

Handball Injuries in Elite Asian Players

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Abstract: The purpose of this study was to investigate the injury incidence and mechanism of injuries in elite Asian handball players using descriptive questionnaire. On the whole, during the last year, 63 injuries were recorded. The incidence of injuries per 1000 hours of competition was found to be 20.7 while per 1000 hours of training .96 injuries happened. The results showed that acute injuries [82.54%] was significantly much higher than chronic injuries [17.46%] [$X^2=26.683$, $P=0.000$]. According to findings 15% of the injuries were severe. The highest incidence of injuries [41%] was in left and right backs. The findings also show that there is a meaningful difference in the incidence of injuries made to different parts of the body in handball players [$X^2=37.07$, $P=0.00$] in a way that majority of the injuries happened in the ankle [23.8%], knee [15.9%] and shoulder [11.1%]. Based on results 65% of the injuries in handball are of the non-contact kind while 35% were the consequence of players' contact with their opponents [$X^2=5.730$, $P=0.00$]. The main mechanism leading to injuries included, plant and cutting [28.5%] and blocking [22.2%] [$X^2=18.810$, $P=0.00$]. Also the results of analysis showed that 65% of the injuries in handball happen in the second half of the game while the remaining 35% happened in the first half. These results showed that the incidence of injuries in elite Asian handball players is quite high and prevention should focus on ankle and knee injuries. In addition, In order to decrease injuries that arise from plant and cutting movement, there seems to be a need for teaching appropriate techniques to athlete and also doing balance-promoting training.

Key words: Handball • Sport Injury • Athletes

INTRODUCTION

Team handball is one of the most popular sports in the world [1-5]. This sport was included in the list of Olympic Games in 1972. It is the most popular sports in European after football, volleyball and basketball [3,6,7]. During the recent years, this sport has grown more popular in Asia and people's interest in this sport is growing. Injuries happen to the players of this sport as in other team activities [8]. The results of previous studies show that the incidence of injuries is much higher during the match than training [9-14]. For instance, Seil *et al.* [1998] reported 6% injuries per 1000 hours of training and 14.3% injuries per 1000 hours of playing during the matches in German's League [15]. Acute injuries include 56 to 98% of the injuries in handball [7,9,11,16-19] while injuries as a result of overuse include 2 to 44% of the injuries [7,9,11,17-19]. Concerning the severity of the injuries Papacostas *et al.* [2001] reported 51% of the injuries as slight, 24.3% as moderate and 13.5% as serious and finally 10.9% as severe [11].

In the studies recently conducted by Momeni [2008] and Piry [2010], the back players were reported to have experienced more injuries than other players [5, 13]. Concerning the injuries made to different parts of the body, some of the researchers regard ankle as the most common area affected by injuries [11,12,14,19]. Others reported the knee as the most highly affected by the injuries [10,15,17]. The results of recent studies show that injuries are the result of players' contacts with others during the game [2,3,5,10,13].

The incidence of injuries has been reported to be variable in different times. For example, Myklebust *et al.* [1997] reported that 53% of injuries happen in the first half of the game [6]. On the other hand, Jung *et al.* found that 46% of injuries happens in the first half and 54% in the second half [2]. Considering the goals of World Health Organization and lack of information about the incidence of injuries in handball and the mechanisms involved at higher levels of the competition especially in Asia, there seems to a need for Epidemiologic research in handball. Accordingly, this study is an attempt to consider the

mechanisms involved in and the incidence of injuries using a questionnaire. The results of this study can help to design special plans to prevent the injuries.

MATERIALS AND METHODS

This is a retrospective descriptive study and considers the incidence of injuries during the last year to male participants in the Asian Handball championships, which was held in 2008. For this purpose, all the teams participating in these competitions were invited to take part in this study. Of these teams, Iranian, Chinese, Qatar and Lebanese teams agreed to participate in our study. The sample population included 40 players from the four teams taking part in the study.

The instrument used in this study is a standard questionnaire taken from Olsen and *et al.*'s [2006] study modified after consulting two professors in the field of Physical Education and Sport Medicine [10]. The questionnaire was related to the sports injuries that inflicted the athletes during the last year. The related information about age, sex, name of the team, the date of injuries, the mechanism [howness] of the injuries, position of the player, the type of collision [contact or non-contact], the type of injuries [acute or chronic], the location of the injuries and the severity of injuries was collected. In this study, all the physical injuries happening during the match and training requiring medical aid was defined as injury without considering the consequences such as absence in the following games or training sessions [1, 3]. In order to measure the incidence of injuries per 1000 hours, the total time players were at risk of injuries [exposure time] was calculated. The exposure time was calculated by multiplying the number of matches by the time of each match lasted and by the number of players. The exposure time during the training sessions was calculated by multiplying the hours of training sessions by the average time of training for each player [10]. By fitting the exposure time to injuries in formula 1, the incidence of injuries per 1000 hours was calculated.

Formula 1:

The incidence of injuries per 1000 hours = $1000 \times \text{number of injuries} / \text{the hours of exposure}$

The injuries were divided into four categories based on their severity including: 1-slight [meaning that the player can participate in the next match or training session], 2-mild [not being able to participate in the competitions or training sessions for 1 to 7 days, 3-moderate [being absent from competitions or training

sessions for 8 to 21 days] and 4-severe [being away from the competitions and training sessions for more than 21 days] [10]. In this research acute injury defined as an injury with a sudden onset associated with a known trauma and overuse injury as an injury with a gradual onset without any known trauma [9]. Injured anatomic areas was classified as follows: head and neck, trunk [chest, abdomen and waist], the upper extremity [shoulder, elbow, forearm, wrist and fingers] and lower extremity [hip joint, thigh and pelvis, groin, knee, lower leg, ankle and toes] [10]. In order to a more precise consideration of the incidence of injuries in different positions [for players], players were classified into five groups based on their duties: left and right backs [back [side]], centre, left and right wings, line player and a goalkeeper. Regarding the kind of collisions leading to injuries, if the player was injured because of a direct shot of the opponent, or being pushed or stopped or blow at a part of the body other than the injured part, the injury would be classified as "contact" and if he was injured due to running, turning, jumping, or falling, then the injury was classified as "non-contact" [9]. The mechanism resulting in injuries included: landing, dribbling, blocking, plant and cutting, shooting, turning, etc. Before conducting the analyses, all the variables were considered using K-S test to see if they are normal. The collected data were analyzed using SPSS 16. Considering the fact that the data were non-parametric we used chi-square test at $P < 0.05$ level of significance to analyze the collected data and Excel was used to draw the graphs.

RESULTS

On the whole, during the last year, 63 injuries were recorded. Considering the hours the players were exposure to injuries which were 1540 and 32192 hours during the competition and training sessions respectively, the incidence of injuries per 1000 hours of competition was found to be 20.7 while per 1000 hours of training .96 injuries happened. Concerning the incidence of acute and chronic injuries, the results showed that acute injuries [52 injuries or 82.54%] was significantly much higher than chronic injuries [11 injuries or 17.46%] [X^2 -26.683, $P=0.000$]. The findings also showed that majority of the injuries during the last year were mild injuries 38% and slight, moderate and severe injuries included 25, 20 and 15% of the injuries respectively [Figure 1]. Based on the results of this study, 70% of the severe injuries happened in the lower extremity and 50% of the injuries in the trunk were moderate.

Regarding the incidence of injuries in different positions, the results showed a clear meaningful difference [$X^2=18.982$, $P=0.00$]. The highest incidence of injuries [41%] was in left and right backs. Centre players were next in the ranking [19%]. The lowest incidence of injuries were found to be in left and right wings [12.7%] [Figure 2.].

Concerning the type of collision leading to injuries in different positions, the results showed that for goalkeepers 90% of the injuries were of the non-contact type and in left and right wings 87% of the injuries is also of the non-contact type while in line players, 57% of injuries were the result of contact. The results indicated that right and left backs and goalkeepers experience similar incidences of injury to their trunk [33% of the total injuries] while most of the injuries in the upper extremities happen to backs [50%]. The findings also show that there is a meaningful difference in the incidence of injuries made to different parts of the body in handball players [$X^2=37.07$, $P=0.00$] in a way that majority of the injuries happened in the ankle [23.8%], knee [15.9%] and shoulder [11.1%].

The results of further analysis showed that 65% of the injuries in handball are of the non-contact kind while 35% were the consequence of players' contact with their opponents. The difference between the two types of injuries was statistically meaningful [$X^2=5.730$, $P=0.00$]. furthermore, 69% of injuries happening in the lower extremities were of the non-contact type while all the injuries in the head and neck area was the result of contact. The main mechanism leading to injuries included, plant and cutting [28.5%] and blocking [22.2%] [$X^2=18.810$, $P=0.00$] [Figure 3.]. According to the results of the study 42% of the injuries in the upper extremity was caused by blocking while 55% of the injuries in the lower extremity was caused by plant and cutting. The results of further analysis showed that 71% of the injuries to line players was the result of turning while in the backs the injuries [42%] were the result of plant and cutting.

When the reported injuries during the game were analyzed the results of analysis showed that 65% of the injuries in handball happen in the second half of the game while the remaining 35% happened in the first half. However, the difference was not statistically significant [$X^2=3.125$, $P=0.00$].



Fig 1: Severity of injury in handball players

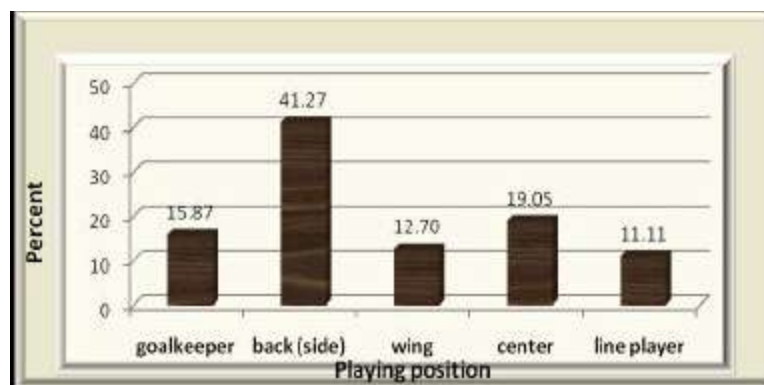


Fig. 2: The incidence of injury in different playing position

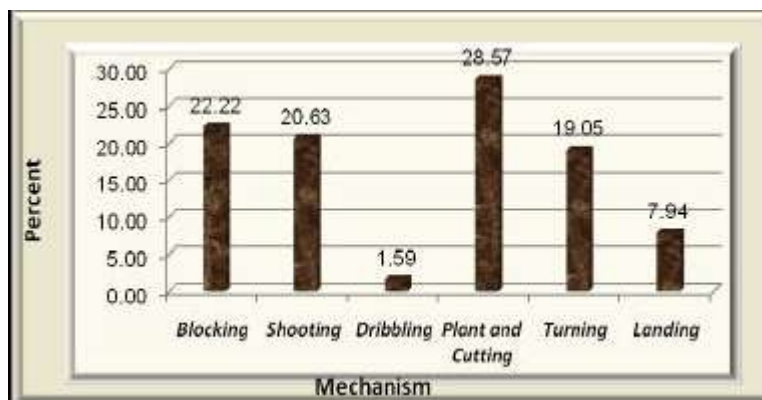


Fig. 3: The mechanisms of injury in handball players

DISCUSSION

In this study, the incidence of injuries per 1000 hours of competition and training, the type of injuries [acute or chronic], severity of injuries, position of injured players, the location of injury, the type of collision leading to injury, the mechanisms resulting in the injuries and the incidence of injuries in the first and second half of the game were considered.

The incidence of injuries per 1000 hours of competition was found to be 20.7 injuries which is higher than the incidence of injuries in Olson *et al.*'s study [2005] [4.7 injuries per 1000 hours], Tasigil *et al.*'s study [2005] [18.4 injuries per 1000 hours] and Olson *et al.*'s study [2006] [9.9 injuries per 1000 hours of competition] [9, 10, 16]. The incidence of injuries in this study was found to be lower than that in Wedderkopp *et al.*'s study [2003] [52 injuries per 1000 hours], Langevoort *et al.*'s study [2007] [108 injuries per 1000 hours] and Junge *et al.*'s study [2006] [114 injuries per 1000 hours of competition] [2, 3, 17]. Furthermore, the incidence of injuries in every 1000 hours of training was found to be 96 injuries which is higher than that reported in Olson *et al.*'s study [2006] [9 injuries per 1000 hours of training] and Olson *et al.*'s study [2005] [0.4 injuries per 1000 hours of training] [9, 10]. This rate was found to be lower than the rate found in Nielsen *et al.*'s study [1998] [1.64 injuries per 1000 hours of training] [7]. In this study, the incidence of injuries per 1000 hours of competition was found to be 21.5 times more than the incidence of injuries per 1000 hours of training. The higher incidence of injuries during the competition might be due to the higher severity during the matches or be reflective of the nature of competition [19].

The results also showed that acute injuries [52 injuries [82.54%]] were much more than chronic injuries [11 injuries [17.46%]] [$X^2=26.683$, $P=0.00$]. previous studies had also reported acute injuries to be the more common type of injury [7,9,11,17,18,19]. The main reason for acute injuries is being cruel playing during the game [8]. Finding and reporting injuries that are the result of overuse is difficult and this can be the main reason for the low number of injuries caused by overusing [18]. The majority of injuries during the last year were mild injuries 38% and slight, moderate and severe changes included 25, 20 and 15% of the injuries respectively. Accordingly, Papacostas *et al.* [2001] found that 51% of the injuries were slight, 24.3% were moderate, 13.5% were serious and 10.9% were severe injuries [11]. Lindblad *et al.* [1993] also found out that 68% of the injured players were away from sports for more than one week [4]. It seems that changing the rules, training and implementing preventive plans can effectively decrease the injuries especially severe ones.

Concerning the incidence of injuries in different positions, the results of the study showed that there was a statistically significant difference between the players in different positions [$X^2=18.982$, $P=0.00$]. In general, the highest incidence of injuries was reported in the back players [41%]. The results of this study are consistent with the findings of Wedderkopp *et al.* [2003], Reckling *et al.* [2003], Momeni [2008], Olson *et al.* [2006] and Piry *et al.* [2010]. They all reported the highest incidence of injuries in the back players [5,10,13, 14, 17]. The higher incidence of injuries in the back players can be attributed to handball steps, burst movement, quick change of direction in comparison with the players in other positions [5] and more severe and numerous collisions with the opponent players [18]. On the other

hand, Seil *et al.* [1998] reported that left and right wings experience the highest incidence of injuries [15]. The likely difference in the results can be the level of players, i.e. whether they are professional or non-professional.

The results showed a difference between the incidence of injuries in different parts of the body in handball players. The highest incidence of injuries happens in the ankle [23.8%] and the knee [15.9%]. The high incidence of injuries in the ankle can be the result of plant and cutting movements that left and right wings and back players do during the attack and hitting the defensive wall of the opponent team and also because of the strides and repetitive landing and handball steps which cause higher incidence of injuries to the players. Based on the findings of this study, 65% of the injuries were of the non-contact kind while the remaining 35% happened as the result of contact. This finding is consistent with the findings of Myklebust *et al.* [1997], Petersen *et al.* [2005], Wedderkopp *et al.* [1997] and Olson *et al.*'s [2003] [6, 8, 12, 18]. Unlike other studies, Momeni [2008] stated that among the Asian players, the incidence of injuries as the result of contact [81.2%] is much higher than the injuries that are of the non-contact type [5]. The reason for the different results is not clear. It seems that improvement in the ability to keep the balance, proprioception sense, strength, endurance, agility and other factors related to physical and motor fitness and also using appropriate techniques in doing plant and cutting, landing, turning, can effectively decrease injuries of the non-contact type.

The major mechanisms involved in causing the injuries include plant and cutting [28.5%] and blocking [22.2%] [$X^2=18.810$, $P=0.00$]. Olson *et al.* [2006] also reported that majority of the injuries happen during the attack when left and right wings and backs do plant and cutting, landing, turning [10]. An important finding of this study was that 71% of the injuries that happen to line players are due to turning. In order to decrease the injuries to line players as the result of turning is to train them and teach them appropriate turning techniques.

Concerning the incidence of injuries in the first and second half of the game, the findings of the study showed that most of the injuries happen in the second half of the match [65%]. This finding is consistent with the results of Jung *et al.* [2006], Langevoort *et al.* [2007] and Piry [2010] [2, 3, 13]. In contrast, Myklebust *et al.* [1997] reported that 53% of the injuries happen in the first half of the game [6]. The reason for higher number of injuries in the second half might be due to the central neural system fatigue and

muscle exhaustion in the players as the result of finishing the sources of glycogen and lack of carbohydrates at the last minutes of the game [1]. The attempt made by the players to change the result of the game might be another factor contributing to the high incidence of injuries in the second half [13].

CONCLUSION

The results of the study showed that the incidence of injuries in professional Asian handball players is quite high. Therefore, players and coaches should implement preventive plans in order to prevent the injuries in line with the goals of World Health Organization. The results also showed that the main mechanism leading to the injuries was plant and cutting movement. In order to decrease such injuries, there seems to be a need for training the players and teaching appropriate techniques and also doing balance-promoting training.

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