MedPress
Public Health & Epidemiology

Sports Injury of Korean National Team during 5th Asian Indoor & Martial Arts Game in Ashgabat: A Cohort Study

Hyun Chul Kim[1], Kyoung Sub Kim[2], Ki Jun Park[3,*]

[1] Department of Medicine and Science, Korean Sport & Olympic Committee, South Korea.

[2] Department of Physical Education, Sangji University, South Korea.

[3] Department of physical therapy, Sangji University, South Korea.

Case Report

***Corresponding author**

Ki Jun Park,
Department of physical therapy,
Sangji University, 83 Sangjidae-gil,
Wonju-si, Gangwon-do,
Wonju 26339, Korea.
Email: koc-pt@sangji.ac.kr.

Article Information

Received: 10-03-2022;
Accepted: 27-03-2022;
Published: 08-04-2021.

Abstract

The purpose of this study was to investigate the characteristics of sports injuries of Korean athletes before and during the 5th Asian indoor & martial arts game Ashgabat. We prospectively collected data on Korean national athletes. Athletes were assessed by one sports medicine doctor, based on the daily injury reports form of International Olympic Committee and data were stratified according to sex, sports style, injury location. Fisher's exact test were used to compare groups. Injury risk was expressed in relative ratios with 95% confidence intervals. Among 67 athletes, 55 athletes (32 male, 23 female) were selected except for athletes who did not agree with this study. In comparison of sports injury parts by each sport, there was a difference according to the characteristics of each sport (p=0.001). During the competition, there were 50 sports injuries. The incidence of 100AE sports injury was 46.30 (95% CI 33.46 to 59.13). Female had a higher incidence of sports injury than male (p=0.013). In addition, the comparison of the incidence of sports injury per 100 exposures for each sport is athletic and bowling (p=0.002), athletic and swimming (p=0.001), Taekwondo and swimming (p=0.003) and dance sports and swimming (p=0.018) were statistically significant. The location of sports injury was statistically significant for each sport (p=0.006). According to the type of sports injuries, 17 cases of ligament sprain injuries were the most common, followed by 12 cases of muscle injuries, and 7 cases of tendinitis. These results will help predict sports injuries caused by athletes participating in games and training, and will help develop sports injuries prevention programs.

Keywords: Sports Injury, Epidemiology, Athletes, International Competition

Introduction

The Asian Indoor & Martial Arts Game is an international sports competition founded by the Olympic Council of Asia (OCA) and is held every four years [1]. The Asian Indoor & Martial Arts Game is a competition that integrates the Asian Indoor Games (AIG) and the Asian Martial Arts Games (AMAG), and the 5th Asian Indoor & Martial Arts Game dispatched 67 athletes from seven sports to achieve excellent results overall [2]. Recently, interest in preventing sports injury has been increasing in international sports sites, and the International Olympic Committee (IOC) is also trying to identify the risk factors of sports injury at various international competitions to prevent sports injury [3]. Sports injury refers to the inability of athletes to participate in games and training due to injuries that occurred during sports activities [4], which also affects the performance and retirement of athletes in sports injury [5]. Preventing such sports injury and protecting athletes' health is a clear goal and task of the National Olympic Committee (NOC), including the International Sports Federations (IFs) and the Korean Olympic Committee (KOC) [6,7]. Accordingly, the Korean team also dispatched one doctor and two physical therapists to the Ashgabat indoor dance competition. According to a study by Van Mechanlen et al. [8]. The first step of the four-step model for sports injury prevention is to conduct epidemiological investigations on sports injury, and the second step is to analyze the factors and mechanisms of injury. And the third step is the introduction of a preventive program, and the final step is to preventive repeat the first step to evaluate the effectiveness. Accordingly, cohort studies on sports injury, the first step in injury prevention, have been reported in a single sports and various international competitions [9,10,11,12,13].

Citation: Park KJ, Kim HC, Kim KS. Sports Injury of Korean National Team during 5th Asian Indoor & Martial Arts Game in Ashgabat: A Cohort Study. Medp Public Health Epidemiol. 2022; 1(1): mpphe-202203002.

According to a study by Park et al. [14], athletes have different skills to use mainly depending on weight and detailed sports, and the risk of sports injury varies because their metabolism varies depending on sex. However, previous studies have only identified the incidence of sports injury according to each sport and sex, and did not investigate sports injury according to weight class and detailed sports [9,10,11,12,13]. Therefore, there is a lack of research to identify factors that can affect sports injury, such as weight class and detailed sports, which are the second step of injury prevention [15]. Therefore, this study conducted a cohort survey to find out the characteristics of sports injury that occurs during the competition for athletes participating on behalf of Korea at the Asian Indoor & Martial Arts Game. These data are expected to be provided as useful basic data for improving athletes' performance and developing sports injury prevention programs in the future.

Methods

Study population

This study was the first Korean national team to participate in the 5th Asian Indoor & Martial Arts Game held in Ashgabat, Turkmenistan from September 17, 2017 to September 27, 2017, with a total of 67 (40 males and 27 females) selected as subjects. All participants in the study were fully familiar with the explanation of the purpose of the study, and 55 (32 males and 23 females) of them participated in the study, excluding athletes that did not agree with this study. Participants in the study voluntarily signed the consent form and were finally selected. Each sport and detailed sports of the study participants are shown in Table 1.

Table-1: General characteristics of the subjects.

	Total	Men (n)	women (n)
Taekwondo	14 (men 7, women 7)	Finn (1), Fly (1), Feather (1), Light (1) Welter (1), Middle (1), Heavy (1)	Finn (1), Fly (1), Feather (1), Bantam (1), Light (1), Welter (1), Heavy (1)
Athletic	10 (men 6, women 4)	Shot put (1), Sprint (1), Middle distance (3), Hurdle (1)	Shot put (1), Sprint (1), High jump (1), Middle distance (1)
Swimming	10 (men 8, women 2)	Backstroke (2), Freestyle (1), Breaststroke (3), Butterfly (2)	Backstroke (2)
Bowling	8 (men 4, women 4)	Men (4)	Men (4)
Dance sports	8 (men 4, women 4)	Latin (2), Standard (2)	Latin (2), Standard (2)
Weight lifting	5 (men 3, women 2)	Men (3)	Men (2)
Total	55	32	23

Data collection

For sports injury of Korean national team athletes, the training details (training dates and matches dates), the characteristics (sex, each sport), details (weight class, positions, and detailed sports), and sports injury characteristics were recorded based on the IOC daily injury report form [16]. Sports injury caused by participating in games and training was recorded by Korean team medical staff on the spot. At this time, if one athlete suffered sports injury in several areas, each was classified as a different injury so that there was no missing record. Sports injury pattern were classified into head, neck, upper extremities, trunk, and lower extremities according to IOC classification of sports injury, and type of sports injury were classified into muscle injury, ligament sprain, bruise, arthritis, tendinitis, ligament rupture, and fracture [16]. The incidence of injuries were calculated as the number of injuries per 100 athlete exposures (AE) in training and matches. The incidence of injuries for 100 AE was calculated as follows: (total number of injuries/total AE × 100).

Statistical analysis

The examined variables included sex, injury location (body region and site). Descriptive statistics were used to examine injury patterns. To compare each sport and location between groups based on Fisher's exact tests were applied. Injury rates were calculated as the number of injuries per 100 athlete exposures (AE). The risk of injury was expressed as and 95% confidence interval (95% CI), and the incidence of injury for each sport was compared to the Poisson's ratios. All statistical analyses were performed using SPSS V.27.0 for Windows, and the significance level was set at a P value less than 0.05.

Results

Injury Incidence Rate

A total of 50 cases (23 cases for male, and 27 cases for female) of sports injury occurred during the Korean national team's competition regardless of acute and chronic. The incidence of sports injury per 100 exposures was 46.30 cases (95% CI 33.46 to 59.13). There were 32.86 cases (95% CI 19.43 to 46.29) for male athletes and 71.05 cases (95% CI 44.25 to 97.85) for female athletes, female had a higher incidence of sports injury than male (p=0.013). In the sex comparison of the incidence of sports injury per 100 exposures according to each sport and detailed sports, there was a statistically significant difference only in athletic (Figure-1). In addition, the comparison of the incidence of sports injury per 100 exposures for each sport is athletic and bowling (p=0.002), athletic and swimming (p=0.001), Taekwondo and swimming (p=0.003) and dance sports and swimming (p=0.018) were statistically significant, but other than that, they were not statistically significant (Figure-2).

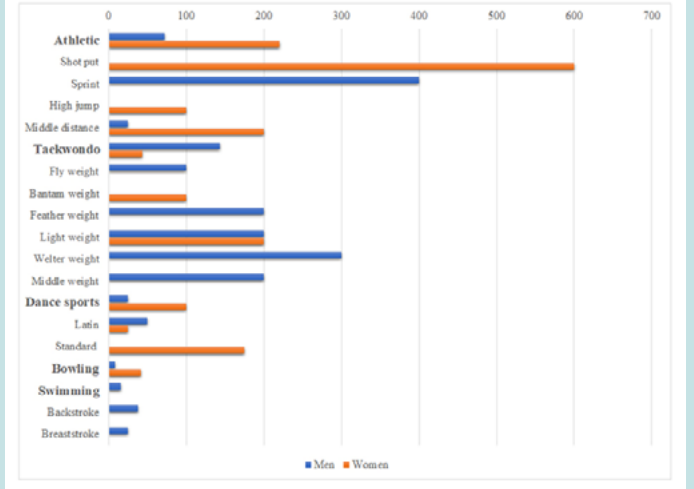

Figure 1: IR per 100 athlete exposures (AE) for each sport

Injury location and injured tissue type:

The lower extremity (56.0%) was the highest in sports injury for Korean national athletes, followed by upper extremities (28.0%), trunk (12.0%), and head/neck (4.0%), and the location of sports injury was statistically significant for each sport (p=0.006) (Figure-3). As for the type of sports injury, ligament sprain was the most common with 17 cases (7 cases for male and 10 cases for female), followed by 12 cases of muscle injury (6 cases for

male and female respectively), and 7 cases of tendinitis (2 cases for male and 5 cases for female). Type of sports injury according to sex were similar (p=0.588; Figure-4).

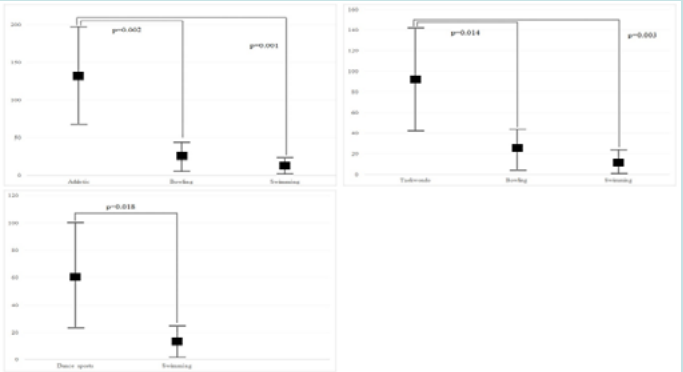

Figure 2: IR per 100 athlete exposures (AE) for each sport compared in Poisson's ratios

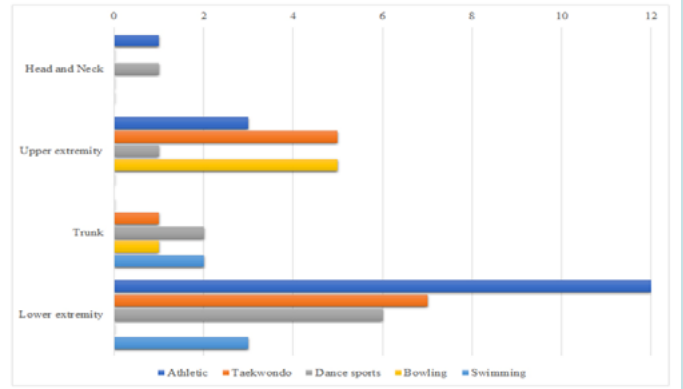

Figure 3: During this competition injury location.

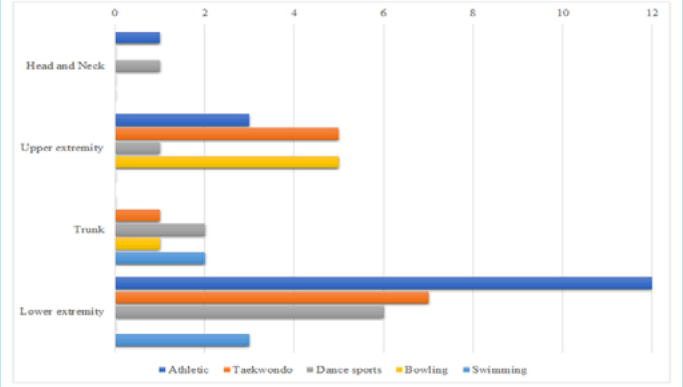

Figure 4: Injury site and mechanism in relation to injury type.

Discussion

Sports injury, which is an obstacle to athletes' performance improvement and successful career, is one of the most important factors that cannot be overlooked [5]. Therefore, preventing sports injury is of paramount importance for athletes management. Accordingly, a cohort study was conducted on Korean athletes at the Asian Indoor & Martial Arts Game, an international competition, to find out the incidence and type of sports injury that occurs during the competition. This is to provide useful basic data for improving athletes' performance and developing sports injury prevention programs in the future.

Injury incidence rate:

Each sport differs in exposure to the risk of sports injury depending on the rules of the matches and the content of the event [17]. Accordingly, the incidence of sports injury may vary according to sex, each sport, and detailed sports. In our study, the incidence of sports injury per 100 exposures of the Korean national team was 46.30 cases (95% CI 33.46 to 59.13), 32.86 cases (95% CI 19.43 to 46.29) for male athletes and 71.05 cases (95% CI 44.25 to 97.85) for female athletes. Meanwhile, according to Kim and Kim [18], the ratio of athletic injuries between men and women is different. There are several factors for this reason, but one of them is the difference in neuromuscular muscles between male and female. According to Dutton [19], loss of control ability in neuromuscles during exercise changes the pattern of exercise and causes muscle fatigue, increasing the incidence of sports injury. Unfortunately, female athletes are significantly inferior to male athletes in controlling neuromuscles [19]. These differences in neuromuscular control capabilities can also be associated with recovery and recurrent injury. Another reason is the difference in metabolism between male and female. Glucose and lipid metabolism and energy balance and body fat distribution have a significant impact on athletes' health, which has a greater impact on female athletes than male athletes [20]. In addition, when looking at the incidence of sports injuries per 100 exposures for each sport in our study, athletic was the highest, followed by Taekwondo, dance sports, bowling, and swimming. The comparison of the incidence of sports injuries according to each event is athletic and bowling (p=0.002), athletic and swimming (p=0.001), Taekwondo and swimming (p=0.003) and dance sports and swimming (p=0.018) were statistically significant. A prospective study of sports injuries has been conducted for each of the last three Olympic events [12,13,14,15,16,17,18,19,20,21,22,23]. There were differences in our study and participating events, but in these three studies, athletic and taekwondo had a higher incidence of injury than swimming, which was similar to our study. This may be because the technology used for each sport characteristic is different, and the training method and technology are different [17]. In addition, even athletes in the same event have different skills and movements that they mainly use depending on the detailed event, so the incidence of sports injuries and sports injuries are different [23]. Athletes in weight classes have different weight loss and weight loss methods depending on their respective weight classes, which can also affect the incidence of sports injuries [14].

Injury location and injured tissue type:

In our study, there was a difference in the area where sports injury occurred for each sport (p=.006). According to Kim [24], sports injury is often caused in specific areas due to differences in skills and body parts mainly used for each sport. In addition, according to Sterkowicz et al. [25], uses different skills depending on the physical physique and physical strength of each athlete. Accordingly, there is a difference in the areas where sports injury occurs for each sport. Looking at the types of sports injury, ligament sprain was the most common, followed by muscle injury and tendinitis. These results showed similar trends to previous sports injury cohort surveys [21,22]. This may be because

aspects of training and competition do not change significantly over time [26]. Ligament sprain was common in knee, lumbar, and ankle, muscle injury was common in femur, groin, lower leg and tendinitis had many Achilles, and type of sports injury according to sex were similar. As such, national team athletes are always exposed to the risk of sports injuries. Therefore, it is most important to prevent sports injury in order to successfully improve the career and performance of not only national team athletes but also all elite athletes [5]. Therefore, this study conducted a cohort survey of Korean athletes at the Asian Indoor & Martial Arts Game, an international competition, to find out the incidence and type of sports injuries. However, because it was a small competition, many athletes could not participate, so the number of participants in the study was limited. In addition, it was not possible to consider athletes from other sports who did not participate in the competition. These cohort data are expected to be provided as useful basic data for improving athletes' performance and developing sports injury prevention programs in the future.

Conclusions

In the Korean national team, female athletes had a higher incidence of injury than male athletes. In addition, detailed sports affect the incidence of sports injury. For sports injury, the lower extremities were the highest, followed by the upper extremities, the trunk, and the head and neck. Lastly, the type of sports injury were ligament sprain, followed by muscle injury, and tendinitis. Type of sports injury according to sex were similar.

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Citation: Park KJ, Kim HC, Kim KS. Sports Injury of Korean National Team during 5th Asian Indoor & Martial Arts Game in Ashgabat: A Cohort Study. Medp Public Health Epidemiol. 2022; 1(1): mpphe-202203002.