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Original Research Article

Prevalence of musculoskeletal pain in field hockey players of Maharashtra: a cross-sectional study

Mayuri A. Khatavkar*, Shradha Pawar, Sayali Kedare

Department of Physiotherapy, MGM College of Physiotherapy, Navi Mumbai, Maharashtra, India

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***Correspondence:**
Dr. Mayuri A Khatavkar,
E-mail: mayukadam98@gmail.com

ABSTRACT

Background: Field hockey has its dynamic nature involving multidirectional movements which may lead to injuries. Thus, the study was aimed to find prevalence of pain and further categorizing with respect to gender, type of players and their playing positions, amongst hockey players.
Methods: It was a cross-sectional observational study taken place amongst various hockey clubs and Maharashtra Hockey Association. 363 participants out of 700 of mean age (20.89±11.04 years) were recruited from various zones of Maharashtra, along with respective consent. Data was tabulated and analyzed using MS-Excel.
Results: It was found highest in lower-back (34%) amongst the field hockey players. Based on gender, the most prevalent sites of pain were lower-back (22%) in males and neck (21%) in females. Lower back region seemed to be most prevalent in pain in both elite (42%) and recreational (29%) players. In elite players, most prevalent pain was seen as low back (46%) in males and that of bilateral hips (30%) in females. In recreational players, it was found that both genders reported prevalence of injury over lower back. (males- 25%, females- 33%). Based on play positions, it was found knee region in the goal-keepers and in lower-back of defenders get affected the most (47%). These numbers would help to filter out injury prone areas and to help in formulating preventive measures.
Conclusions: It was concluded that the highest prevalence of pain was found in lower-back (34%).

Keywords: Field hockey, Maharashtra, Musculoskeletal injuries, Nordic questionnaire, Pain, Prevalence

INTRODUCTION

Hockey is National sport of India and played widely in various international competitions such as Olympic Games, World Cup, World League, Champions Trophy and Junior World Cup, etc. It is a team sport played between two teams of eleven players each. By using hooked sticks, the player tries to dive a small hard ball toward goals of opposite ends of a field. It involves running, sprinting, and sudden twists in directions of movement to control a ball against the opposing team. It involves techniques such as hitting, pushing, flicking the ball. The common techniques included in hockey are dribble, drag flick, flick, push pass, hit, drive, scoop sweep. Due to its dynamic techniques the players are more prone to musculoskeletal injuries of acute or chronic nature. This may be resulted due to the terrains on which it is played such as artificial turf and natural grass. Hockey can be played by both elite and recreational players. Elites are the ones who already have experience of the sport with accuracy of its techniques. They are the ones who have spent maximum duration on their coaching. Recreational players are the population who in their leisure time take the opportunity to play. It could be with or without the training or coaching so far concerned with the tournaments or leagues. If compared amongst elite and recreational, it may be seen that due the extrinsic as well as intrinsic factors recreational players may thought to be more prevalent in having pain.[1,2]

Field hockey is played based on several positions such as goal-keeping, defending, mid-fielding, sweeping, forward play. Based on this, positional variations, it could be possible that the player may be prevalent to a particular joint/area pertaining to the individual biomechanics of the positions. Crouched position is the most common in hockey which prevails an area/joint to cause pain further leading to injuries. In Maharashtra, field hockey is played throughout the 6 divisional zones (Aurangabad, Amravati, Nashik, Pune, Konkan, Nagpur). Regional teams include both male and female players representing their zonal region at district, state as well at National level of game. It is observed that in-spite of the popularity the sport, there is a lack of information on data related to injury rates and type of injury. Also, there is not much data on the differences in injury rates among gender, positions and level of achievement. In accordance to National Collegiate Athlete Association, overall injury rate is 6.3% per 1000 athlete exposure. Rees et al has done a systematic review to determine the prevalence of injury in field hockey in Ireland.[1-6] And due to lack of favorable conditions owing to uneven terrains or maintenance of the same, the players may be more prone to injuries.

Owing to dynamic nature of the sport and its technique, there may be multiple musculoskeletal areas of pain seen in field hockey either during training and competition. It is important to identify the site and type of pain amongst the players so as to help in early prevention in order to minimize the risk of injury. There are handful of prevalence studies done in other countries, and in India it seems to have dearth of literature. As there is lack of knowledge on the types of injuries caused, there is lack of measures to be taken for ultimate prevention. It is important to identify the site and type of pain amongst the players so as to help in early prevention in order to minimize the risk of injury. Thus, the purpose of this study was the identification of the prevalence of pain among field hockey players which will provide a guideline for injury prevention strategies that can be referred by players, coaches, strength conditioning specialists, and physiotherapists when dealing with players, those at risk of injuries.[6-8]

METHODS

The study undertaken was a cross-sectional study around different regions of Maharashtra from November 2022 to April 2023 in which sampling was done using convenience type. 700 field hockey players were screened from hockey clubs of different zones of Maharashtra. A sample size of 362 was calculated using open EPI software, keeping effect size as 0.8. They were falling in the age group with mean age years (20.89±11.04 years). After obtaining approval from the institutional ethical committee, samples were recruited with their consent, as per our inclusion criteria and those who were playing hockey for less than a year were excluded from the study. Procedure and purpose of the study was explained. Their participation and results had kept confidential with blinded participation forms. They were screened for prevalence of pain using Nordic musculoskeletal pain questionnaire throughout various regional club and academies.[9]

The questionnaire assessed the pain from acute duration from past 7 days up-to chronic pain from past 12 months. A general questionnaire of choice items identifying areas of the body causing musculoskeletal problems. Completion is aided by a body map to indicate nine symptom sites being neck, shoulders, upper back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet. Respondents are asked if they have had any musculoskeletal trouble in the last 12 months and last 7 days which has prevented normal activity.

Additional questions relating to the neck, the shoulders and the lower back further detail relevant issues. Twenty-five forced-choice questions elicit any accidents affecting each area, functional impact at home and work (change of positions), duration of the problem, assessment by a health professional and musculoskeletal problems in the last 7 days. The answers to all questions are answered in either dichotomous response (yes/no) with the side either unilateral/bilateral was to be mentioned. Inference- the maximum responses of yes/no were considered for calculating the final results.

The data was tabulated, stored and evaluated in Excel wherein the demographics were analyzed using MS Excel worksheet with latest supported version. Descriptive statistical analysis was done to calculate percentage/ average, proportions and graphical representation of demographic data, prevalence with respect to gender, type of players, and playing positions prevalence was mentioned. Statistics were presented through pie-charts, tabulated with frequency, mean and standard deviation.

RESULTS

The demographics showed that the mean age of 363 participants of our study was 20.89±11.04 years. The mean years of experience of hockey was 7.58±10.67 years as shown in demographics table below. There were participated 61% of male and 39% of females hockey players. There were 40% of the elite players and rest were the recreational players. Table 1 depicts demographics of players with respect to their playing positions. From this, it can be inferred that there were maximum center forward players (35%) who had participated. Figure 1 shows the zonal distribution for the responses collection. It was the maximum from the Konkan region (63%)

After the analysis of Nordic musculoskeletal pain questionnaire pain, it was found that the prevalence was maximum for lower-back region amongst field hockey players (34%). Females reported most prevalent musculoskeletal pain over neck region (21%) and that of the males reported over the lower-back region (22%). The

musculoskeletal prevalence in the elite as well as the recreational players was seen as 42% and 29%, respectively over the lower-back region. The elite female players reported most prevalent musculoskeletal pain over bilateral hip joint region (30%) and that of the elite male players reported over the lower-back region (46%). It was seen in the recreational players, both the genders reported most prevalent musculoskeletal pain over the lower-back region (25% and 33%, respectively) (Table 1).

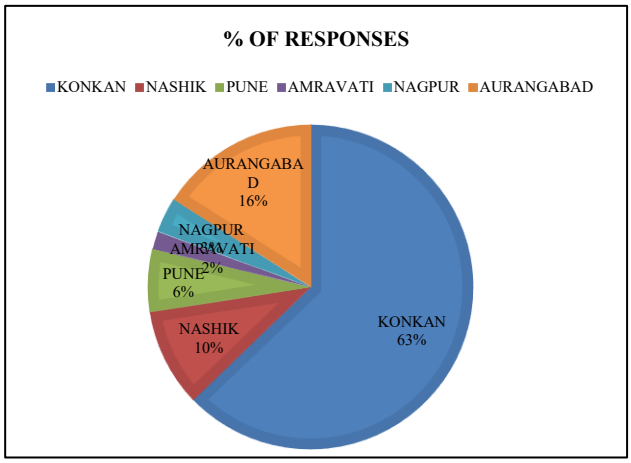

Figure 1: Zonal distribution of players.

Table 1: Demographics.

	Mean±SD	
Age	20.89±11.04	
Years of experience	7.58±10.67	
	N	**%**
Gender		
Male	223	61
Female	140	39
Type of play		
Elite	144	40
Recreational	219	60
Playing positions		
Goal-keeper	43	12
Defender	80	25
Mid-fielder	87	22
Forward	127	35
Sweeper	6	2
Others	15	4

Musculoskeletal pain prevalence based on their playing positions had shown that two specific positions such as goal keepers and defenders reported most of the prevalence over knee region and the lower back region (47%) respectively. Out of all the playing positions, female players get mostly affected while playing as the sweeper over the upper-back, lower-back and knee (20% each). It was reported that the male athletes get mostly affected while playing as the sweeper as well as the center forward player over shoulder and lower-back region (20% each) (Table 2). These all observations would help in creating plan for preventive measures such as- need to improve flexibility and strength at lower back and knee region for goal keepers. Focus is needed to be given to female sweeper position and for males, sweeper as well as center forward, to prevent any further injuries.

Table 2: Prevalence of musculoskeletal pain amongst hockey players.

Items	% prevalence of pain along with site
Cumulative	Lower back (34)
Females	Neck (21)
Males	Lower back (22)
Elite	Lower back (42)
Recreational	Lower back (29)

Table 3: Prevalence based on playing position.

Position	Prevalent joint
Goal-keeper	Knee (47%)
Defender	Lower-back (47%)
Mid-fielder	Lower-back (34%)
Forward	Lower-back (34%)
Sweeper	Lower-back, hip (33%)
Other	Hip (27%)

DISCUSSION

The primary objective of this study was to find prevalence of pain amongst field hockey players of Maharashtra state. From this study, we have observed the highest percentage of injury prevalence over lower back region (34%) amongst field hockey players in Maharashtra. It was observed that, due to dynamics of this sport, the lumbar spine is in constant position of forward bending affecting the normal lumbo-pelvic rhythm. The lumbar spine acts as a bridge between upper limb and lower limb. It creates shear forces on the vertebral column leading to trauma to the structures of spine which disturbs the muscle mechanics of the lower-back. Hence, as a cumulative effect of pain lower-back has high prevalence than any other joint.

The male players reported to have highest injury prevalence over lower-back region (22%). The kinematics behind lumbar spine while holding the hockey stick in hand and positioning it in a manner of stooped (forward bending) position tends to increase the compressive force on the facet joints of lumbar spine further causing micro-trauma to the structures. On comparing it is seen due to the distinct body type, structure and composition of males over females and as it is associated with different physiology and rate of homeostasis. There is also vigorous intensity involved and the rough play of male players than that of female players. As the game of hockey is essentially a low-intensity activity, inter-spread

with varying bouts of high intensity activity. The player requires a good amount of muscular endurance, strength, power. It was observed that the rate of fatigue in males was much slower than what was compared to males according to the study done in the physiological characteristics of field hockey by Jin et al.[10] In females, it was found that the neck was the most prevalent area (21%) of pain. That is due to the poor posture attained while holding the hockey stick during the actual play causing cervical strain on the superficial neck muscles. It also includes the pain to the associated structures such as tendons, ligaments and strong bands of tissue and fascia. In females, it is often seen that the hormones play a significant role starting from their training till the actual day of play. It is supported by the physiology that while practicing the energy demands are boosted by the primary hormones like oestrogen which ultimately when reduces produces its after-effects of low-bone mineral density and muscle mass. According to study done by Effendi et al injury prevalence in females may be owing to muscle mass and hormonal changes making them susceptible to injuries.[11]

This study included elite players with state and national level of experience as well as the recreational players. It was observed that, the most injury prevalent area in both the types of players (especially in males and recreational female hockey players) was lower-back region. This may be due to the mechanical movements sustained while playing this sport. This may involve movements such as excessive bending from lumbar spine. This in turn may cause increased bending forces leading to early wear and tear. It may create the strain over the muscles such as erector spinae, latissimus dorsi, and multifidus and may further limit in their mobility. Also the external obliques help in twisting activities which are a part of this sports dynamics. This all may have a cumulative impact of overuse musculoskeletal injuries in the elite players. Whereas in the recreational hockey players, the main reason behind this outcome may be the lack the level of training. Also these players are exposed to the game for a shorter course of time. The level of competition in recreational players is at less complexity than what elite players experience. Thus, even though the biomechanics of the sport remains unchanged, the injuries suffered by recreational players may be thought to have results of amateur play.

For elite female hockey players, the most injury prevalent region was hips/thigh with 30% of prevalence. It was postulated that prolonged hip flexion while playing hockey changes the normal resting length tension relation of the agonists (hip flexors) and the antagonists (gluteal muscles) producing asymmetrical force couple between them. This abnormal force couple produces muscle imbalance. Male players tend to have longer and larger bones, which provide a clear mechanical advantage over female players. The increased articular surface and larger structure of male bones provide them with a greater leverage to support muscles. Hip is the static stabilizer of the lower-extremities in the kinetic chain of legs. The ligaments in female players are generally more lax, fragile than those of males. This gives male players an advantage to accept the physical demands put-forth.[11,12]

Depending upon the playing positions practiced in the field hockey, the injury prevalence may vary with difference in the etiology. It was observed that the crouch position attained throughout the duration of the game leads to sustained injuries.[13] It contributes to weaker back muscles that leads to low back pain. Constant acceleration of the lumbar spine and its muscles may lead to over-use activity leading to micro-trauma of the structures. This also includes the biomechanics of the sport which prevails a particular joint area/part of body undergoing the play such as acceleration of the ball, dragging maneuvers, momentum of body moving during varied positions, stance achieved during play, stability of body, base of support used, center of mass/gravity achieved while each activity. Changes made owing to the rules of field hockey such as self-pass and high threshold ball hits have made game even faster, which in turn increases risk of musculoskeletal injuries among players according to the study done by Upadhyaya et al.[14]

In this study, it was observed that there was 47% prevalence seen for the knee joint in goal-keepers. Goal-keepers action is to slip while clearing the ball from getting into goal. They have risks of injury to knee specifically due to constant squat position of the player which may further lead to lack of strength, endurance for gluteus maximums, medius as well as quadriceps-hamstrings muscles. This can be seen as an example of overuse injuries. Defenders play in a very dynamic position pertaining to slip and fall injuries. They are positioned in 4 different ways of sides of right half, left half, right back, left back. It has pain prevalence of 43% over lower-back region. Angular motion is produced by the application of force by a player's torso and stick to linear velocity of puck leaving the stick. It creates the angular momentum at the gluteus muscles, along with extensors of back, erector spinae muscles. Mid-fielding involves repetitive actions leading to chances of over-use injuries also known as half-backs play as defence as well as offense of hockey. They require good amount of lower limb strength, lower back stability. It involves more of hip transitions along with lower-back movements. Thus, their injury prevalence was seen most over lower-back region.[12]

Forward players are the attackers of the team. It requires quick skills to drag ball from an opponent and target towards goal. It was found 34% of injury prevalence over the lower-back region amongst them. It may be due to the player need to sustain the stooped position. They also get involved in various twisting activities. This may put a strain on the extensors such as erector-spinae, gluteal muscles. While playing in the sweeping position, the player bends forward with one hip perpendicular to the ground and another hip is extended back. It suggests that

the mass of the upper-body lies totally on hips in combination with forward flexed posture of the lower-back. This makes the areas prevalent to pain and further injuries.[12,15]

Also, we found the prevalence for chronicity of the pain based on the responses taken for any activity limitation during past 12 months and 7 days. For past 12 months, it was seen that lower-back had 25% of prevalence which was highest, for both males and females. The activity limitation of past 7 days it was seen that lower-back had prevalence of 10% as a cumulative effect. It can be concluded from the above results that the chronicity of pain prevalence has been decreasing from chronic to acute. This may be due to the recurrence of micro-traumas due to mal-adapted postures, insufficient training and structural injuries. Chances of over-use injuries due to repetitive stress to the prevalent area led to arising pain. Non-usage of protective gears can also be the contributing risk factor leading to injuries.

There is indeed need for the appropriate preventive measures according to several reported observations of injuries. In brief, depending upon joint involved while playing a particular position, preventive measures can be taken such as correction of playing posture, strengthening of related muscles (for example, in goal keepers, gluteus maximums, medius as well as quadriceps-hamstrings muscles) and improving flexibility in related antagonists (lumbar paraspinal muscles), etc. Limitations one may get could be resistance to accept the need for the change since some players may feel reckless game is the need of the hour, which can be a total myth.

Limitations of this study was inconsistency while obtaining appropriate response and overshadowing of their injuries and pain by few of the players, in light of said social stigma about being weak and lack of awareness about impact of injuries in further future. Thus, it can be said that, based on the results obtained upon various parameters of the seniority of the sport, position-based variations, gender variability and the actual biomechanics of hockey specific area related injury prevalence was found. Depending upon which, the injury prevention of the most prevalent areas and strengthening of the least prevalent joints can be done. Further studies may be underdone to find out the type of injury based on prevalent areas found.

CONCLUSION

This study indicates that there was highest prevalence of pain found in lower-back (47%) in field hockey players of Maharashtra. It also concluded various joints getting affected in males as well as in females and also showed need to take specific preventive measures while playing as goal keeper, sweeper as well as center forward. This gives an insight towards problem size with respect to injury prevalence in specific aspects so as to plan further for appropriate preventive strategies.

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