Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

European Journal of Experimental Biology, 2013, 3(5):274-281

ISSN: 2248 –9215
CODEN (USA): EJEBAU

Relationship between types, prevalence and common intensity of injuries with selected anthropometric properties with emphases of game's position among female elite volleyball players

Sharareh Sh.[1], Sadeghi H.[2] and Amirtash A.[2]

[1]*Department of Physical Education and Sport Science, Islamic Azad University, Olom Tahghighat Branch, Iran*
[2]*Department of Physical Education and Sport Sciences, Kharazmi University, Tehran, Iran*

ABSTRACT

The purpose of this research, show the relationship between the types, prevalence, and intensity of injuries common with selected anthropometric properties of elite women volleyball players playing in each of the posts. Methodology 79 elite women volleyball players (mean 24.42% years old and with the 8.66% years sports history) in Iran's super League in 1390, as a subjects of this research were completed the Personal Information Questionnaire Injuries reported to Australian Standard Questionnaire and Some anthropometric properties were measured. Using Descriptive statistics(mean, standard deviation, frequency percentage) to classify information and to determine the relationship between type, prevalence, and intensity of common injuries with game's position chi-square test , with a selection of anthropometric properties Pearson correlation coefficients and weighted regression coefficients were used. Results: this research showed 0.49% injuries per year, 1.46% per 1000 hours of training. Regardless of the game's position, sprain (18.25%), ankle (25.26%) and severe injuries (45.26%), respectively are the most common type of injuries, anatomical spots and intensity of injuries. Discussion and Conclusion: weighted regression coefficient showed the common injuries of volleyball like (sprains, dislocation of joint, bone fractures, chronic tendon,…) Have significant relationship with length and volume some of the limbs and diameters of joint. There is a significant relationship between some of environmental properties (torso circumference at hip, maximum arm circumference,…), seated vertical height and knee width with prevalence of injuries. Have significant relationship between weight, seated vertical height, torso circumference at hip, shank length and knee width with the intensity of injuries and length some of anthropometric properties and environmental properties with anatomical position of injuries including knee, shank, ankle, hip, finger, wrist, elbow and arm of elite woman volleyball players. According to the results, we can say that sprains, chronic tendon injury, inflammation and Swelling and anatomical parts ankles, knees, fingers are the most common type of injuries and anatomic parts injuries.

Keywords: type and prevalence of injury, anthropometric properties, game's position

---

INTRODUCTION

Despite all the benefits of regular exercise, the risk of injury, especially in athletics is an indisputable fact. Injuries are the inconspicuous Result of competitions in a way that nowadays become a concerning issue for athletes, coaches and sports officials (5). Volleyball concerns as a noncontact sport and it seems that the prevalence of injuries in volleyball is low but this sport including Strong motions and shifts, fast, horizontal and vertical movements of the body and all of them require a lot of force to do, hence volleyball face to injuries (17). 63% of ankle and knee injuries in volleyball linked with the jump - landing factor (5). Studies have shown that the prevalence pattern of injury in volleyball is almost repetitive and almost similar in men and women (13, 17). The most common injuries of volleyball players are damages caused by repeated knee injuries, shoulder injuries (internal

conflict and functional instability). It is noteworthy that volleyball players are at the risk of back pain, dislocated fingers, bruising and abrasion (14). Reported that Injury prevalence between 7/1 to 2/4 times in 1000 practice hours hence volleyball knows as a forth traumatic sports (1).

In recent years Iran's Volleyball has the considerable luster in international competitions that is the result of appropriate training and planning. In volleyball an elite attacker with the 16 to 20 training hours a week, annually average of spikes (strokes) are 40000 that put the athlete at risk of injury (11). In fact the combination of technical and tactical needs and high fitness level, introduce volleyball as a sport full of injuries. In a review of 227 researches done on years between 1977 and 2005 in 70 different sports in 38 countries found that ankle injury in volleyball has the third rank (4). Other researchers found that the knee, ankle, shoulder and fingers of volleyball players as a anatomical spots are exposed the most injuries. In addition to these injuries, volleyball players most likely to occur mainly in acute knee injuries and knee injuries and repeated activities resulting knee and shoulder injuries (1, 2, 12, 17).

The anthropometric properties are including the measurement of different part of body, body composition, fat mass and limb length with the ratio between them. From the perspective of injuries' causes can refer to the structure and physical characteristics (anthropometric properties) (4). In fact it can be supposed that athletic anthropometric properties have an effect on performance level and appropriate Determination of physics and body structure specialized to that sport (7). Volleyball players, based on abilities in performing skills and physical features, play at different specialized and organized posts. Setters, line spikers, sprint spikers, strength spikers and leberos are the posts of volleyball. The most important physical and biomechanical features base on specialized posts are including height, vertical and horizontal jump, reaction time, muscle strength, agility and ,…. (15). volleyball skills including spike, service, receiving, set and defense that each volleyball player needs high speed displacement, explosive power and ability to do high vertical jump. For better performance skills and earn more points in the match, reinforcing physical fitness factors is required (6). Player performances in team sports such as volleyball depend on several factors, including body size, specialized sport skills, team tactics and psychological characteristics (4,6,7). Several studies done on the relationship between the anthropometric and biomechanical factors with the characteristics of the players (2,3-11). Reviewing on studies showed that not enough research have done on common injuries of volleyball players relationship between anthropometric and biomechanical features. Mr. Fatahi (2009) examined the type and prevalence rate of injuries relationship with some anthropometric and biomechanical features of elite men volleyball players (8). The aim of this research was to study the relationship between the type, frequency, and intensity of common injury with selected anthropometric and biomechanical characteristics of elite women volleyball players playing each of the posts.

MATERIALS AND METHODS

Current study with the aim of Identification type, prevalence rate, intensity and the anatomical spots done on 79 elite volleyball players with average age 24.42 years old, sport history 8.66 years, played at least 3 years in Iran super league. Subjects are including 12 setter, 14 leberos, 25 sprint spikers and 28 strength spikers. With reference to team accommodation and explanation of the purposes and Necessity of research Consent form was completed by subjects. The Personal Information Questionnaire (history of the game, playing post, age and number of weekly training sessions) and the Australian Sports Medicine questionnaire (to determine the anatomic injury, type of injury, intensity of injuries, etc.) were used .Using calipers (limbs volume), caliper and tape (limb length and circumference), 40 anthropometric properties of subjects included (height, weight, height acromion appendage to the ground in an standing position, standing knee height to ground, seated vertical height, knee - sciatic length in sitting position on a chair, head width, head diameter, head length, head circumference, the distance between the two hands, torso width at nipple height, torso circumference at nipple height, torso width at umbilicus height, torso circumference at umbilicus level, torso width at nipple height, torso circumference at hip level, upper arm circumference in the armpit area, maximum arm circumference, forearm length, the elbow circumference, maximum forearm circumference, elbow width, wrist width, wrist circumference, arm length, hand length, hip length, thigh circumference in the middle, the width of the knee - the femur, the knee circumference, shank circumference, maximum shank muscle circumference, the foot length, circumference of the foot arch, ankle diameter, the triceps Fat, scapular fat, shank fat , Supraspinatus fat) were measured. With the aim of reducing parameters that cover similar measurements between 40 anthropometric properties we applied multiple correlation and extracted parameters with correlation more than 0.8. With using factor analysis statistical method on 27 extracted parameters, 4 main components that have 64% of information variance used in factorial analysis. Between extracted component from factor analysis, 13 parameters with ratio more than 0.6 including weight, standing height, seated vertical height, distance between two hand, torso width at nipple height, torso circumference at hip level, maximum arm circumference, head circumference, thigh circumference in the middle, the width of the knee - femur, shank length, the foot length, knee - sciatic length in sitting position on a chair were determined. Using Descriptive statistics

mean, standard deviation, frequency percentage to classify information and to determine the relationship between type, prevalence, and intensity of common injuries with game's position used chi-square test ,at least to determine the relationship between type, prevalence, and intensity of injuries with a selection of anthropometric properties, Pearson correlation coefficients weighting regression coefficients were used.

RESULTS

Subjects of this research had 88.61% right dominance upper extremity and 79.75%, right dominance lower extremity, 15.19% setters, 17.12% leberos, 31.65% sprint spikers and 35.44% strength spikers. This is reported that the Incidence rate of injury 0.41± 0.49 in a year and 1.29 ±1.46 injuries in 1000 hours of training for participants. Injuries In each of playing post are strength spikers 33.33%, sprint spikers 30.88%, setters and leberos 17.89%. Figures 1, 2 and 3 show the information about frequency percent of the injuries in the anatomic spots, type and intensity of injuries in different organs of the female elite volleyball players. As can be seen the highest prevalence of injury in sprint spikers, strength spikers, leberos and setter in ankle (30.78%), shoulder (28.42%), fingers (33.33%), knee (19.61%), the most frequency percent of injury joint dislocation, sprains, inflammation and Swelling, Contusion and Bruising respectively, 17.05%, 24.21%, 23.53%, 13.73% were reported. As seen in Figures 1, 2 and 3 shows the most frequency percent type and intensity of injuries regardless of game' position respectively ankle injuries (25.26%), sprain (18.25%) and severity (45.26%).

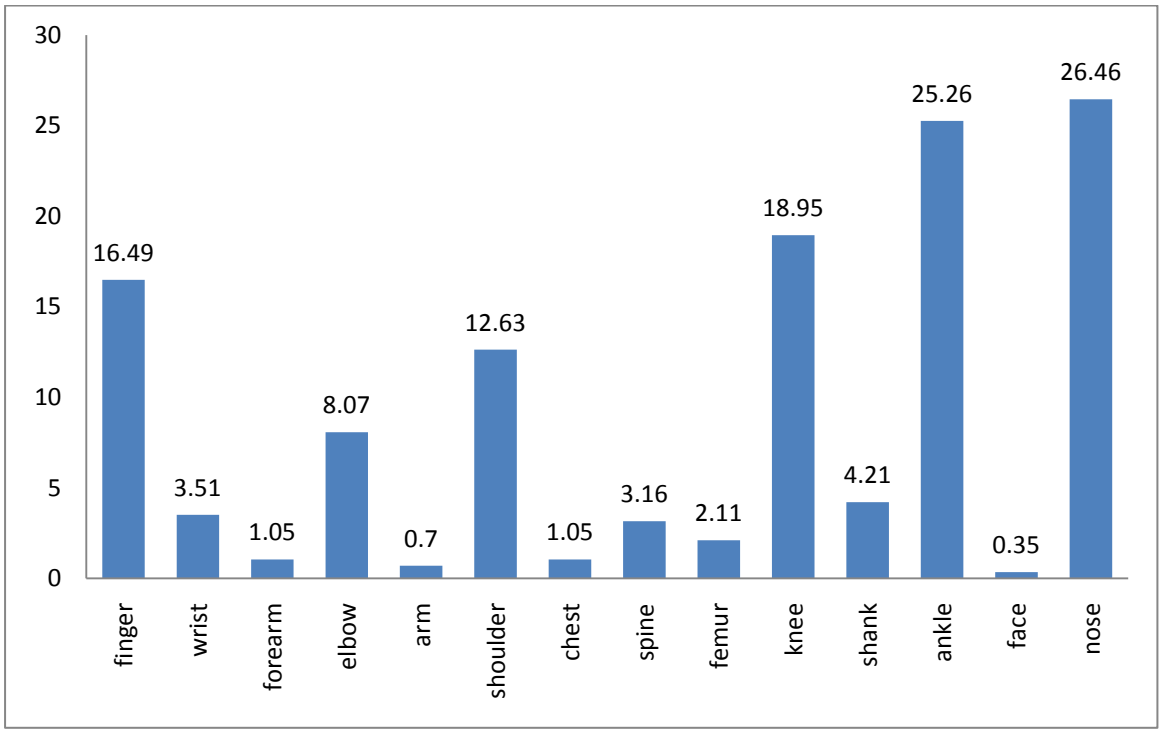

Figure 1: Frequency of anatomical spots of injuries in subject of this research

Chi-square test of the injury type and prevalence in elite women volleyball players in Table 1 shows that there is a significant relationship between type and the anatomical spots of injuries with game' position of players.

Table 1:Chi-square test between type, prevalence, intensity and anatomical spots with game' position

Test Statistics	Anatomical spots of injuries	Type of injuries
Chi-square	109.5*	71.73*
Df	39	39
Sig	P<0.001	P<o.oo1

** Significant relationship (A=0.05)*

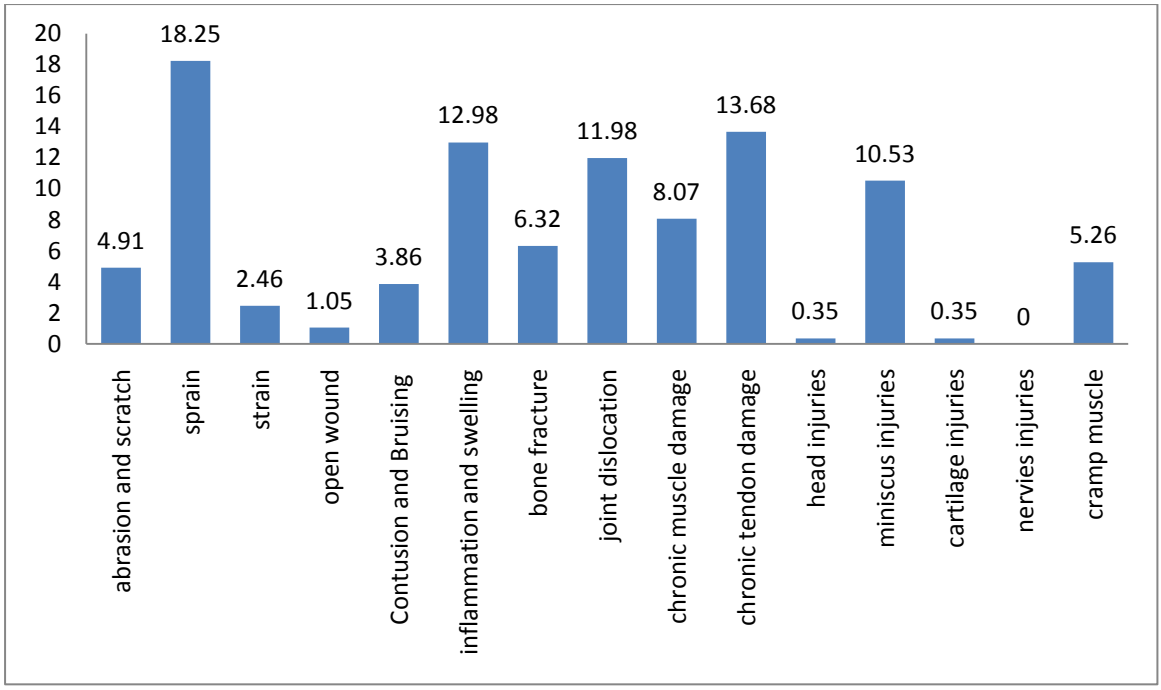

Figure 2: Frequency of type of injuries in subject of this research

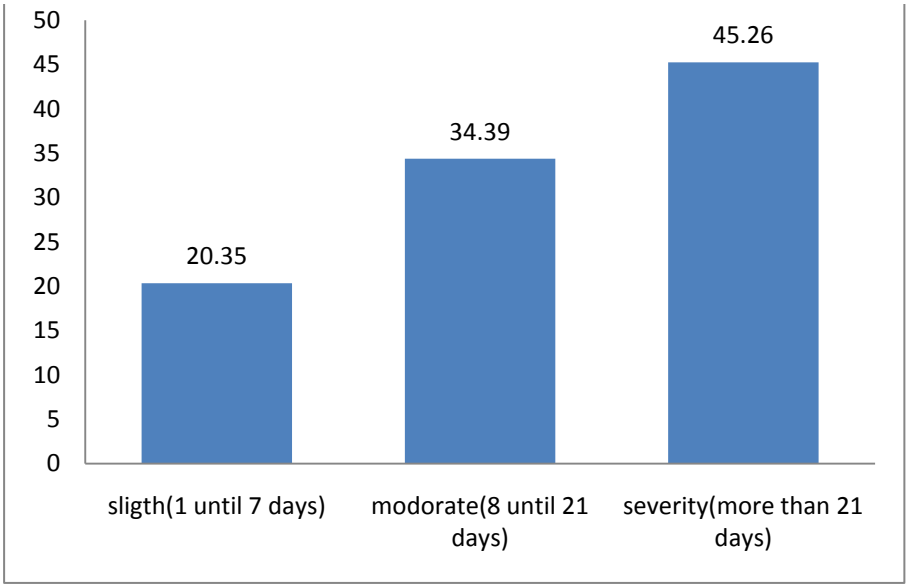

Figure 3: Frequency of intensity of injuries in subject of this research

With the aim of reducing parameters that cover similar measurements between 40 anthropometric properties we applied multiple correlation and extracted parameters with correlation more than 0.8. With using factor analysis statistical method on 27 extracted parameters, 4 main components that have 64% of information variance used in factorial analysis. Between extracted component from factor analysis, 13 parameters with ratio more than 0.6 including weight, standing height, seated vertical height, distance between two hand, torso width at nipple height, torso circumference at hip level, maximum arm circumference, head circumference, thigh circumference in the middle, the width of the knee - femur, shank length, the foot length, knee - sciatic length in sitting position on a chair were determined. Figure 4 shows variance percentage the anthropometric properties extracted from PCA.

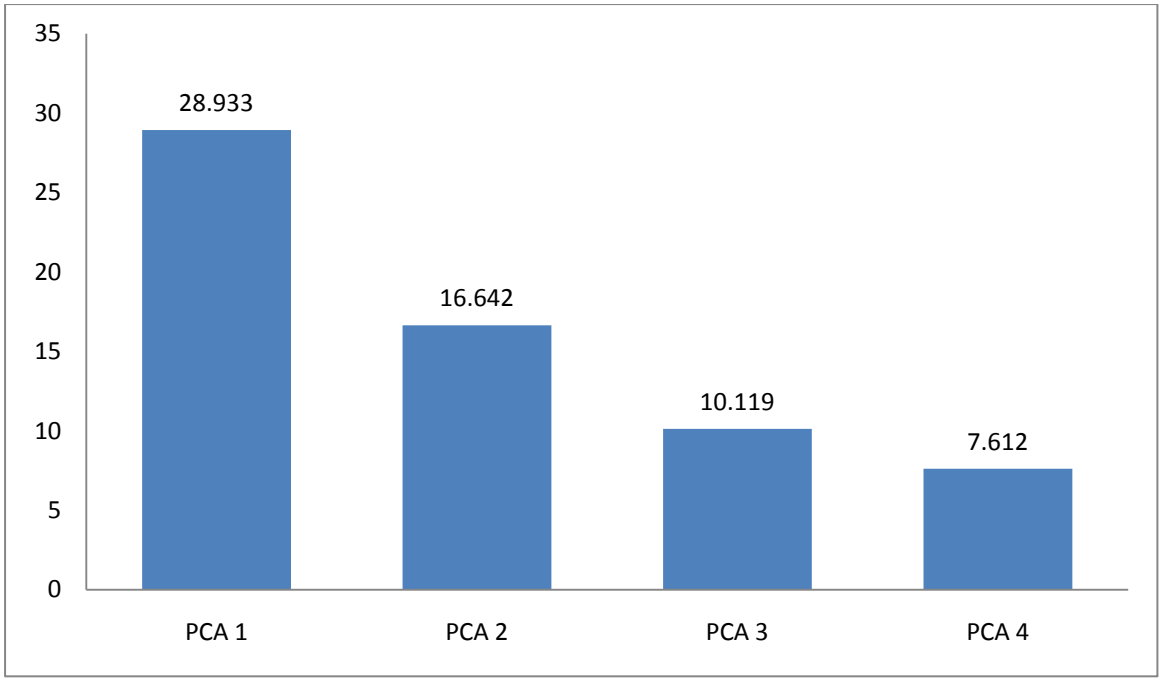

Figure 4 : variance percentage the anthropometric parameters extracted from PCA

Table 2 shows the result of regression coefficient between type of injuries and female elite volleyball players main extracted anthropometric properties from principle component analysis. Results show a significant relationship between types of injuries, sprains, strains, bone fractures, joint dislocation, meniscus damage, inflammation and swelling, abrasion and scratch, open wound, spasms and cramps and chronic muscle injuries with weight, torso circumference at hip, maximum arm circumference, knee width and seated vertical height of elite women volleyball players. Weight has important role on an open wound injuries, bone fractures, chronic muscle damage, spasms and cramp and meniscus. Seated vertical height with abrasion and scratch, inflammation and swelling, joint dislocation and meniscus, torso circumference at hip with strain and joint dislocation, finally femoral epicondyle (knee) width with sprains, bone fractures, joint dislocation with meniscus.

properties / Type	weight	torso circumference at hip	knee width	maximum arm circumference	seated vertical height
Strain		0.26			
Open wound	0.25				
Joint dislocation		0.23	-0.16		0.18
Chronic muscle injuries	0.29			0.12	
Bone fracture	0.27		-0.27	-0.23	
Sprain			-0.22		
Meniscus	0.15		-0.27		0.24
Cramp	0.26				
Inflammation					0.31
Abrasion and scratch					0.21

Table 3 shows the significant relationship between the main factors of seated vertical height, torso circumference at hip, maximum arm circumference, femoral epicondyle (knee) width with prevalence of injuries in women volleyball players.

Table 3 : regression coefficient of main anthropometric properties with Prevalence of injuries

properties	Prevalence of injuries
seated vertical height	0.37
torso circumference at hip	0.26
Maximum arm circumference	-0.27
knee width	-0.32

Significant relationship between anatomical spots of injuries with anthropometric properties in Table 4 were observed. The results suggest that there is a significant relationship between weight with forearm, arm, leg and ankle, have relationship between seated vertical height with wrist, hip, knee. There is relationship between standing

height with the fingers, torso circumference at hip with fingers, wrist, spine and ankle and shank length legs with ankle, at least maximum arm circumference with anatomical spots of the arm.

Table 4: regression coefficient of main anthropometric properties with anatomical spots of injuries

properties / anatomical spots	weight	torso circumference at hip	knee width	maximum arm circumference	seated vertical height	Standing height	Shank length
Finger		0.21		-0.33		0.25	
wrist		0.23			0.31		
forearm	0.34						
Arm	0.44						
Spine		0.23					
Femur					0.27		
Knee			-0.21		0.21		
Shank	0.32						
ankle	0.28	0.25					0.33

Table 5 expresses the relationship between intensity of injuries and anthropometric properties including seated vertical height, weight, torso circumference at hip, knee width and shank length.

Table 5: regression coefficient of main anthropometric properties with intensity of injuries

Intensity / Properties	slight	moderate	severity
weight			0.25
seated vertical height	0.27		0.27
torso circumference at hip			0.39
Maximum arm circumference			
knee width	0.25		-0.27
Shank length		0.37	

DISCUSSION

The aim of this research was to determine the relationship between type prevalence and intensity of common injuries with selected anthropometric properties in each game' position in elite women volleyball players. Recent research results indicate that regardless of participants playing posts, sprain (18.25%), chronic tendon injuries (13.68%) and inflammation and swelling (12.91%) as well as the ankle (25.26%), knee (18.95%) and fingers (16.49%), respectively are the most common type of injury. Among the players with different posts, liberos reported 13.73%cramp and bruising, 11.76% sprains, chronic tendon injuries, meniscus injuries and spasm as a most prevalence injuries that Due to the nature of the libero post without jumping and landing, low chronic tendon injuries of the upper limbs resulted from spike seems normal and also In this study, most of the anatomical spots injuries reffered to knee and ankle, respectively, with an average 19.61% and 17.65%. with attention to the task of these players in backward playing court (fast displacements, explosive movements and high agility, performing dive and rolling techniques) seems reasonable results. In setters showed that tendon chronic damage and inflammation and swelling (23.53%), sprain (15.69%), and joint dislocation (13.73%) and the most anatomical spots injuries including fingers (33.33%), ankle (23.53%) and elbow (15.69%). Since the main task of setters is making a good set and appropriate attack, fingers are the most affected area. These players often suffer from tendinitis and bursitis in the elbow and because of repeated setting technique seems quite reasonable.

The most common injuries among the various playing posts reported about strength spikers with the average of 33.33%. The results showed that the prevalence of injury type sprains, chronic muscle damage, inflammation and swelling and meniscus, respectively, have the average 24.21%, 15.79%, 14.74% and 9.47% and the Most prevalence of injury area in shoulder (28.42%), knee (22.11%) and ankle (25.26%) were reported. Due to the type of hand movement during spike and hand different rotation during hand throwing above the head, indecent rate of chronic muscle injuries and bursitis and tendinitis in Upper extremity is more than other playing posts. The results show high prevalence in dislocation and sprain (17.5%), chronic tendon injuries (14.77%) and meniscus (13.64%) and the anatomical spots injuries respectively, ankle (30.68%), fingers (26.14%), knee (18.18 %) in sprint spikers. Sprint spikers when placed in front of the net, they will receive set or not, had to jump in order to disrupt the opposing team's defense and support of teammates spikers. This caused a high prevalence of dislocation injuries, tendon chronic injuries in joints and lower extremity ligaments than other playing posts. The results show that in general, among all of the Iran female elite volleyball players there is a significant relationship between the type of injury including sprain, strain, fractures, joint dislocation, meniscus damage, inflammation and swelling, abrasion and scratch, open wound and muscle cramps and spasms and chronic muscle injury with weight, torso circumference at

hip, maximum arm circumference, knee width and seated vertical height of female elite volleyball players. Significant relationship between the main factors of seated vertical height, torso circumference at hip, maximum arm circumference, and femoral knee width with injury prevalence was observed in female elite volleyball players. Also There is a Significant Relationship between anthropometric factors including seated vertical height, weight, torso circumference at hip, knee width and shank length and between anatomical area the knee, shank, ankle, hip, elbow and arm, finger, forearm, spine and wrist with weight, standing height, the distance between the two hands, seated vertical height, torso circumference at hip, maximum arm circumference, knee width and shank length. Fattahi (2009) showed Significant relationship between injuries including sprain, joint dislocation, chronic tendon injuries and chronic muscle injury with some anthropometric characteristics including seated height, weight, torso width at the level of the umbilicus and the torso circumference at hip, as well as the Significant relationship between the prevalence of injury with seated height, weight, torso width at the level of the umbilicus and the torso circumference at hip in Iranian male elite volleyball players. Due to the lack of similar studies in this field, there was no possibility of comparison with other researches (8). Properties such as torso width at the level of the umbilicus and the torso circumference at hip shows large relative skeletal muscle mass and factors such as seated height (seated height than total height) represents the difference in the high size of upper extremity and lower extremity and bones largeness (6,7). Larger bones and more muscle mass can contribute in tolerance of high pressure exercises and prevent injury. But the other side may cause problems during jumping and the landing for volleyball players. In other words, not necessarily high or low, these factors cannot be a good explanation of the prevalence and type of injury (2,17). High Weight may cause prevalence of injuries including sprain, dislocations and chronic tendon injuries in the ankle and knee in volleyball players. High level of ectomorph Characteristics or being skinny, causing more pressure on the stabilization factors and Over time with consecutive force will rise high risk of injury (10). Factors such as the arm circumference, maximum arm circumference, maximum forearm circumference, maximum shank circumference, the torso width at hip and ankle diameter indicates a larger relative Skeleton and also greater muscle mass and Factors such as height, seated height, distance between two hand, forearm length, hand length indicates larger and More stretched bones. Greater Skeleton and muscle mass contribute in tolerance of high pressure exercises and prevent injury but On the other hand, may create problems when jumping and landing for volleyball players. In other words, not necessarily high or low levels of these factors cannot be a good explanation for prevalence and type of injury. Results showed that Weight will play a crucial role in creating damage in volleyball players, strength spikers due to have the high average weight 71.25% and also as a result of high pressure during jumping and landing for spiking , with attention to performing this technique behind 1/3-line, allocate The prevalence of injury sprain (24.21%), which includes ligaments of the knee and ankle ligaments. Also It was observed that there is a significant relationship between weight and the prevalence of injury meniscus Due to the high weight, low agility and high reaction time, loss of balance that is result of Inappropriate landing and Rotation of the knee can justify the high incident of meniscus in knee joint, high weight and putting double pressure especially in overworking and overtraining seasons, justify The high prevalence of chronic muscle damage (15.79%), inflammation and swelling (14.74%) of the lower extremities. A significant relationship was observed between maximum arm circumference and arm injuries, suggests that the more maximum arm circumference can be a proof of the lower prevalence of arm injury, The present study shows, in leberos with the average 26.86% and 1.96% respectively allocate lowest arm circumference and maximum prevalence. Larger joints diameter and width showed the high individual's skeleton. In general, joint stability, both active (muscles) and passive (ligaments, tendons, etc.) factors are involved. Results show Significant relationship between the knee diameter and width with prevalence of knee injuries in the knee area, most knee width account for strength spikers (average 8.38%) and injury prevalence of meniscus less that sprint spikers. In sprint spikers with average 37.26% the least knee circumference was observed that can be concluded to these players with average 13.62% have the most prevalence of meniscus. Results showed a significant relationship between standing height and vertical seated height with the type and area of injury. Factors such as height acromion height to the ground, knee height to the ground and seated height show the different in upper extremity and lower extremity that have a role in determining the center of gravity. Being tall increase their height of center of gravity and less agility increasing the prevalence and prevalence of knee injury. Average height of Strength spikers is 178.57% that the tallest players, and the average of prevalence of knee injury is 22.11%, the highest prevalence rate of injuries and the average height of sprint spikers is 177.44%, between various posts has allocated 30.68% prevalence of ankle injuries to it. in comparison to other posts Strength spikers have the most average of Standing height, seated vertical height (93.04%)and lowest level of agility that justify The high prevalence of injuries type, sprains, inflammation and swelling and meniscus in lower limbs. passers Average height of leberos 177.16% and 165%, vertical seated height 92.45% and 79.43%, lowest prevalence of lower extremity injuries were reported and with regard to shorter length and high agility players than spikers seem to be logical. In the present study the relationship between some anthropometric characteristics and injury intensity were observed, as was shown in the present research strength spikers with a maximum width of the knees (8.38%) have allocated the third injury area 22.11%. It seems reasonable to conclude that the more width of the knee make the moderate of intensity injuries is more than slight intensity in players.

CONCLUSION

With attention to the results of dislocation, sprain and chronic injuries of the fingers, ankles, knees and shoulders are the most prevalent among the elite volleyball players. There is a significant relationship between Volleyball common injuries such as sprain, dislocation, fracture, chronic tendon injuries with length and size of some limbs and diameter of some joints. Also there is a significant relationship between the chronic tendon injuries, muscle and meniscus with lower extremity power, upper extremity strength and agility of Iranian women elite volleyball players. Furthermore, there is a relation between the type and area of injuries associated with the position and playing posts of Iranian women elite volleyball players. Using players with appropriate Physical characteristics in different game' position, consider too risky spike skills and defense and use of protective equipment in vulnerable limbs to reduce injuries in volleyball players seems necessary.

REFERENCES

[1] Agel J, Palmieri-Smith R, Dick R, Wojtys E.M, Marshall S.W, Descriptive epidemiology of collegiate womens volleyball injuries*, **2007** , 42(2), 295-302.
[2] Augustsson S.R, Augustsson J, Thomee R, Svantesson U, *Scand & J Med Sci Sport*, **2006** , 16, 443-440.
[3] Barnes J.L, Schilling B.K, Falvo M.J, Weiss L.W, Creasy A.K, Fry A.C, *J Sport Med Physical Fitness*, **2007** , 21(4), 1192-6.
[4] Bayios I.A, Bergeles N.K, Apostolidis N.G, Noutsos K.S, Koskolou M. D, *J Sports Med & Physical Fitness*, **2007** ,46(2), 271-280.
[5] Beneka A, Malliou P, Gioftsidou A, Tsigganos G , Zetou H, Godilas G, *Sport Sci Health*, **2009** , 5, 93-99.
[6] Ciccarone G, Croisier J.L, Fontani G, Martelli G, Albert A, Zhang L, Cloes M, *J Sport Med & Physical* Fitness, **2007** , 61(1), 29-43.
[7] Duncan M.J, Woodfield L , Al-Nakeeb Y, *Br J Sports Med*, **2006** , 40(7), 640-651.
[8] Fattahi A, Relationship between injury types and prevalence with some Anthropometric properties and game' position of male elite volleyball players of Iran ,A thesis of Master degree **2009** .
[9] Gharakhanlou A ,Daneshmandi H ,Alizadeh M, Prevention and Treatment of Sport Injuries Samt, **2009** .
[10] Grifis V , Complete Guide of Sport injuries ,Science and movement Institution, Piri, **2000** .
[11] Malliaras P, Cook J.L, Kent P, *Br J Sports Med*, **2006** , 41, 250-263.
[12] Malliou P, Beneka A, Tsigganos G, *Sport Sci Health*, **2008** , 2,113-117.
[13] Palwinski M. P, An analysis of the different spike attack arm swings used in elite levels of men's volleyball , A thesis submitted to the school of kinesiology and health studies, **2008** .
[14] Reeser J.C, Verhagen E, Briner W.W, Askeland T, Bahr R, *Br J Sports Med*, **2006**, 40, 594-600.
[15] Stamm R, Veldre G, Stamm M, Thomson M, Kaarma H, Loko J, Koskel S, *J Sports Med & Physical Fitness*, **2003** , 43, 291-299.
[16] Verhagen E, Van der Beek A.J, Bouter L, Bahr R, Mechelen WA *Br J Sports Med*, **2004** , 38(4), 447-481.
[17] Zetou A, Malliou P, Lola, A, Tsigganos G, Godolias G, *J Back* & *Musculoskeletal Rehabil*, **2007** ,19, 129-134