INJURIES AMONG ITALIAN FEMALE FUTSAL PLAYERS: QUESTIONNAIRE

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Abstract
Studies have found great occurrence of injuries among football and futsal players, especially among female population. One of the most elite European female futsal championships is Italian Serie A. Besides quality of the Serie A, Italy can be proud of good organization of lower leagues and quantity of active female futsal players. In three divisions organized by national federation there are more than 4.000 active female futsal players. If you add all the amateur futsal leagues, number of active players is much bigger. The aim of this research was to enter the number, frequency, locality and the type of injuries, along with the consequences, among Italian female futsal players. Methods: sample was consisted of Serie A, C, D and amateur league female futsal players (N= 95) in the Veneto region. Players completed the questionnaire, consisted of morphological measures, training and competition information and information about types, locality, frequency and consequences of injuries during their career. Analysis of variance (ANOVA) was applied to calculate statistical differences in the number and types of injuries among groups. Results have demonstrated that the most common injury among Italian female futsal players is ankle sprain (42.14%), followed by the ligament injury and meniscus lesion (18.88%) and contusions (13.84%). Total of 159 injuries in 83 players (87.73%) were recorded. 78.31% of injuries were result of a trauma. 28.92% respondents suffered repeated injury. The highest number of injuries (61.45%) occurred during competition. Statistical significance (p<0,05) has been shown in the number of injuries between groups and the number of knee injuries. Conclusion: the most common injury among Italian female futsal players is ankle sprain, followed by the knee injury. Significant differences have been shown among groups in the number of injuries occurred and the number of knee injuries. Training programs should be improved with the more frequent use of better preventive programs decreasing these types of injuries.

Key words: *injuries, quality, female*

Introduction

In the last decades female sport, especially female soccer, has become increasingly popular. One of the most growing sports in the last years is indoor soccer (futsal). Studies of Gorostiaga at al., (2009) showed that there are more than 12 million registered futsal players in more than 100 countries. Futsal is a complex sport, characterized by aerobic and anaerobic metabolic demands and it has his own special character using, besides soccer, aspects of other sports (basketball, handball and hockey). The team is consisted of 14 players (5 players in the field, 4 players + 1 goalkeeper) and unlimited number of substitutes with the players on the bench is permitted (3). That's why the intensity and the rhythm of the game is very high and it doesn't decrease eventually, so futsal players spend 26% of time playing in high intensity (9).

Futsal is played on the 38-42m x 18-25m field, on the 3x2m goals size (as in handball), two 20 minute (effectively) halves (the time is stopped every time the ball is outside of the game), which makes the game last 70- 80 min. Technical proficiency of futsal players is a consequence of a smaller ball which demands faster and more precise ball manipulation (14) and small field (20x40m) which causes constant pressure of other team players. Therefore, futsal players are under pressure and in the 1 vs. 1 situation almost all the time (11).

Futsal is a contact sport and the injury risk is very high. Great injury occurrence can have serious consequences for the player, and the team (especially if it's hard to find an adequate substitute of the same quality) and the public health system (22). De Loes at al. (2000) have shown the entire expenses for the 3864 knee injuries were 4.268.014 $, with the greatest number of female soccer injuries. Studies has also shown women have greater ACL injury risk (2.4-9.5%) than male.

The most common movements leading to ACL rupture are landing, stopping and direction changing and therefore high risk sports are handball, basketball, soccer and futsal. The causes of greater injury incidence among females can be explained through environmental, anatomical, hormonal, neuromuscular and biomechanical aspects.

Knee-pelvis angle mechanism is a great ACL predictor (17). Elite female futsal players have shown the greatest occurrence in ankle (22.5%) (2), upper leg (24%) and knee injuries (23.1%) (13). Most common injury occurrence is during training process (58.6%) (26). Most common injuries among elite male futsal players (24) are ankle (38%) and ligament injuries (38%) while 41% of injuries have been repeated.

Epidemiological studies have shown great number of ankle and knee injuries, as well as the Achilles tendon injury occurrence (1) as a result of the hard playing surface and game characteristics which can cause great stress on the ankle and knee joints (18,20). Injury incidence is very high in futsal, especially among female population. The goal of this research was to establish frequency, types and locality of injuries among Italian female futsal players in the Veneto region.

Methods

Subjects

The research was conducted on a sample of 95 subjects consisting three groups (N=95): Italian Serie A (n=50), Serie C and D (n=18) and amateurs (n= 27) in the Veneto region. Body height, weight and body mass index were taken. All players were fully informed and gave their permission.

Table 1. Age and anthropometric characteristics of Italian female futsal players

	Serie A (n= 50)	Serie C, D (n= 18)	Amateurs (n= 27)
Age (years)	26.14± 5.9	25.61 ± 4.63	28.73 ± 6.24
Body height (cm)	164.94± 4.67	166.67± 4.93	165.59 ± 4.81
Body weight (kg)	60.24 ± 7.69	63.11± 8.3	61.3 ± 8.44
BMI (kg/m2)	22.21 ± 2.68	22.73 ± 2.95	22.41 ± 2.76

Procedure

Subjects completed injury sport related questionnaire (Gabrilo at al., 2013), which has been used earlier (4,12). Subject completed the questionnaire at the beginning of the spring competition period, in January. Researcher has been available at all time for questions and answers. Subjects could refuse participation and withdraw at any time. Participation was anonymous and personal data (name, birth and address information) that could directly connect to individual wasn't included in the questionnaire. The questions were made so subjects could give multiple- answers.

Variables

The questionnaire consisted of: 1) morphological-anthropometric data, 2) data related to training and competition and 3) data related to injuries. Morphological- anthropometric data: subjects reported body height (BH) and body weight (BW) which is obtained at the obligatory health procedure. Body mass index (BMI) has been calculated according to formula (Mišigoj- Duraković, 2008). Training and competition data: questions consisted data regarding playing experience, competition level, number of games played during the year, number of training hours etc.

Injuries data: questions consisted data related to number of injuries, types and locality of injuries, repeated injuries and injuries occurred during training and competition. The injury has been defined as physical symptom occurred during training or game, characterized with the need for medical intervention and missing the activity.

Statistics

The means and standard deviations for parametric variables were calculated, as well as frequencies and proportions for nonparametric variables. Univariate analysis of variance (ANOVA) was applied to establish the differences in the groups examined. Statistical significance was set at $p<0,05$. The statistical analyses were performed using statistical program R.

Results

Subjects (N=95) were aged 26.83 ± 1.67 (range 16- 43), body height 165.73 ± 0.87 (157- 175 cm), weight 61.55 ± 1.45 (51- 85kg) and BMI 22.45 ± 0.26 (18.28- 31.25). Ages averages in all three groups, along with the anthropometric measures, are shown in the table 1. Data considering training and competition (experience, number of training and games) are shown in table 2.

Table 2. Playing experience and the number of training sessions and games among Italian female futsal players

	Serie A (n= 50)	Serie C, D (n= 18)	Amateurs (n= 27)
Experience in futsal (years)	10.43 ± 6.26**	5.5 ± 3.49 **	7.17 ± 4.87 **
Number of training sessions-	2.28 ± 0.5	2.06 ± 0.24	1.74 ± 0.45
with the team (weekly)			
	4.88 ± 1.08	3.58 ± 0.69	3.52 ± 1.16
Number of training sessions-	2.14 ± 1.88	1.5 ± 1.22	1.2 ± 0.63
individually (weekly)			
	2.45 ± 2.18	2.92 ± 2.5	1.4 ± 0.94
Number of games (in a year)	34.69 ± 6.93**	28.28 ± 5.34**	26.46 ± 13.15**
**** p<0,05 ** p<0,01; significant differences between groups***			

Using analyses of variance (ANOVA) significant difference (p<0,01) in futsal experience between the groups has been shown. SerieA players are most experienced (10.5 years), followed by the amateur league players (7 years) and Serie C and D players (5.5 years). Furthermore, significant difference (p<0,01) has been shown in the number of games played during the year. Serie A players play the most games (35), followed by Serie C and D players (28) and amatory league players (26). Injury frequencies are shown in the table 3. Altogether, 94 injuries, which occurred in 45 subjects out of 50 (90%), have been found in Serie A. The most common injuries were ankle sprain (24; 25.53%), knee ligament and meniscus injuries (22; 23.4%). 14 injuries (14.9%) were fractures, ligament injuries (13.83%) and contusions (13.83%), especially head and face.

Table 3. Injuries numbers, types and percentages among Italian female futsal players

Injuries- number /Level of	***Serie A (n= 50)***	***Serie C, D (n= 18)***	***Amateurs (n= 27)***
FRACTURES			
Fingers (hand)	**2** (2.13%)	**1** (3.22%)	
Fingers (foot)	**1** (1.06%)	**3** (9.68%)	**1** (2.94%)
Wrist	**6** (6.38%)	**1** (3.22%)	Wrist
Foot	**3** (3.19%)		**1** (2.94%)
Lower leg	**1 (1.06%)**		
Upper arm/forearm/elbow	**1 (1.06%)**		1 (2.94%)
ALTOGETHER	**14 (14.89%)**	**5** (16.13%)	**3** (8.82%)

*p<0,05 statistical significance

Table 4. Continued

SPRAIN			
Ankle	**24**(25.53%)	**11**(35.48%)	**12** (35.29%)
ALTOGETHER	24 (25.53%)	11 (35.48%)	12 (35.29%)
KNEE INJURIES			
Ligament	14 (14.89%)	4 (12.9%)	2 (5.88%)
Meniscus	6 (6.38%)	2 (6.45%)	2 (5.88%)
Bursitis	2 (2.13%)		
ALTOGETHER	22 (23.4%)*	6 (19.35%)*	4 (11.76%)*

*p<0,05 statistical significance

Most of the injuries occurred during the matches (66.67%). Repeated injuries occurred in 35.55% cases, and 73.33% as a result of trauma. Among Serie C and D, 31 injuries have been notated which happened to 17 out of 18 subjects (94.4%). The most common injuries were ankle sprains (11; 35.48%), knee ligament and meniscus injuries (6; 19.35%), followed by the fractures (16.13%), especially foot fingers (9.68%). Subjects suffered 52.94% of injuries during training sessions.

Repeated injury happened to 23.53% subjects and 82.35% injuries happened as a result of a trauma. Amateur league players suffered 34 injuries all together, which happened to 21 subjects out of 27 (77.8%). The most common injury was ankle sprain (35.29%), followed by the contusions (20.59%), especially ankle and back (5.88%), muscle injuries (14.7%)- thigh and lower leg, knee ligament and meniscus injuries (11.76%). 61.9% of injuries occurred during the matches. Repeated injury happened in 19.5% of cases, and trauma caused 85.71% of injuries. Altogether, injuries caused by a trauma occurred in 78.31% and the rest (21.69%) by overuse and other causes. 28.92% showed repeated injury, 38.55% injury occurred during training and 61.45% during competition. Using analysis of variance, significant differences (p<0,05) has been shown in the number of injuries occurred during carrier, as well as in the type and locality of injuries, while groups differ in the number of knee injuries (graph 1). Results of entire population (N=95) showed 159 injuries altogether which occurred in 83 subjects (87.37%). The most common injuries were ankle sprains (67; 42.14%), knee ligament and meniscus injuries (30; 18.885), contusions (22) and fractures (22), both 13.84%.

Table 5. Continued

MUSCLE INJURIES								
Thigh		**7**	(7.45%)		**3**	(9.68%)	**3**	(8.82%)
Lower leg		**1**	(1.06%)				**2**	(5.88%)
ALTOGETHER		**8**	**(8.51%)**		**3**	**(9.68%)**	**5**	**(14.7%)**
LIGAMENT/TENDON INJURIES								
Shoulder		**6**	(6.38%)		**1**	(3.26%)	**2**	(5.88%)
Wrist		**4**	(4.26%)				**1**	(2.94%)
Achilles tendon		**1**	(1.06%)		**2**	(6.45%)		
Foot		**2**	(2.13%)		**1**	(3.22%)		
ALTOGETHER		**13**	**(13.83%)**		**4**	**(12.9%)**	**3**	**(8.82%)**

CONTUSIONS								
Head/face		**5**	(5.32%)		**1**	(3.22%)		
Neck		**2**	(2.13%)				**1**	(2.94%)
Back		**3**	(3.19%)		**1**	(3.22%)	**2**	(5.88%)
Thigh		**1**	(1.06%)				**1**	(2.94%)
Lower leg		**2**	(2.13%)				**1**	(2.94%)
Ankle							**2**	(5.88%)
ALTOGETHER		**13**	**(13.83%)**		**2**	**(6.45%)**	**7 (20.59%)**	

*p<0,05 statistical significance

Table 5. Continued

Number of all injuries			**94***			**31***		**34***
No training days (average)			69.32			34.56		38.81
No competition days (average)			87.74			44.28		72.44
Injuries occurred during training (%)		33.33%			52.94%		38.09%	
Injuries occurred during competition								
	(%)	66.67%			47.06%			61.9%
Injuries caused by a trauma (%)		73.33%			82.35%		85.71%	
Injuries caused by overuse/others (%)		26.67%			17.65%		14.29%	
Repeated injuries (%)		35.55%			23.53%		19.05%	

*p<0,05 statistical significance

Graph 1. The most common injuries among Italian female futsal players in all three groups (%)

*p<0,05, statistical significance

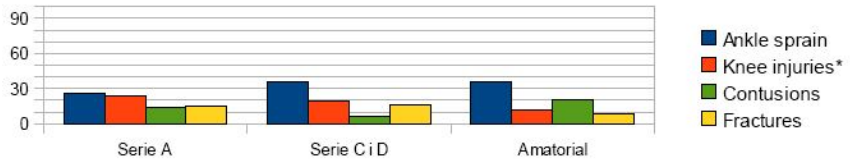

Figure 1. The most common injuries among Italian female futsal players in all three groups (%)

Graph 2. The most common injuries in total sample, % (n=95)

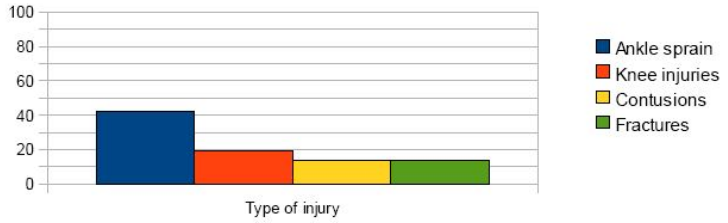

Figure 2. The most common injuries in total sample, % (n=95)

Discussion and conclusion

Considering slower development of female sport, small number of studies have been found in the field of futsal, especially among injuries among female population (2,13,26). Articles review is based on the studies related to female and male samples (1,7,21,25). Results of this research based on the total sample (N=95) showed that the most common injuries among Italian female futsal players are ankle and knee joint injuries. Ankle and knee injuries are the most common in all three groups. Statistical differences have been found in the number of knee injuries. They are in accordance with the other results (13) demonstrating that the most common injuries among elite female futsal players are ankle (2), thigh and knee injuries. On the sample of elite male futsal players it has been shown that the greatest injury occurrence were the ankle and knee ligament injuries (24), while the most common injuries in Futsal World Cups (2000, 2004, 2008) were lower leg contusions, ankle injuries and groin injuries (18). Large number of ankle and knee injuries can be explained by the hard playing surface and futsal game characteristics: constant accelerations and decelerations, jumps and fast movement changes that can cause great stress on ankle and knee joints (18,20). The most common injury mechanism happens during tackling, running, kicking, turning and landing. During tackling lower extremities injury usually occurs because players can't respond fast enough to such quick and unexpected movement. During running, turning and landing the most common causes are surface (extreme accent in futsal) and unsuitable shoes (1,6). Results from this study have demonstrated that the most frequent injury occurrence is during matches. That result is contrary to other studies (13,26).

Mentioned studies have demonstrated that female futsal players have a greater injury occurrence during training sessions compared to male. Of the entire population from this study, Serie A players have shown that the greatest number of injuries occurred during competition. This can be explained by the large number of games played per year, difficulty and high competitive level of Serie A. Statistical significance has been shown in the variable- number of games played per year, where Serie A players play the greatest number of games. Greater injury occurrence during competition has been shown among amateur league players. Serie C and D players were the only one demonstrating higher injury occurrence during training sessions which cannot be explained due to the lack of literature. The number of games played per year (preparation, championship, cups and national team games) is the aspect that should be considered and treated as an injury risk factor. Large number of games decreases the time available for the suitable training, while training-game ratio has been shown as a good injury indicator among soccer players (10,25). Out of 159 injuries in total, the greatest number of injuries has been noted among Serie A players. Furthermore, statistical significance has occurred between the number of injuries among Serie C, D and amateur players. The greatest number of repeated injury has also been noted among Serie A players (66.67%). These show Italian female futsal players have greater repeated injury occurrence compared to their male counterparts- 41% (24). It has also been shown that female soccer players with a previous ACL injury have a greater risk of repeated injury (11). This can be explained by the anatomical and neuromuscular characteristics, low core stability, extraordinary quadriceps dominance, aggressive playing style etc. On the other hand, repeated ankle injury can happen due to mechanical (ligament laxity) or functional (proprioceptive defect) instability of the ankle after first injury. Furthermore, players are at a higher risk for the injury of the weaker leg (2.6 times) if difference in strength is greater than 15% (21). That is why muscular strength, especially quadriceps and hamstrings muscles, is extremely important. It enables movements like jumps, kicking, running etc. Core stability enables control of the body position and movements, optimal production, transfer and force control during activity (5,23). Core strength is considered important biomechanical function which enables force generation, decreases loadings on the joints during activities and it is primary in the injury prevention (16). The greatest number of injuries, in all three groups, occurred due to trauma which can be explained by the game characteristics: constant pressing of the other team players and 1 vs. 1 situations (22), constant accelerations and decelerations, jumps and movement changes (18,20) on small hard surface playing ground. Furthermore, groups have shown significant difference in playing experience. Serie A players have showed the longest experience in futsal (10.5 years) which is very logical considering the need for certain abilities, long training process and preparation which enables playing at the highest competitive level like Serie A. Amateur league players have showed 7 years of experience, higher that Serie C and D players (5.5 years). This can be explained by the fact that players in the amateur competition played at a higher levels for a long time and now they enter amateurs because they want to stay in the sport but don' t have necessary abilities to compete in high level anymore. Serie C and D have just started collecting experience on their way to higher level competitions. The biggest number of injuries among Italian female futsal players in the Veneto region happens in the lower extremities (ankle and knee joints). The most common injuries are ligament injuries. Results of this research are in accordance with the previous studies on the sample of futsal players. The greatest number of injuries occurred during competition as a result of trauma. SerieA players showed significantly bigger number of injuries occurred and the number of knee injuries then Serie C, D and amateurs. More studies in female futsal are needed in order to develop training and preventive programs in order to decrease the number of injured players.

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POVREDE KOD IGRAČICA FUTSALA U ITALIJI: UPITNIK

Sažetak

Istraživanja su pokazala veliku pojavu povreda među nogometašima i igračima malog nogometa, posebno među ženskom populacijom. Jedna od najelitnijih europskih ženskih liga malog nogometa je Italian Serie A. Pored kvaliteta Serie A, Italija može biti ponosna na dobru organizaciju u nižim ligama i količinu aktivnih igračica malog nogometa. U tri lige u organizaciji nacionalne federacije ima više od 4.000 aktivnih igračica malog nogometa. Ako dodate sve amaterske lige malog nogometa, broj aktivnih igrača je mnogo veći. Cilj ovog istraživanja je bio da se utvrdi broj, frekvencija, lokalitet i vrsta povreda, zajedno sa posljedicama, među talijanskim igračicama malog nogometa. Uzorak je bio sastavljen od igračica serije A, C, D i Amaterske Lige ženskog malog nogometa (n = 95) u regiji Veneto. Igrači su popunili upitnik, sastavljen od morfoloških mjera, obuke i informacije o vrstama, lokaciji, učestalosti i posljedicama povreda tijekom svoje karijere. Rezultati su pokazali da je najčešća povreda među igračicama malog nogometa uganuće zgloba (42,14%), zatim povrede ligamenata i meniskusa (18.88%) i kontuzije (13.84%). Najviše povreda (61.45%) došlo je tijekom natjecanja. Statistička značajnost (p <0,05) je pokazana u broju povreda između grupa i broju povreda kolena. Najčešća povreda među talijanskim igračicama malog fudbala je uganuće zgloba, zatim povrede koljena. Programi obuke trebaju biti poboljšani sa češćim upotrebama boljih preventivnih programa u cilju smanjenja ove vrste povreda.

Ključne riječi: *povrede, kvalitet, ženski fudbal*

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