injuries as injury caused retirement or permanent disability and life ended.<sup>3</sup> Currently, the Oslo Sports Trauma Research Center Questionnaire on Health Problems (OSTRC-H) is established to complement time loss definition. This approach can be focus on overuse injuries and illness and directory measure symptom of injury and illness.<sup>3</sup>

Finally, recommendation of epidemiological study should include injury burden and classification of recurrent injury to improve data collection.<sup>5,10,16</sup> Next research will include injury burden and recurrence of injury to make better research. Some athletes are re-injured the same body region and the same mechanism after return to full play.<sup>5</sup> Recurrence of injury is also needed to prevent to decrease injury incidence rate. Another suggestion is number of subjects. This study had only one team and twenty-two players. Many of researches have recruited more than 10 teams and over two hundred of players.<sup>5,9,12</sup> In Japan, many of amateur sports are unable to have any athletic trainer and difficult to conduct injury survey without medical personal. Differentiations of performance level and sports environment in amateur athletes and elite athletes are important to understand and recognize for injury prevention and possibly performance enhancement.

## **5. Conclusion**

Injury incidence rate in amateur soccer players was not huge difference between professional and elite level. Injuries were reported more game phase than preparation phase. Sprain and

contusion were the common injury types as same as previous researches excluded muscle strain. Lower extremity injury incidence was much higher than upper extremity. The most common body regions are ankle and knee as same as other studies.

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