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To Study Relationship between Foot Posture and Low Back Pain among Female Cricket Players

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Abstract: ***Introduction: Lower back pain is remarkably common phenomenonalmost all age group people are affected. People have rendered to keep their posture upright. It is estimated that almost 70-85% of the adults are affected. Loss of productivity and healthcare cost are considerable in relation to financial burden with people experiencing low back pain. There are ample of studies done to find the relationship between foot posture and low back pain among individuals. Female cricket players have high prevalence of low back pain but foot posture of female cricket players have never been studied well hence this study is intended to explore the relationship between foot posture and low back pain among female cricket players. Methodology: 60 subjects were selected for the study as per the inclusion criteria. Female Player with non-specific low back pain without radiation and players having NPRS score between 4-8 were included. Data was collected from Rohtak road gymkhana, Ram Pal cricket academy, and Dhyan Chand National stadium. All the subjects were given thorough explanation about the procedure which was performed. Results: The result of the present study revealed that there is significant relationship exist between foot posture and non-specific LBP in group 2 (bowlers)with the mean age 20.60, mean NPRS value 4.20, FPI-6(L) mean 7.80, FPI-6(R) mean 7.85 with the mean previous experience of playing was 12.70 with the significance 0.030 in left foot and 0.050 in right foot, the probable reason for the finding was that the fast-bowling is related with an increased chance of LBP. Conclusion: From the result, it was concluded that there is statistical as well as theoretical significant correlation between non-specific LBP and foot posture among female cricket players of GROUP 2 consisting bowlers and statically insignificant but theoretically significant correlation in GROUP 1&3 which consist batswomen and all-rounders respectively.***

Keywords: Foot posture, back pain, cricket players

1. Introduction

Lower back pain is remarkably commonphenomenon [1] almost all age group people are affected [2]. People have rendered to keep their posture upright [1]. It is estimated that almost 70-85% of the adults are affected [3][4]. Loss of productivity and healthcare cost are considerable in relation to financial burden with people experiencing low back pain [5]. As most of the people experiencing back pain seek medical attention formerly or in formerly women are more likely to seek the care for pain [2]. A complex array of risk factors put to the condition, like increase age, female sex, low education, obesity, occupational and psycho-social factors. There's one more well established risk factor postural variation like decrease lumbar lordosis, limb length discrepancy which have been suspected to cause low back pain by altering the stress placed on soft tissue structure around spine, atypical foot and function have been implicate with low back pain are more likely to have low arched foot or pronated (planus) [5].Basic and postural variations from the norm within the feet are believed to be related with mechanical LBP due to their capacity to cause disturbance of typical muscle and joint biomechanics within the lower back subsequently making stretch and strain of lumbo-pelvic joints leading to LBP[6]. However, back and feet seems like isolated region of the body yet they are conjoint by the lower extremity kinematic chain [7].

Hypothetical components that interrelate foot pose and LBP:A. Heel tallness of footwear; B. insufficient stun absorption; C. components related to over the top foot pronation; D. useful appendage length discrepancy;E. sagittal plane bar [8].

Excessive foot pronation is set to produce prolonged internal rotation of the lower limb[3] and anterolateral pelvic tilt in the hip joint [8]. A rigid high arch foot has been linked with development of low back ache [3]. variations in the height of medial longitudinal arch has also shown in impact on the magnitude of acceleration of the foot position at the lumbar spine when running and alteration of foot position can affect pelvic alignment and EMG activity of erecter spinae and gluteal muscle when walking [5]. Due to thin increase strain on pelvic like iliopsoas piriformis and gluteus maximus that will over a period of time will lead to rotation of affected lumbar vertebral bodies [8]. Patient with lower back pain along foot pronation exhibit higher vertical ground reaction force and higher loading gait rate in gait cycle. Excessive foot pronation results in altered alignment of the tibia, femur and lumbar spine [9]. Impact of expanding subtalar pronation on pelvic pose utilizing intelligent markers on the lower appendages and pelvis and a computerized 3-dimensional movement examination framework. They appeared that the pelvis got to be anteverted by 1.57◦on normal when both feet were tilted along the side. When one foot was supinated by the same sum, the pelvis got to be anteverted by 1.41◦and an along the side tilted by 1.46◦on normal (factually noteworthy changes). So also, recording from infrared markers put on surface life structures points of interest of the tibia, femur, pelvis and lumbar spine.[6]

Pronation of the subtalar joint could be a tri-planar movement, which is characterized by adduction and plantar flexion of the talus, and an eversion of the calcaneus in a closed kinematic chain. The adduction of the talus leads to an internal rotation of the lower limb, and an eversion of the calcaneus, related to the plantar flexion of the talus. In case of an expanded calcaneal eversion, the lower limb expects an intemperate internally rotated position with a discrepancy in limb length [10].

Amid weight-bearing, medially rotating the hip comes about in subtalar joint supination, while along the lateral rotation the hip comes in subtalar joint pronation. Therefore, toeing out results in subtalar joint pronation, whereas toeing in results in subtalar joint supination. A hip with excessive hip lateral rotation (toe out) and hence restricted hip medial rotation will pronate more at the subtalar joint. One-sided foot pronation may produce sacroiliac joint dysfunction,so contribute to low back pain. Unilateral foot pronation may produce sacroiliac joint dysfunction and so contribute to low back pain. Unilateral subtalar joint pronation has been shown to make useful leg length disparity. The more prominent hip lateral rotation on the right hip when compared with the left may have been in part dependable for the development of low back and foot torment. The more prominent hip lateral rotation on the right may have come about in damaged subtalar joint pronation on the same side due to the toe-out situation of the foot at heel strike [11].People with mechanical LBP were more likely to have a normal of 2.2◦less dorsiflexion within the right ankle ($p = 0.002$), and1.7◦in the left ($p = 0.032$); and an expanded navicular drop by a normal of 1.7 mm on the proper ($p = 0.003$) and 1.6 mm on the left($p = 0.009$). More supinated feet may be able of more stun assimilation. Subsequently, pronated feet may bear less stun retention to the lumbar spine, which would be reliable with the idea that foot pronation, would be a hazard figure for LBP [6].Intemperate pronation caused either a leg length discrepancy or a static pelvic tilt based on the defective biomechanics the body had to overcome. The spine must account for this defective foot biomechanics and leg disparities through the lateral deviation of the spinal column and revolution of the vertebral bodies, causing a utilitarian lumbar scoliosis and LBP. Moreover, came to this same conclusion of abnormal pronation driving to leg length discrepancies and the ensuing pelvic tilts causing low back torment. [12].

Physically fit way of living is important for all the individuals. Participating in sports activities can provide pleasure, relaxation, competition, socialization, maintenance and improvement of fitness and health. [13]. Nowadays, Elites sportsperson are anticipated to train longer and harder to excel in their chosen sports [14]. Sports activities can also lead to risk factor for injuries and permanent disabilities. Sports injuries are a notable cause of concern-for athletes, sports and community [13].

Cricket is an aggressive sport that involves many notational skills and movements. To amplify the skills and movements many players ensure that their body is kept fit and strong. There are 3 aspects of the game batting, bowling and fielding which are incidental to injury [15]. Musculoskeletal torment can happen in different ways whereas playing cricket: a player being struck by a ball or bat, quick rotational movements, sliding and plunging, collisions with other players and overuse injuries. It is imperative that players are instructed that anticipation is better than cure. A few players don't have satisfactory physical training, and are hence not physically arranged for cricket. Since of this, their muscle quality, perseverance, nimbleness and wellness on the field may not continuously be satisfactory for the diversion of cricket [14].

The foremost common locales were the lower limits (39%), taken after by upper limits (36%) and lower back (18%). The predominance of cricket-related musculoskeletal pain particular to the different anatomical destinations were generally knee (30%) and lower back (29%), taken after by bear (17%), ankle (13%) and thigh (11%). The lower back and knee are generally related with micro trauma injuries. Fast-bowling is related with anincreased chance of lower back pain. Lumbar pain, which is common among fast-bowlers, can lead to premature retirement of these players.[14]. 38% chances that bowlers have back injuries.[16]

There are ample of studies done to find the relationship between foot posture and low back pain among individuals. Female cricket players have high prevalence of low back pain but foot posture of female cricket players have never been studied well hence this study is intended to explore the relationship between foot posture and low back pain among female cricket players. The need of the study is to improve the treatment protocol of low back pain by modifying the foot posture in cricket players.

2. Methodology

With reference to letter no. 10/876/Acad/DPSRU/2018/798 dated 17/9/19 The departmental research development committee of School of Physiotherapy, Delhi Pharmaceutical sciences and research university has reviewed and after final recommendations in the project titled “To study relationship between foot posture and low back pain among female cricket players” has been approved. 60 subjects were selected with convenient sampling with 95% confidence Interval for the study as per the inclusion criteria. Inclusion criteria comprisesFemale Players with non-specific low back pain without radiationand players having NPRS score between 4-8 were included. Data was collected from Rohtak road gymkhana, Ram Pal cricket academy New Delhi, and Dhyan Chand National stadium New Delhi. All the subjects were given thorough explanation about the procedure which was performed. Thereafter informed consent and voluntary participation consent were obtained from the subjects. A proper assessment was done after which, all the subjects were assigned into 3 groups (1,2&3) and each group was having 20 subjects (n=20)

1) Low back pain was checked through Numeric pain rating scale.[22][23]
2) Foot posture was checked through FPI-6. Subject were asked to stand in their relaxed stance positionwith double limb support. The subject was instructed to stand still, with their arms by their side and looking straight ahead. Subject was asked to take several

steps, marching on the spot, prior to settling into a comfortable stance position. During the assessment, it was important to ensure that the subject does not try to see what is happening for them self. The subject was needed to stand still for approximately two minutes in total for the assessment. The investigator was needed to move around the subject during the assessment and had uninterrupted access to the posterior aspect of the leg and foot. The investigator checked the 6 criterion of foot posture that were:

- Talar head position (viewed from front)
- Supra and infra lateral malleoli curvature (viewed from behind)
- Calcaneal frontal plane position (viewed from behind)
- Prominence in region of TNJ (viewed at an angle from inside)
- Congruence of medial longitudinal arch (viewed from inside)
- Abduction/adduction of fore foot on rear foot (viewed from behind) [24][20]

Figure 3.1: Talar head position

Figure 3.2: Supra and infra lateral malleoli curvature

Figure 3.3: Calcaneal frontal plane position

Figure 3.4: Prominence in region of TNJ

Figure 3.5: Congruence of medial longitudinal arch

Figure3.6: Abduction/adduction of fore foot on rear foot

3. Results

Data Analysis was doneon Microsoft excel 2016 and statistical analysis was done by using SPSS software version 24.The demographic profile of age was analyzed by using descriptive statistic.The relationship between non-specific low back pain and foot posture among female cricket players was done by using Karl Pearson correlation (r). The level of significance was set at p =0.05.

Demographic details

A total number of 60 players were taken and divided into 3 groups each containing 20 players. Group 1(batswomen) mean and standard deviation of age 23.55+5.68, Group 2 (bowlers)mean and standard deviation of age 20.60+4.12 and Group 3(all-rounder) mean and standard deviation of age 19.75+6.034.

Group 1 mean and standard deviation of NPRS, FPI-6(L), FPI-6(R) and duration of playing are 4.20±0.523, 8.45±1.276, 8.25±1.585 and 14.55±5.643 respectively.
Group 2 mean and standard deviation of NPRS, FPI-6(L), FPI-6(R) and duration of playing are 4.20±0.410, 7.80±1.005, 7.85±1.040 and 12.70±4.067respectively.Group 3mean and standard deviation of NPRS, FPI-6(L), FPI-6(R) and duration of playing are 4.15±0.366, 8.75±0.366, 8.45±1.638 and 11.05±5.443 respectively. As shown in table 5.1

Table 1

	Group 1		Group 2		Group 3	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
NPRS	4.20	0.523	4.20	0.410	4.15	0.366
FPI-6L	8.45	1.276	7.80	1.005	8.75	1.517
FPI-6R	8.25	1.585	7.85	1.040	8.45	1.638
Duration of Playing (Years)	14.55	5.643	12.70	4.067	11.05	5.443

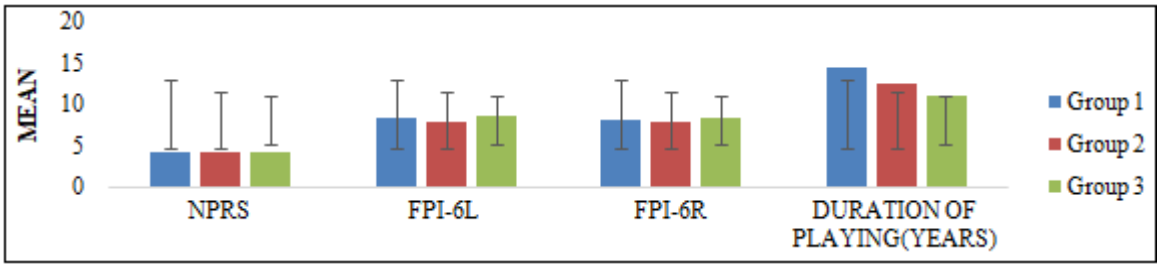

Figure 1: Mean and standard deviation ofGroup 1 (NPRS, FPI-6(L), FPI-6(R) and duration of playing), Group 2 (NPRS, FPI-6(L), FPI-6(R) and duration of playing) and Group 3(NPRS, FPI-6(L), FPI-6(R) and duration of playing).

The result of present study revealed that there was statistically insignificant relationship between FPI-6 (L) & FPI-6(R) with LBP in GROUP 1 (Batswomen)for LEFT (r = 0.331; p value = 0.154) RIGHT (r = 0.317; p value = 0.173) and in GROUP 3 (All- rounders) for LEFT (r =0.260; p value = 0.268) RIGHT (r = 0.268; p value = 0.169). There was statistically significant relationship between FPI-6 (L) & FPI-6(R) with LBP in GROUP 2 (Bowlers) LEFT (r =0.485; p value = 0.030) RIGHT (r =0.444; p value =0.050). as shown in table 5.2, 5.3 and 5.4 and FIGURE 5.3a & 5.3b; 5.4a &5.4b& 5.5a & 5.5b.

Table 2: Correlation Group 1

		FPI-6(L)	FPI-6(R)
NPRS	Pearson Correlation	.485*	.444*
	p value	0.030	0.050
	N	20	20

Table 3: Correlation Group 2

		FPI-6(L)	FPI-6(R)
NPRS	Pearson Correlation	0.331	0.317
	p value	0.154	0.173
	N	20	20

Table 4: Correlation Group 3

		FPI-6(L)	FPI-6(R)
NPRS	Pearson Correlation	0.260	0.320
	p value	0.268	0.169
	N	20	20

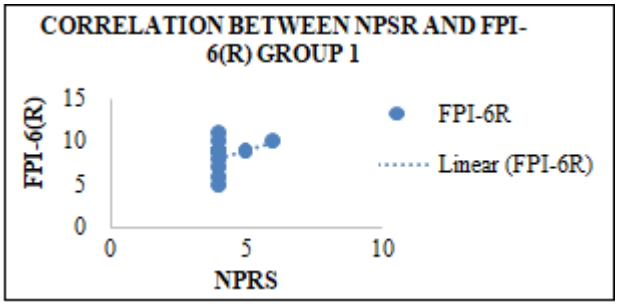

Figure 2 (a): Correlation between NPRS AND FPI-6 (L) of Group 1

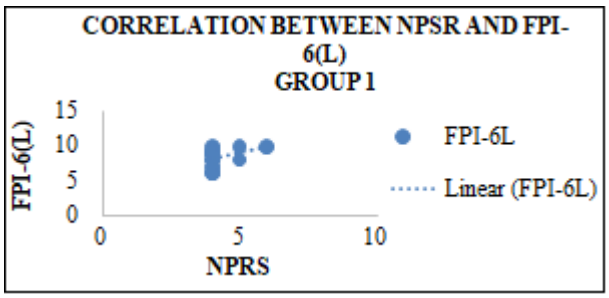

Figure 2 (b): Correlation between NPRS AND FPI-6 (R) of Group 1

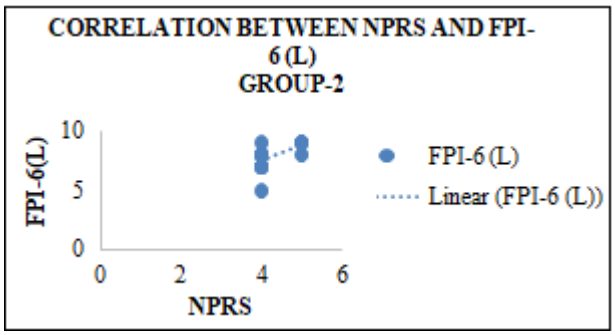

Figure 3 (a): Correlation between NPRS AND FPI-6 (L) of Group 2

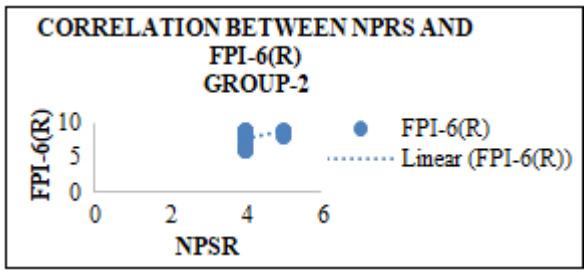

Figure 3(b): Correlation between NPRS AND FPI-6 (R) of Group 2

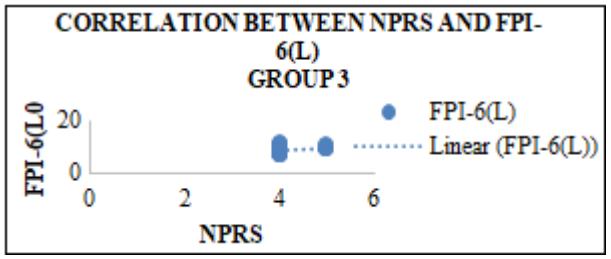

Figure 4 (a): Correlation between NPRS and FPI-6 (L) of group 3

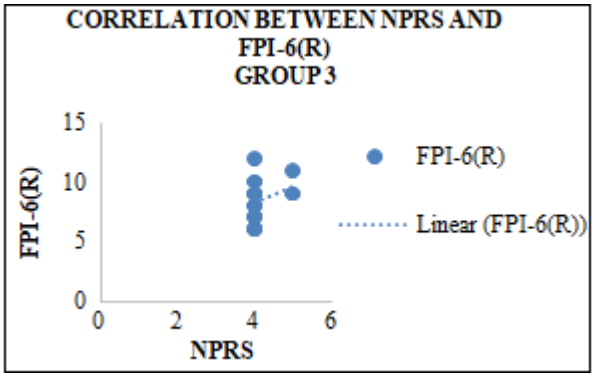

Figure 4 (b): Correlation between NPRS and FPI-6 (R) of group 3

4. Discussion

The primary purpose of this study was to determine the relation between non-specific low back pain and foot posture among female cricket players. The criteria for subject inclusion was subjects with non-specific low back pain without radiation and numeric pain rating should be between 4-8. The foot posture was assessed through foot posture index 6. The players were divided into 3 Groups: Batswomen, Bowler and All-rounders. Each group had 20 players in it.

The result of the present study revealed that there is significant relationship exist between foot posture and non-specific LBP in group 2 (bowlers)with the mean age 20.60, mean NPRS value 4.20, FPI-6(L) mean 7.80, FPI-6(R) mean 7.85 with the mean previous experience of playing was 12.70 with the significance 0.030 in left foot and 0.050 in right foot, the probable reason for the finding was that the fast-bowling is related with an increased chance of LBP. Lumbar pain, which is common among fast-bowlers [14], and pronated foot was more often present in pace bowlers while supinated foot was often seen in spin bowlers [24]. Fast bowlers are more prone to injury there back due the technique and load on the lumbar was more to stabilize the counter- rotation of the shoulder.

Pronated foot leads to medial rotation of lower end of tibia upon the talus and upper end of tibia rotates laterally which further leads to medial rotation of femur and increase the Q angle. Patella shifts laterally due to weakness in vastus medialis oblique muscle.Medial rotation of femur leads toanterior pelvic tilt whichincreases the lumbar lordotic curve which further compensatesand increases the kyphotic curve. To compensate the kyphotic curve cervical lordosis increases which further leads to forward head posture, the kinematic changes which occurs during the pronated foot.

Excessive foot pronation but also abnormal pronation can lead to LBP as there was over- rotation of the pelvis to correct the asymmetry in the lower limb. On excessive pronation, the pelvic alignment shifts anteriorly approximately 10^{o} and anterior pelvic tilt has been associated with LBP.[14] Excessive foot pronation has dynamically shortened the lower limb.[25]The insignificance present in group 1 (batswomen)and group3(all-rounders) could be due as only foot posture individual cannot only be the factor to promote LBP there

are other factors also responsible likelimb length discrepancy.The factors responsible for the LBP are the height of heel in footwear, inadequate shock absorption, functional limb length discrepancy and sagittal plane blockage.[8] Decreased in ankle dorsiflexion can lead to mechanical LBP.[7]

5. Conclusion

From the result, it was concluded that there is statistical as well as theoretical significant correlation between non-specific LBP and foot posture among female cricket players of GROUP 2 consisting bowlers and statically insignificant but theoretically significant correlation in GROUP 1&3 which consist batswomen and all-rounders respectively.

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