

Evaluating the Prevalence, Type and the Probable Causes for Sport Injuries in Iranian Super League Male Volleyball Players

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Abstract: In this study, the prevalence, type and the probable causes of sport injuries in Iranian super league male volleyball players was evaluated. The study was descriptive and the statistical population was about 160 volleyball players that were present in Iran super league in the year 2005. The statistical sample was about 60 men with at least three years of experience in volleyball. The information was gathered using a combined questionnaire by interviewing the volleyball players and their coaches. During the training and competition seasons, lower limbs with 44% and 46.8% were the most vulnerable organs to injuries. During training, joint injuries with 46.1% and during competition, muscular injuries with 43.5% were the most common kinds of injury. During training and competition, sprain with 46.8% and 38.6% was the most common joint injury and spasm with 42% and 37.3% was the most common muscular injury. During training, fracture with 49.4% and during competition, the close fracture with 54.6% were the most common bone injuries. During training and competition, fingers with 42.8% and 44.9% were the most vulnerable organs of upper limbs, ankle with 33.1% and 38.3% the most vulnerable organ of lower limbs and lumbar with 68.6% and 75% the most vulnerable organ of trunk, head and neck to be injured. During training and competition, sprain with 23% and 20% was the most common kind of injury as a whole. During training, fingers with 15.58% and during competition, ankle with 17.4% were the most vulnerable organs of all body to be injured; and each considered probable factors with different effects caused injuries. The study revealed that body building in volleyball, ground/surface condition and quality of personal equipment could be important factors to be associated with the injuries in this sport. Eventually, it was concluded that fingers, lumbar and ankle were the most vulnerable organs and injuries which were mostly the result of overusing organs with incorrect techniques. Therefore, correcting the techniques might play a considerable role in the prevention of injuries.

Key words: Injury % Volleyball player % Super League

INTRODUCTION

International Volleyball Federation reports that 800 million people play volleyball at least once a week throughout the world [1]. Volleyball greatly affects the players' body health and growth, but injury risks can not be taken for granted [1-3].

Different studies mention different vulnerable organs in volleyball players. Knobloch *et al.* (2004) reported the upper limbs (71.3%) and lower limbs (21.5%) as the most vulnerable organs [2]. In another research, Bahr and Reeser (2003) reported knees (30%), ankles (17%) and fingers (17%) as the most vulnerable organs [1]. Bahr *et al.* (1997) reported the ankles (54%), lumbar (11%), knees (8%) and fingers (7%) as the organs for most injury incidences [4].

But most researches on volleyball injuries reported ankles, knees, shoulders, hands and fingers as the organs for most injuries [5-10].

Don *et al.* (2004) reported the ankle as one of the most vulnerable organs in volleyball in a research on volleyball players in Ataturk University [11]. Hell and Shanel (1985) reported the ankle joint (55.1%) as one of the most vulnerable organs in 224 volleyball players participated in Federal tournaments [12]. In a research on volleyball players in Norway, Bahr *et al.* (1994) estimated ankle injuries as one injury per 1000 hours of volleyball playing and reported that the injury risk during the competition was four times more than the training [12-13]. In researches on players in Norway and Denmark, Bahr *et al.* (1994) and Aggard *et al.* (1997) reported that 0.9% of volleyball injuries happened in the ankles [5, 13].

Knee injuries are greatly incident in volleyball. Gerberich *et al.* (1987) reported that knee injuries constitute 59%-60% of volleyball injuries [8]. In a research on 886 volleyball players, Kujala *et al.* (1995) reported that 11.6% were affected with knee deviation and knee inflammation was 37.9%, knee deviation 1.9% and other injuries 22.3% [14]. Rice and Anderson (1994) reported that 19.4% out of American international volleyball team members' 222 skeletal-muscular injuries were knee injuries during 1980-1990 and tendonitis patella injuries occurred most frequently [15]. Schafle *et al.* (1990) reported 17 types of knee injuries: almost 6.47% inflammation and 23.5% deviations [16]. In volleyball, knees are prone to injuries resulted from overuse [10, 16-19]. Cook *et al.* (1997), Ferretti *et al.* (1986) and Court *et al.* believe that tendonitis patella is a prevalent inflammation in volleyball players causing pain in patella. Tendonitis patella is an injury resulted from overuse and repeated additional load on the knee occurs in extensor mechanism. When landing, knees endure the weight 9-11 times more than body weight. These unusual loadings are the key reason for tendonitis patella [11, 20, 21].

Bach *et al.* (1992) report that acromioclavicular joint is acutely injured in landings on hard grounds and when diving. Glenohumeral joint may be injured in sudden hits and repetitive loads in volleyball [22]. Aggard *et al.* (1996 and 1997), Bahr (1994), Rice and Anderson (1994) and Watkins (1992) report that shoulder injuries more result from overuse and constitute 20%-23.6% of volleyball injuries and almost 75% of researches on volleyball players report about 50% shoulder injuries [5, 6, 13, 21, 23]. Available data show that 75%-90% of shoulder injuries in professional players result from overuse resulting in tendonitis in wrist rotator muscles and biceps [5, 6, 17, 15, 9, 10]. Dislocation of finger joints frequently happens for volleyball players and the pinkies and the thumbs are injured in 80% of cases. In lateral dislocation, lateral ligament of the joint – the ligament which is the reverse of the dislocation direction - is injured. In posterior dislocation, both lateral and anterior cruciate ligaments are slightly injured. Finger fracture sometimes happens for volleyball players. These fractures may be treated though plaster casting of the injured organ for 2-4 weeks. A review of the related literature shows that although the research results agree on some macro-variables, some variations and conflicts over the details still remain to discuss. Therefore, the key feature of the present research is that not only it studies Iranian super league volleyball players (no researches have been

conducted on the mentioned players up to now) but also it provides the authorities with local information.

It is clear that if firstly the factors resulting in injuries and also prevalent injuries in volleyball are recognized and a solution to minimize and prevent them is presented and the volleyball players are provided with the mentioned information, volleyball players will be healthy and extra charges to rehabilitate the injured will be prevented. Therefore, it is essential to find strategies to minimize the injuries. The researcher intends to collect and present strategies to observe the scientific rules of training to prevent injuries through recognition of their types, prevalence and probable causes.

MATERIALS AND METHODS

The statistical population consisted of 160 volleyball players and 12 teams participating in Iranian super league competitions in 2005. The statistical sample consisted of 60 super league volleyball players with at least three years of sport experience who were selected from interested players (average age: 24.5 years, average weight: 80 kg and average height: 189.2 cm).

The present research is descriptive-field and uses review of literature. A combined (open and close) researcher-made questionnaire was used to gather data. The questionnaire validity was examined by professors, some sport medicine professionals and experienced national team players. The result was accepted. To obtain the questionnaire reliability, 12 Isfahan Zob-e-Ahan team members completed the questionnaire within 2 weeks. The reliability was $p < 0.05$, 0.84 using Cronbach's alpha coefficient.

The researcher attended in a season of volleyball super league competitions in Iran clubs in 2005 to gather data and the players were interviewed to complete the questionnaires held in Tehran. Finally, team coaches were interviewed about the most prevalent type of injury and the most vulnerable organ so that the researcher can utilize their experience.

RESULTS

Characteristics of the Sample: Age range 20-35 years, average age 24.5 years, weight range 63-97 kg, average weight 80 kg, height range 178-205 cm and average height 189.2 cm. The players' sport career was between 3 to 20 years and 7 years averagely.

The results showed that the injuries occurred in organs during the training and the competition were as follows: upper limbs 36.5% and 37.6%, lower limbs 44% and 46.8% and trunk, head and neck 19.5% and 15.6% respectively. The frequency of the type of injuries to the organs during the training and the competition were as follows: joint injuries 49.2% and 43.6%, muscular injuries 43.8% and 51.9% and bone injuries 7% and 4.5% (Table 1).

The ratio of each organ to entire injuries, prevalent injuries and the percentage and intensity of probable factors affecting the incidence of injuries in elite volleyball players are presented in the following Table 1-4 and Fig. 1.

DISCUSSION AND CONCLUSION

In the present research, the most prevalent type of injury during the training was joint injury (49.1%). Therefore, this research conforms to that of Knobloch (2004) (41%), Ytterstad (1996) (70.3%), Loes (1995) (77%) and Watkins (1992) (41%). The results can claim that probably the reaction force pressed to the organs by ball hits or landings affects the joints and makes them prone to injury.

During the training and competition, lower limbs were most prone to injury (44% and 47% respectively) and the coaches reported them as the most vulnerable organs (50.2%). The following researchers confirmed the present findings as they reported the lower limbs as the most vulnerable organs in volleyball: Bahr and Bahr (2003) (47%), Aggard *et al.* (1997) (38%), Bahr and Bahr (1997) (62%), Medical Services in North Sydney (1997) (46%), Aggard and Jorgensen (1996) (34%), Kujala *et al.* (1995) (57.4%), Soulguard *et al.* (1995) (42.8%), Rice and Anderson (1994) (39.2%), Chan *et al.* (1993) (44.3%), Bayer *et al.* (1992) (67.7%), Schafle *et al.* (1992) (28.6%), Watkins *et al.* (1992) (65%), Gerbrich *et al.* (1987) (90%) and Hell and Shanel (1985) (55%) [4-17].

Most of the injuries occur in the lower limbs due to especial technical and motor patterns in volleyball such as maximum physical attempt, quick jumping, quick replacement, incorrect landings and the performance of especial movements. In fact, the main reason of these injuries can be the movements and performances in which lower limbs play a vital role. As in volleyball there are plyometric takeoff, quick landings and quick change of direction after landing, if the leg is located in an

Table 1: The frequency percentage of the incidence of injuries to different organs during the training and competition

	Organ		
	Upper	Lower	Trunk, head and neck
Training	36.5%	44.0%	19.5%
Competition	37.6%	46.8%	15.6%

Table 2: The frequency percentage of the type of injuries during the training and competition

	Type		
	Joint	Muscular	Bone
Training	49.2%	43.8%	7.0%
Competition	4.5%	51.9%	43.6%

Table 3: The ratio of each organ to entire injuries during the training and competition

Organ	Training time (%)	Competition time (%)
Head and neck	1.90	0.94
Back	0.82	1.20
Lumbar	13.40	11.80
Chest	0.00	0.00
Finger joints	15.60	16.90
Palm	2.15	4.90
Wrist	2.23	2.30
Forearm	0.66	0.94
Elbow	3.40	5.30
Arm	1.70	1.60
Shoulder joint	6.80	3.40
Scapula	3.40	2.30
Ankle	14.60	18.00
Tendo calcaneus	2.80	2.60
Front shine	0.91	0.94
Back shine	0.74	3.10
Knee	10.40	11.60
Patella	6.05	2.02
Hamstring muscles	3.31	1.80
Quadriceps	2.60	4.90
Hip joint	2.60	2.02

inappropriate angle during landing, it may make each part of the lower limbs prone to injury.

During the training and competition, sprain is the most prevalent type of joint injuries (38.6% and 46.86% respectively) as well as the most prevalent type of injury among all injuries to organs during training and competition (23% and 20.1% respectively). The following researchers obtained the same results: Knobloch *et al.*

Table 4: The percentage and intensity of probable factors affecting the incidence of injuries

Some probable factors	Level of effect	%
Lack of ideal body building trainings	Very much	68.3
Inappropriate condition of training field	Much	46.7
Lack of protective sport equipment and personal and safety equipment during the trainings and competitions	Very much	46.7
Cool-down or insufficient warm-up before the training or competition	Very much	65.0
Fatigue	Very much	36.7
Over-training	Much	43.3
Incorrect performance	Much	43.3
Incorrect training and non-observance of scientific rules in the training	Much	45.0
Past injuries	Much	26.7
Importance and competitiveness of the competition (the importance of competition result)	Much	31.7
Lack of sufficient physical fitness	Much	50.0
Lack of sufficient rest between two tournaments	Average	35.0
Poor mental and spiritual moods	Average	33.3
Lack of knowledge about injury types	Much	41.7

(41%), Ytterstad (1996) (70%), Loes (1995) (73%) and Watkins (1992) (41%). The analysis of the present results shows that if the ball and the body are not in the same direction in volleyball, the player has to land on one of his legs or without balance in order to reach the ball. This mechanism may cause a sprain in the joints of lower limbs [24]. Overuse of the joints of the upper limbs makes them more prone to sprain. Also, shoulder girdle is prone to sprain due to excessive rotation in hit movements or service or ball spike.

During training and competition, the most prevalent muscular injury is muscular spasm (42% and 37.3% respectively). One of the most important aspects of neuromuscular balance is the ability to ideally balance the agonist and antagonist muscles. As it was mentioned, one of the causes for muscular injuries during the performance is the inability to balance these two types of muscles. A muscle is just able to contract or to remain non-contracted. Therefore, if the muscle contracts to apply the power and remains in the same state, it will be injured. As most volleyball movements are quick and sudden, the energy depletion from contraction state happens very quickly and it results in the technique performance. If any amount of this contraction remains in the muscle for a while, it will cause muscular spasm.

Close fracture during training (50.6%) and fracture during the competition (54.6%) are the most prevalent bone injuries. In different researches, bone injury is not investigated separately and is generally investigated as fracture. What can be said about the bone fracture in sports is that generally it is more prevalent in sports in which there is more performance pressure or the power is applied within a short time interval, no bone is an

exception and as volleyball is not a high impact sport, stress fracture is more prevalent in volleyball players. The reason can be the constant application of the power to a region [24]. However, the stress fracture occurs in these players due to landings in diving, defensive movements in front of the net, falling due to the lack of balance in landings, hard offensive and hit movements [24].

The present research shows that during the training and competition, the finger joint is most prone to injury (42.8% and 44.9% respectively). Also, it is the most vulnerable organ during the training (15.58%). The following researchers confirmed the present findings as they reported the finger joint as the most vulnerable organ: Bahr and Bahr (2003) (17%), Medical Services in North Sydney (1997) (22%), Bahr and Bahr (1997) (9%), Aggard *et al.* (1997) (21%), Aggard and Jorgensen (1996) (26%), Kujala *et al.* (1995) (18%), Soulguard *et al.* (1995) (25%) and Watkins and Green (1992) (22%). As volleyball players' fingers and hands are the most employed organs, they can be the most vulnerable organs. The inappropriate position of the hand and the ball, high speed of the ball, power impact, etc. result in many injuries to these organs [24].

The most vulnerable organ in the lower limbs during the training and competition was ankle (33.1% and 38.3% respectively). The most vulnerable organ in the whole body during the competition was ankle (17.49%). In order to confirm the research findings of the two above mentioned variables, coaches were interviewed. They reported the ankle joint as the most vulnerable organ in the lower limbs (47.3%). They also reported the ankle as the most vulnerable organ in the whole body (17.49%).

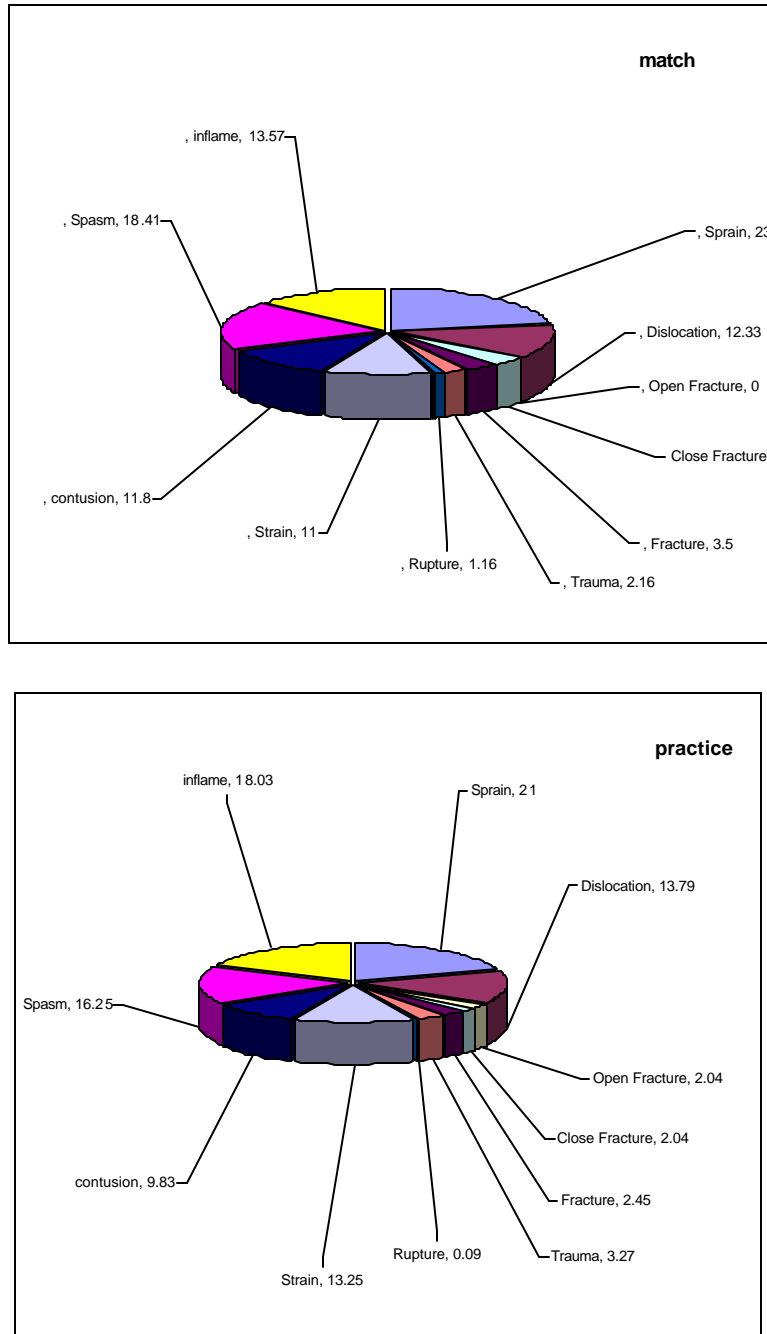


Fig. 1: The ratio of prevalent injuries to entire injuries to the organs during the training and competition

The following researchers confirmed the present findings as they reported the ankle as the most vulnerable organ in volleyball players' lower limbs: Aggard *et al.* (1997) (24%), Bahr and Bahr (1997) (54%), Medical Services in North Sydney (1997) (22%), Aggard and Jorgensen (1996) (25%), Soulguard *et al.* (1995) (36%), Kujala *et al.* (1995) (34%), , Rice and Anderson (1994) (25%), Bayer *et al.* (1992) (60%), Schafle *et al.* (1992) (25%), Watkins *et al.* (1992) (35%) and Hell and Shanel (1985) (55.1%). One of the important operations of the ankles is to absorb shocks. When jumping from a height and landing on the legs, the elasticity of the legs decreases the pressure transfer to the upper limbs and the lumbar. In volleyball, probably, the ankle is greatly prone to injury due to repeated jumping especially non-balanced landings which directly hits the ankle. When landing, the legs are pressed by a power 9 to 11 times as much as the body weight [25] and as the leg and ankle are the first organs absorbing the power, if the leg and the ground do not meet in an appropriate angle, the leg will be more vulnerable.

The most vulnerable organ in trunk, head and neck during both the training and the competition is the lumbar (68.6% and 75% respectively).

The following researchers confirmed the present finding: Bahr (2003) (22%), Bahr (1997) (14%) and Schafle *et al.* (1992) (16%). To describe the present findings, it can be said that ball hit includes the quick hyperextension of the lumbar and immediately flexion. If the forward and the ball are not located in the same direction, the trunk rotation will be added to these movements and the hit position can endanger the lumbar. The players will be prone to lumbar vertebrae due to excessive repetition of hits in the attacks or diving during the training or competition.

In regard to the present findings, all team players, coaches and doctors should know that it is highly probable for volleyball payers to be injured in their ligaments and lower limbs especially ankles and fingers. Therefore, they should act in a preventive manner.

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