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Evaluation of foot posture and Correlation with the injury in female Kho Kho players

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Abstract

Kho-Kho ranks as one of the most popular traditional sports in India. Prevention and intervention have become focal points for researchers and clinicians. Foot pronation as a potential lower extremity overuse injury risk factor has received great attention in research and clinical practice. This insight encourages us to evaluate static foot posture and injury risk in female Kho-Kho players with a belief that this may provide indications for biomechanical interventions. Methodology: Foot posture was assessed in female Kho-Kho Players using Foot Posture Index (FPI) in standing posture Study design: Cross-sectional study. Sample size: 56 University level players. Results: There was correlation between FPI of Right and Left foot with respect to the injury in the ipsilateral foot. The p values were statistically significant ($p \leq 0.000$). Conclusion: Altered foot posture is a risk factor for injury in female Kho-Kho players.

Keywords: Ankle injury, Foot posture index, Kho-Kho, Pronated foot

Introduction

Kho-Kho ranks as one of the most popular traditional sports in India. Like all Indian games, it is simple, inexpensive and enjoyable. It does, however, demand physical fitness, strength, speed and stamina, and a certain amount of ability. Dodging, feinting and bursts of controlled speed make this game quite thrilling. To catch by pursuit - to chase, rather than just run - is the capstone of Kho-Kho. The game develops qualities such as obedience, discipline, sportsmanship, and loyalty between team members^[1].

Identifying lower extremity musculoskeletal injury risk factors is important for sports medicine clinical practice and research, potentially allowing for the development of more effective and efficient prevention and management strategies.

Foot pronation as a potential lower extremity overuse injury risk factor has received great attention in research and clinical practice. Foot mechanics are considered to contribute to lower extremity malalignment and pathology proximal to the foot via joint coupling with tibial internal rotation^[2].

Two recent reviews have evaluated the relationship between foot posture and lower extremity injury^[3, 4]. Tong and Kong³ concluded that both pronated and supinated foot types are significantly associated with lower extremity injury.

Chuter and Janse de Jonges narrative review suggested that excessive foot pronation increased the risk of exercise related lower leg pain and Medial tibial stress syndrome (MTSS)^[4].

A Systematic review and Meta-analysis by Neal *et al* found that a strong and very limited evidence of small effect that a pronated foot posture is a risk factor for MTSS and patellofemoral pain respectively^[5].

Considering the hypothesised link between foot posture and lower extremity injury, static foot posture is frequently assessed in the clinical setting, with a belief that this may provide indications for biomechanical interventions (e.g. foot orthoses).

Thus, with this insight we evaluated the foot posture in female Kho Kho players.

Methodology

Study design: Cross-sectional study

Study consisted of 56 female Kho Kho players in the Age group of 18 to 26

Study Setting: University Gymkhana

Sample collection: Convenient sampling

Study selection criteria

Inclusion criteria

1. Female kho kho players in the age group of 18 to 26 years
2. Kho kho players represent at the university level
3. Female players practising kho kho for the last one year at competitive level

Exclusion criteria

1. Recent ankle injury
2. Any recent lower limb fractures
3. Players not practising kho kho at competitive level

Study was initiated with the approval of institutional ethical committee.

Prior evaluation the subjects consent was taken to participate in this study.

The subjects foot posture was evaluated with a tool Foot posture Index (FPI).

Methodology to evaluate foot posture by FPI

The Foot Posture Index (FPI) is a clinical tool designed to provide a fast, simple, and multidimensional assessment of foot type. The original FPI developed by Redmond *et al* [6] was validated through a Rasch analysis to a 6-variable model (FPI-6) [7].

When using the FPI-6, the clinician assesses 6 characteristics across 3 different views of the foot and assigns a numerical score to each characteristic. Each criterion is scored on a 5-

point scale (-2 to +2), with negative numbers indicating a supinated posture and positive numbers indicating a pronated posture. FPI-6 scores were assessed while the participants stood in a relaxed, double-limb stance position, with equal weight through both lower extremities, eyes looking straight ahead, and arms at their sides. Participants stood on an elevated surface to allow the researcher to obtain all measurements from a seated position.

The assessment typically takes less than 1 minute to complete and requires no equipment. The FPI-6 composite score ranges from -12 to +12 and is used to categorize foot type based upon established cut-off scores [8] Researchers have found the FPI-6 to have moderate to good reliability [9, 10]

All players were asked to report any ankle injury during the regular practise sessions or during the game for the last one year. Both the feet of all the players were assessed with FPI. The scores of FPI were recorded and statistically analysed for correlation of FPI scores and ankle injury.

Results and Observations

56 female Kho Kho players were assessed with FPI for both left and right foot. 23 players reported ankle injury on the left foot i.e. 41.07% and out of these players, 20 players were identified with pronated foot on the left ankle i.e. 86.95%.

Out of 56 players, 13 players reported with right ankle injury i.e. 23.21%. Out of these players, 11 players were identified with pronated foot on the right ankle i.e. 84.61%.

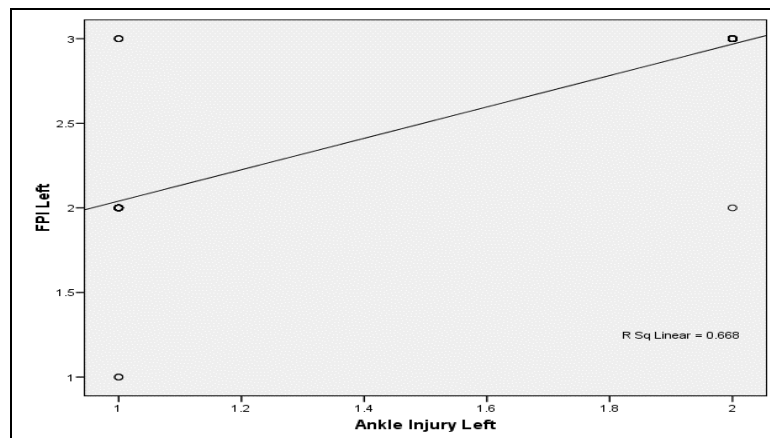
These results shows highly significant correlation of pronated foot with ankle injury (p =0.000) on both the feet.

Table 1: Correlations FPI scores with left ankle

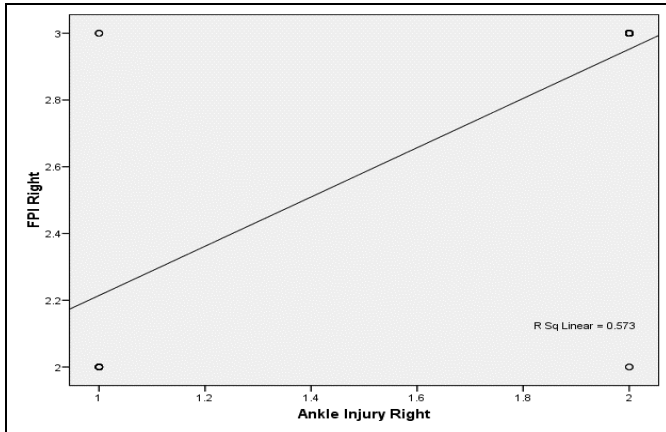
Correlations			
		FPI Left	Ankle Injury Left
FPI Left	Pearson Correlation	1	.817(**)
	Sig. (2-tailed)		0.000
	N	56	56
Ankle Injury Left	Pearson Correlation	.817(**)	1
	Sig. (2-tailed)	0.000	
	N	56	56

Table 2: Correlations FPI scores with right ankle

Correlations			
		FPI Right	Ankle Injury Right
FPI Right	Pearson Correlation	1	.757(**)
	Sig. (2-tailed)		0.000
	N	56	56
Ankle Injury Right	Pearson Correlation	.757(**)	1
	Sig. (2-tailed)	0.000	
	N	56	56



Graph 1: Represents co relation of left ankle injury with FPI scores of the left foot



Graph 2: Represents the co relation of right ankle injury with FPI scores of the right foot

Discussion

In our study, according to Table 1 and Table 2 it is evident that the Kho -Kho players with Pronated feet were associated with injury

It has been widely proposed that dysfunction of the plantar intrinsic muscles of the foot leads to an increase in foot pronation in static stance, while walking or running [11, 12] This may result in a less rigid foot as the midfoot remains “unlocked” and therefore, generates less torque leading to inefficient force transmission through the foot lever and insufficient foot stiffness adaptation in transverse plane. In addition, with excessive pronation, the angle of pull of the Achilles tendon and the plantar -flexors would be less than ideal such that some of the force generated by the muscles would pull medially as well as upward [13].

Alteration in ligamentous laxity, muscular strength, anatomic foot and ankle alignment, postural sway, gait biomechanics, and muscle reaction time may be observed as potential intrinsic risk factors for dysfunction [14].

Low medial longitudinal arch could present as an isolated biomechanical derangement sustained a higher percentage of lateral ankle sprain [15].

Moreover, some authors reported high incidence of this injury in females with an increased calcaneal eversion range of motion [16].

In a literature review, relationship between foot characteristics and inversion ankle injury was studied. It has been demonstrated that increased foot width, cavovarus deformity and increased calcaneal eversion range of motion are static foot characteristics that have a distinct correlation with lateral ankle sprain [17].

Although lower extremity injuries are multifactorial these findings are consistent with those of other researchers^{18, 19} who have suggested that both extremes of arch height (high and low) serve as intrinsic risk factors for lower extremity injuries. In addition to an association with lower extremity injuries, Reilly *et al* [20]. found that extremes of FPI scores were associated with individuals with hip and knee osteoarthritis.

Pes planus has long been considered to be a postural variation that increases the likelihood of developing foot problems [21].

It is important that clinicians consider additional established risk factor variables such as altered hip kinematics in evaluating possible risk factors [22]

It has been found that FPI has been shown to correlate with dynamic measures of foot function; the strength of this correlation has varied from weak to strong [23, 24]

Conclusion

It is evident from this study that altered foot posture is a risk factor for injury in Kho-Kho players.

Clinical Implications

It is important to assess foot posture in Kho-Kho players and appropriate strategies like prescription of foot orthosis and rehabilitation should be incorporated for the same.

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