



Analysis of sports injuries in training and competition for handball players

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Abstract

The aim of this study is to determine injury types and injured body parts of handball athletes in competition and training in our country so that we will be able to find tangible data providing facility to prepare protector program for most injured body parts. A total of 705 athletes (male, 492; female, 213), who are the ones at different ages participated in handball tournaments in 2011 in Turkey and young male and female national team players (22 male, 22 female) joined voluntarily to the study. A questionnaire about the subject was asked to athletes. It is determined that the min-max age range of sporters is 11-31 and the average age of them is 17.04 ± 4.6 , 69.08% of sporters who participated in the study are male and 30.2% of them are female. 52.6% of the athletes reported that they got at least one injury in their sports life and 47.4% of them reported that they have had no injury. The injury incidence in relation to exposure in competition and training was 65% and 35%, respectively. The most popular incidence of injury in competition (37.8%) and training (45.8%) was sprain and it is determined that foot and ankle were the most commonly injured body parts. The most injured body parts in handball caused by competition and training are ankle, knee, and calf-thigh. It is evaluated that exercise programs for these body parts should be developed and added to training programs to lessen incidence of injuries except ones caused by factors being particular to sports.

Keywords: Handball, sports injury, training, competition.

INTRODUCTION

Having millions of fanciers and players handball is a sports branch which are becoming more common and attractive internationally. In European countries, handball becomes main factor of physical education thanks to that attention (24).

It is emphasised that modern handball imposes pretty much burden on musculoskeletal system of players so it turns conditioning of all body and extremity muscles into a precondition. Also it is stressed that using forearm, arm, shoulder, knee and ankle actively causes working muscles in an extreme way in that area thus these areas used extremely and they are open to strikes and injuries because of the aspects of handball (23). According a study, 40-60 % of handball accidents result from colliding with competitor, 20-40 % of them result from wrong throwing or dropping technique, hampering the arm throwing the ball causes sudden handicap, wrong shooting technique causes shoulder handicaps and jumping and turning movements causes knee handicaps (11).

Reasons of sport injuries may be collected under many titles. Overloading, prior and partly treated injuries, cold, muscle and joint strictness due

to extreme stress and infection, muscle weakness due to previous injury or lack of education, power imbalance between muscles, inability of sports equipment, lacking physical preperation, the lack of warming, not appropriate sports branch for sporter, insufficient technique, not being ready mentally, extreme competition, competitive sport and illnesses can be shown among these reasons (21).

In addition to these, sporters can be exposed to handicaps and injuries with different extents due to striking, dropping, sudden and severe spasm and some compulsion. Also factors as starting a hard training without sufficient warm-up and stretching exercises, focal infection, sleepless and tired sporter, lack of condition can result in injuries (28).

Knowledge in athletes' common injury types, causes and regions can be the base to develop different strategies for preventive measures and to execute studies called protective sports medicine.

The aim of this study is to determine the sports injury types and injury zones occurring in training and competitions for athletes who are interested with handball sports branch in our country. According to the results, it is aimed to put forward data for the creation of training programs which

provide prevention or reduction of injuries not caused by the structure of sport.

MATERIALS AND METHODS

The study was conducted on male and female handball players who participated in national tournaments at the categories of stars, young and adult during the year 2011 and young male and female national team players. The list of clubs which will participate in Championships in Turkey was created by the help of the federation before the study, clubs' accommodation were visited one by one to have athletes fill out questionnaires before competitions. In this way, athletes from seven regions had been reached. National team camps were visited for the national team players. The research was completed in a period of 6 months between the months of January-June and 705 (492 male, 213 female) athletes whose average age is 17.04 participated in the study on a voluntary basis. Athletes were informed in accordance with "Declaration of Helsinki" and they declared their voluntary participation.

A questionnaire of 20 questions which was previously prepared on the subject by us was distributed to handball players and they were asked to fill out. The questionnaire has been created in two parts. The decisive questions such as age, gender, education level, age to start competitive sports, demographic characteristics as the province in which the license was given take place in the first part. In the second part, "sports Injury" was defined and questions as having or not having sports injury

throughout their lives according to this definition, name given to their injury, injured body parts, having injury in training or competition, the personal opinion for the cause of injury and other questions related with athletes' sport life were asked. The activity in which pain or discomfort felt was based for injuries that may occur due to overuse. As a result of the possibility that athletes have injury more than one, statistical studies were done depending on the number of injuries not the number of athletes.

The data collected by questionnaires were brought into tables in package program, SPSS 16.0 according to the purpose of the study. The percentage (%), standard deviation (SD), min-max values and average values were calculated. Significance levels were assessed according to the level, $p < 0.05$, by using χ^2 test in the comparison of data in cross tables.

RESULTS

Rate of ages in handball players participated in the study shows a wide distribution. Min-max age is 11 - 31 and the mean age is 17.04. It is determined that age of 42.1% of athletes is in 11-14, 25.1% in 15-18, 21% in 18-23, 11.8% of them is at 24 and above (sd = 4, 67). A significant relationship was found between sports injury and age in the statistical study ($p = 0.00$).

As shown in Table 1, the ratio of the answers as "yes" for the question, "Have you ever had sports Injuries?" is max in the range of 24 to 31 years of age.

		Sports Injury		Total	
		Yes	No		
Age	11-14	Count	121	175	296
		% within Age	40.90%	59.10%	100.00%
		% of Total	17.20%	24.80%	42.00%
	15-18	Count	59	119	178
		% within Age	33.10%	66.90%	100.00%
		% of Total	8.40%	16.90%	25.20%
	19-23	Count	121	30	151
		% within Age	80.10%	19.90%	100.00%
		% of Total	17.20%	4.30%	21.40%
	24-31	Count	70	10	80
		% within Age	87.50%	12.50%	100.00%
		% of Total	9.90%	1.40%	11.30%
Total	Count	371	334	705	
	% within Age	52.60%	47.40%	100.00%	
	% of Total	52.60%	47.40%	100.00%	

Pearson Chi-Square Asymp. Sig. (2-sided) ,00

According to gender distribution of the athletes participating in the study, 69.8% were male (492) and 30.2% were female (213). A significant correlation wasn't found between gender and sports injury ($p = 0.553$) in the statistical study (Table 2).

Age to begin sports for handball players was identified as 11.2% is under the age of eight, 51.6% between 9-11, 26.1% in 12-14, 9.7% 15-17, % 1.4 at 18 and above. A significant relationship was found between sports injury and age to begin sports in the study ($p = 0.003$). Search for the level of statistical significance of sports injuries with age to begin sports is another study (Table 3).

When handball players' sports injury cases throughout their active sports lives are searched,

52.6% of 705 athletes participated in the study stated that they had a sports injury, 47.4% said that they have not undergone the sports injury.

In the study, the question, "What do you think about the most important reason to have sports injury in training?" is asked to athletes; %34,1of them said that insufficient warming cause injury. 17.6% said unconscious action and 16.3% declared overload as a major cause of injury (Table 4).

When the causes for having injury in competition was asked to athletes; 37.6% of athletes showed illegal behavior of the opponents, 19.8% insufficient warming before competitions, and 12.3% inadequate training in preparation for the competition as a cause of injury (Table 5).

Table 2. Distribution of sports injuries according to sex.

		Sports Injury		Total	
		Yes	No		
Sex	Male	Count	256	236	492
		% within Gender	52.00%	48.00%	100.00%
		% of Total	36.30%	33.50%	69.80%
	Female	Count	116	97	213
		% within Gender	54.50%	45.50%	100.00%
		% of Total	16.50%	13.80%	30.20%
Total	Count	372	333	705	
	% within Gender	52.80%	47.20%	100.00%	
	% of Total	52.80%	47.20%	100.00%	

Pearson Chi-Square Asymp. Sig. (2-sided) .553

Table 3. Distribution of sports injuries according to age to begin sports.

		Age to Begin Sports					Total	
		8 and under	9-11	12-14	15-17	18 and higher		
Injury	Yes	Count	39	199	107	20	5	370
		% within Injury	10,50%	53,80%	28,90%	5,40%	1,40%	100,00%
		% of Total	5,50%	28,30%	15,20%	2,80%	0,70%	52,60%
	No	Count	39	165	79	46	5	334
		% within Injury	11,70%	49,40%	23,70%	13,80%	1,50%	100,00%
		% of Total	5,50%	23,40%	11,20%	6,50%	0,70%	47,40%
Total	Count	78	364	186	66	10	704	
	% within Injury	11,10%	51,70%	26,40%	9,40%	1,40%	100,00%	
	% of Total	11,10%	51,70%	26,40%	9,40%	1,40%	100,00%	

Pearson Chi-Square Asymp. Sig. (2-sided) ,003

Table 4. Causes of injuries in training.

	Frequency	Percent	Valid Percent	Cumulative Percent
Unconscious Movement	123	13.7	17.6	17.6
Protective Equipment Disuse	21	2.3	3	20.6
Insufficient Material	23	2.6	3.3	23.9
Insufficient warm-up	239	26.7	34.1	58
Overload	114	12.7	16.3	74.3
Irregular Practice	60	6.7	8.6	82.9
Lack of exercise area	27	3	3.9	86.7
Others	89	9.9	12.7	99.4
Multiple Reason	4	0.4	0.6	99.7
Total	700	78.2	100	

Related with 705 handball players participating in the study, the number of injuries in competition was found as 505 and the number in training was 264. The most common sports injury exposed in match for handball players is sprain with 34.7%. This injury type was followed by contusion with 18.2%, strain 12.3%, tear 12.5%, fracture 8.9%, rupture (bond breakage) 5.7%, dislocation 4.2%, hernia-paravertebral spasm 1%, tendinitis 0.8% and other types of injuries 1.8% (Table 6).

When the athletes' body parts which are affected by sports injuries in competition were examined, they were found to be foot and ankle with 37.8%, knee with 20.6%, the calf-thigh with

14.7%, hand and wrist with 7.9%, the shoulder 7.9%, elbow region with 3%, the hip region with 3.6%, the head region with 2.2%, low back with 1.6%, chest area with 0.8% (Table 7).

An examination of sports injuries in training, 705 athletes got the total amount of 264 personal injuries throughout their sports lives. Rick is in first place with 41.3% at training again. This is the type of injury is followed by, contusion with 22%, strain with 17%, tear with 8.3%, fracture with 4.2%, dislocation with 3.4%, rupture with 1.5%, tendinitis with 1.1%, hernia- paravertebral spasm with 0.8% and impingement syndrome with 0.4% (Table 8).

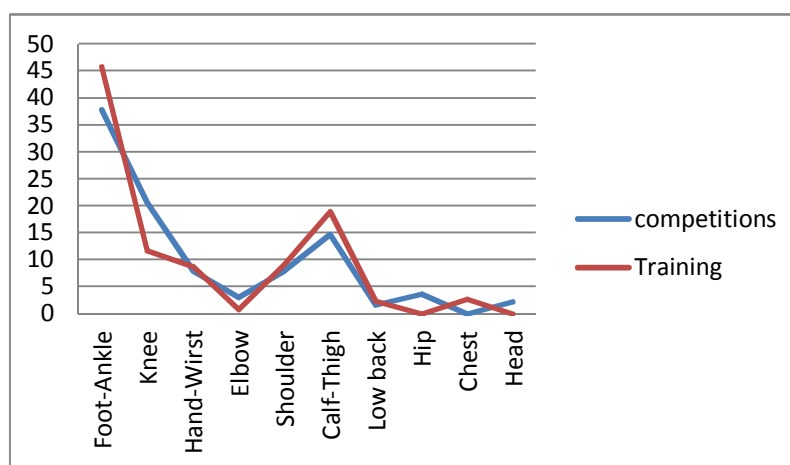
	Frequency	Percent	Valid Percent	Cumulative Percent
Illegal Behavior of Opponent	262	29.3	37.6	37.6
Inadequate Exercise in Training Period	86	9.6	12.3	49.9
Insufficient Warm-up Before Competition	138	15.4	19.8	69.7
Late Stops by the Referees for Positions	46	5.1	6.6	76.3
Overload in the Preparation Period	41	4.6	5.9	82.2
Unsuitable Ground for Competition	32	3.6	4.6	86.8
Trainer's Wrong Tactic	7	0.8	1	87.8
Others	78	8.7	11.2	99
Multiple Reason	7	0.8	1	99.3
Total	697	77.9	100	100

	Frequency	Percent	Valid Percent	Cumulative Percent
Contusion	92	10,3	18,2	18,2
Sprain	175	19,6	34,7	52,9
Fracture	45	5	8,9	61,8
Dislocation	21	2,3	4,2	65,9
Rupture	29	3,2	5,7	71,7
Strain	62	6,9	12,3	84
Tear	63	7	12,5	96,4
Tendinitis	4	0,4	0,8	97,2
Hernia-Paravertreval Spasm	5	0,6	1	98,2
Other Injuries	9	1	1,8	100
Total	505	56,4	100	

	Frequency	Percent	Valid Percent	Cumulative Percent
Foot-Ankle	191	21,3	37,8	37,8
Knee	104	11,6	20,6	58,4
Hand-Wrist	40	4,5	7,9	66,3
Elbow	15	1,7	3	69,3
Shoulder	40	4,5	7,9	77,2
Calf-Thigh	74	8,3	14,7	91,9
Low back	8	0,9	1,6	93,5
Hip	18	2	3,6	97
Chest	4	0,4	0,8	97,8
Head	11	1,2	2,2	100
Total	505	56,4	100	

	Frequency	Percent	Valid Percent	Cumulative Percent
Contusion	58	6,5	22	22
Sprain	109	12,2	41,3	63,3
Fracture	11	1,2	4,2	67,4
Dislocation	9	1	3,4	70,8
Rupture	4	0,4	1,5	72,3
Strain	45	5	17	89,4
Tear	22	2,5	8,3	97,7
Tendinitis	3	0,3	1,1	98,9
Impingement	1	0,1	0,4	99,2
Hernia-Paravertreval Spasm	2	0,2	0,8	100
Total	264	29,5	100	

	Frequency	Percent	Valid Percent	Cumulative Percent
Foot - Ankle	121	13,5	45,8	45,8
Knee	31	3,5	11,7	57,6
Hand-Wrist	23	2,6	8,7	66,3
Elbow	2	0,2	0,8	67
Shoulder	24	2,7	9,1	76,1
Calf-Thigh	50	5,6	18,9	95,1
Low back	6	0,7	2,3	97,3
Chest	7	0,8	2,7	100
Total	264	29,5	100	



Graph 1. Comparison of injured body parts in training and competition.

When areas of the body affected by injuries in training were examined, the foot and ankle with the rate of 45.8% are at the first rank within entire injuries in the study. This body part is followed by the calf-thigh with 18.9% and knee injuries with 11.7%. The rate is 9.1% for shoulder injuries and 8.7% for hand and wrist injuries. In addition, the rate was calculated as 2.3% of low back injuries, 0.8% of elbow injuries and 2.7% of chest injuries.

Head and hip injuries in training were not found in the study (Table 9).

When parts of the body injured in the training and competition are compared, similar results are observed in the study (Figure 1).

DISCUSSION

Age interval of athletes in this study shows a wide range. The mean age was determined as 17.04 ± 4.6 . In general, the age and experience may be

considered to decrease sports injuries. However, in a study of 642 athletes over the age of 12 in England, %66 of handball players are over the age of 20, 34% are under twenty. 49% of athletes over the age of twenty said not having any injury, while the rate of 51% of athletes under the age of 20 are expressing that they underwent injury. While considering that experience and the rate of injury interact in the opposite direction, they were found to be parallel based on the study. Older age, more and more experience is thought to risk further injury. Relatively more severe disabilities (e.g., requires stabilization with gypsum or splint) increased with age of athlete noteworthy. The explanation for the result is that physical fitness (strength, speed, endurance, etc.) increases with age, and thus, game is played with more speed and power (1). In this study, a significant statistical relationship between age and injury has been identified. Increase in the number of injury with age is observed.

Looking at rates of injury based on sex differences of athletes participating in the study, they had a sports injury while expressing 52% for male athletes, 54,5% of female athletes stated that they had a sports injury.

According to the studies in the literature, although rates of sports injury for young girls are similar with young men's ratio, mechanisms of injury may be different. Pull-type injuries for women and contusion injuries for men have been mainly reported (9). In a study conducted in 2008; knee injuries in different sports, especially the incidence of anterior cruciate ligament and ankle injuries for young women are more than young men's injury declared. The possible causes of this situation were determined as the high arthro laxity, lack of muscle strength, coordination and weak proprioception (26).

In our country, the age of onset of handball for men and women is stated as 7, and the minimum age of license extraction is applied as 9 (20). Studies in the literature reveals that sports trainings does not affect the growth, especially in girls before puberty, even postpone it, in the later period is up, the optimal sports training does not negatively affect the growth and increase the development of the organism (functional ability-capacity). As a result, sport exercises may not adversely affect the growth of achieving levels, in addition it can be said that it mainly contributes to development (22). The majority of athletes in sport between the ages of 9-11

are observed in this study. Despite a statistically significant relationship is seen between sports injuries and age of onset in the study, assessment of the severity of injuries by age of onset is a topic for another study. In a study conducted with 302 athletes, injury rates of football players, basketball players and handball players were compared, a total of 119 injuries were identified. That the occurrence of these injuries is 62, 36 and 21 in football, handball and basketball, respectively is reported (27). In a study conducted in Turkey, 100 football players, 50 basketball players, 50 handball players and 50 volleyball players, totally 250 professional athletes were examined, 96% of the football players, 90% of the basketball players, 80% of the handball players, 76% of volleyball players participating in the study stated that they had a sports injury (13).

Sports injuries examined in the study shows 65% of injuries occurs in competitions and 35% in training. Sport injury types' rates of handball in training and match are similar and the most common one is sprain. This type of injury is followed by tears and strain. Fracture, dislocation, fracture type injuries are more frequent in competitions than training session. Contusion, a common type of injury in training and competitions, is noteworthy. Studies in literature shows that handball players mostly have sprain, strain, and contusion type injuries (1,19).

In a study of 130 handball players in the Netherlands, type of injuries were examined, according to the results of the study, 35,4% of handball players are exposed to dislocations, 25,4% to sprains, 12,3% to fractures, 13,8% to ligament rupture, 5,4% to crushing and 7,7% to other injuries have been reported (7). Depending on the comparison of these studies with our study, the sprain and contusion rates were higher, fracture, dislocation and fracture rates were significantly lower.

221 handball players were examined in another study, 18% of sports injuries occurred due to overuse, indicated (19). Rates of injuries such as tendonitis and shoulder impingement syndrome thought to be due to overuse were very low in the study (1.4%, 0.5%).

Body parts exposed to injury in competition and training are similar according to the study results. Foot and ankle are first parts that injury is seen in training and competition. Knee, hand and

wrist, calf-thigh and shoulder are identified other injured body parts in the study. Studies in the literature reveal that the vast majority of injuries in handball occurred in the lower extremities. The study results in this regard are parallel with the literature.

In a study of 108 handball players in Switzerland, 42% of the total injuries occurred in lower limb and 8% of these injuries are ankle sprain indicated. The same study indicated that 18% of injuries occurred in the upper extremities, 14% in chest, and 14% in the head (18).

However the study is in compliance with literature from this point of view, head and chest injuries` rates were found lower in the study.

Investigating causes of injuries in the literature, proprioception disorder in people with a history of ankle sprain set out by Glencross and Thornton for the first time. Later, correlation between the severity of ankle injury and joint position sense disorders was shown (17). In another study, reduction in proprioception with individuals suffering from chronic ankle instability and knee injury was indicated (2). Disorders occurring in the sense of balance and the perception of passive act which are components of proprioception may cause an injury, indicated (6).

Stretching exercises in the warm-up phase preparing for athletic performance have become an essential habit in many sports. Stretching exercises are believed to be important in reducing the risk of injury and performance enhancement (5,15), and there are many studies that supports this idea in the literature (8,14,15,25). In addition, studies in the literature indicate that the acquisition of flexibility prevents injuries and enhances athletic performance. Loss of flexibility also leads to a decrease in joint movement, disrupts the pattern of walking and jogging, adversely effects sports performance and the development of strength and speed (4,29). The muscle strength`s effects for prevention of injuries and support at rehabilitation were also determined in the literature (4).

In conclusion; it is observed that the body parts most injured in handball are foot and ankle, knee, calf-thigh, shoulder and hand and wrist regions. Exercise programs should be developed to strengthen the muscles of these body parts which frequently have injuries to minimize injuries such as tears, strain, sprains, ligament ruptures and

tendonitis due to overuse except injuries such as contusion caused by the binary struggle, the nature of the sport. The proprioception, tendon and ligament`s strengthening exercises for knee injury, foot and ankle which are mostly injured body parts must be added to the training program. Development of warm-up, cool-down and stretching exercises are necessary to prevent injuries caused by inadequate warm-up.

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