The anatomical structure of female and its relation to common injuries of female field hockey players according to the playing position

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Introduction:

Over the last 20 years field hockey has developed into a fast-paced game that requires sprinting within restricted areas of play with rapid stop-start actions and sudden changes in direction. All these actions place considerable strain on the joints of the lower limbs (22, 23). The reason that hockey has developed into such a fast-paced game is mainly due to the introduction of artificial playing surfaces, new hockey stick technology and new rules that have been introduced over the last 20 years (10)

Despite the sport's apparent popularity, the data on injury rates among field hockey players are limited. The majority of the injuries reported are minor ankle sprains and contusions. More serious injuries, such as torn knee ligaments, concussions, and eye trauma leading to blindness, have also been noted (1,4,6,21). Because these studies tend to focus on elite level athletes, it has been difficult to generalize their results to the field hockey community as a whole. Some authors suggest that increased skill, conditioning and a smooth playing surface decrease the risk of injury (6,17,21,23). Others indicate that elite players not only have an increased, but they may be prepared to take more risks (1,12). Although field hockey is classified as a non-contact sport, the high velocity of both ball and stick, and the relative lack of protective equipment (except goalkeepers), all contribute to the inherent dangers of participation in the field hockey. Rule, surface and equipment modifications, outdoor and indoor seasons, better skilled and trained players; have all, in effect, increased the tempo in all forms of the hockey game and so changed the types and incidences of injuries in the field hockey.

A previous study described the epidemiology of hockey injuries and reported that the overall injury rate for games was 7.87 percent for the full length of the study. In addition, the most frequently occurring injuries from this study were lower leg injuries which accounted for 43% of injuries occurring during matches and 60% occurring during practices, which is a concerning fact. Another study reported that the most frequently injured site of the body was the lower limb (51%), followed by the head/face (34%), upper limb (14%), and torso

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(1%). The most prevalent types of injuries were ankle sprains, followed by hand fractures and head / face injuries (3,22.23).

The position that a hockey player holds may also affect the type and frequency of injury as different playing positions require the utilization of different tactics and techniques. For example, a goalie has to face the shots that are targeted at the goal, while midfield players have to run continuously, placing higher demands on their legs. In addition, the percentage of injuries that were occurring according to 3 positions affected mostly defenders (24%) and midfielders (28%), who had the highest weighted proportion of all injuries (5,9, 14, 17).

Because of the surge in popularity and the relatively high risk of injury associated with participation in this collision sport it is imperative that epidemiological studies gather injury data to better understand and mitigate risks for the athletes participating in this sport(14, 15). The purpose of this preliminary study was to examine incidence rates and injury patterns for women competing in The Egyptian field hockey league.

Materials and Methods:

68 female field hockey players from eight teams were surveyed. The participated athletes were played in the Egyptian field hockey league and were professional players. The players were categorized according their playing positions as 8 goalkeepers, 26 defenders, 24 midfielders and 17 strikers.

A total of 68 female field hockey players participated in current study. The personal and anthropometric characteristics mean ± SD were age 19.73 ± 0.88 years; height 162.40 ± 5.08 cm; weight 62.08 ± 6.34; training experience 8.47 ± 0.64 years.

The questionnaire contained questions about observed and experienced injuries, cause of injuries, type of injuries and region of occurrence. The questionnaire had already been used in previous studies (Dick et al., 2007; Merrett & McLaughlin, 2003; Murtaugh, 2001; Sherker & Cassell, 2002). and published in the website of international field hockey federation (www.fih.ch/en/sport/medical).

The investigator went through the questionnaire with each of the participants separately in order to avoid similar answers. The age, team and league status of each interviewee were recorded. The interviews took place mainly at team clubs.

The body regions and injuries, which selected in current study according to the survey in previous studies were identified as head and face, shoulder region, elbow and forearm, back and abdominal muscles, pelvic and thigh area, knee region, leg region, ankle and foot region. Statistical evaluation was performed using the aspects of the playing position and region of occurrence. Descriptive statistics were derived using SPSS (24) and statistics used frequency method to determine the percentage of all collected data.

Result:

Table (1)
Region Head and Neck

Positions	Neck Pain	Facial contusions
Goalkeeper	62.4%	37.5%
Defenders	23.5%	26%
Midfielders	35.7%	31.7%
Attackers	27.6%	46.7%
Overall	38.2%	33.8%

Table (2)
Region Shoulder Girdle

Positions	Rotator cuff inflammation	Rotator cuff tear	Hummers contusion	Scapula contusion
Goalkeeper	37.5%	0%	50%	25%
Defenders	26. 1%	13%	13%	17.4%
Midfielders	31.8%	9. 1%	9. 1%	9. 1%
Attackers	46.7%	13.3%	13.3%	13.3%
Overall	33.8%	10.3%	17.8%	16.3%

Table (3)
Region Elbow and forearm

Positions	Forearm bones contusion	Tennis Elbow
Goalkeeper	12.5%	12.5%
Defenders	34.8%	4.3%
Midfielders	13.7%	22.7%
Attackers	41.2%	26.7%
Overall	27.9%	14.7%

Table (4)
Region wrist and Hand

Positions	Metacarpal contusion	Wrist sprain	Metacarpal Fractures	Phalanges contusion	Phalanges Fractures
Goalkeeper	37.5%	12.5%	0%	12.5%	62.5%
Defenders	47.8%	34.8%	17.4%	34.8%	34.8%
Midfielders	22.7%	51.2%	27.3%	18.2%	18.2%
Attackers	53.3%	62.7%	53.3%	60%	40%
Overall	39.8%	40.6%	26.4%	32.4%	33.8%

Table (5)
Region Thoracic and core

Positions	Ribs contusion	Low back pain	Lower abdominal Muscle Strain
Goalkeeper	0%	77.5%	75%
Defenders	26%	82.6%	34.8%
Midfielders	31.7%	45.5%	27.3%
Attackers	46.7%	73.3%	64.7%
Overall	33.8%	70.2%	52%

Table (6)
Region Pelvic and Thigh

Positions	Hamstring Strain	Quadriceps contusion
Goalkeeper	47.5%	62.5%
Defenders	43.5%	56.5%
Midfielders	65.5%	18.2%
Attackers	80%	50%
Overall	59.8%	42.8%

Table (7)
Region Knee

Positions	Patella contusion	Patellofemoral pain	Meniscus tear
Goalkeeper	12.5%	26%	37.5%
Defenders	21.7%	37.5%	34.8%
Midfielders	18.2%	31.7%	31.7%
Attackers	46.7%	46.7%	46.7%
Overall	25%	33.8%	36.8%

Table (8)
Region Leg and calf

Positions	Gastrocnemius Muscle cramp	Gastrocnemius Muscle tear	Shin splint	Leg contusion
Goalkeeper	37.5%	12.5%	12.5%	25%
Defenders	56.5%	56.5%	43.5%	65.2%
Midfielders	40.9%	32%	45.5%	54.5%
Attackers	66.7%	53.3%	80%	73.3%
Overall	52%	42.7%	45.8%	58.8%

Table (9)
Region ankle and Foot

Positions	Sprained ankle	Toes Fractures	Toes contusion
Goalkeeper	25%	12.5%	50%
Defenders	34.8%	26%	52.2%
Midfielders	22.7%	31.7%	45.5%
Attackers	33.3%	73.7%	86.7%
Overall	29.4%	36.8%	57.4

Discussion:

There has been a dramatic increase in the number of girls and women competing in sports at all levels. While this change has provided women the opportunity to enjoy all of the benefits of participation, they have also experienced athletic injuries. As these women and girls have sustained injuries, researchers have attempted to discern if there is an increased risk of injury compared with men and boys. Studies have examined differences in injury rates between sports, within sports, by body part, by injury nature, and for specific injuries, such as ACL injuries. The results have been varied but some consistent findings are beginning to emerge.

Playing Position:

It appears that Goalkeepers were the lowest rate of contusions bones injury, may be due to the worn a lot of equipment to protective themselves from injury such as leg protection pads and Helmet. This equipment was a reason in occurrence of neck pain and low back pain at a high rate compared to other injuries. Also, goalkeeper skills to protect the goal such as double-leg stack slide, aerial stick saves and exposed to the collision of land. This explanation consisted with (Elizabeth, 2008) who referred to execute the double leg stack and confirmed that, a goalkeeper who tackle stack should be executed or closer, which depending on his ability to establish a playing distance and pressure the ball. While, occurrence of contusions bones injury of strikers and midfielders could be explained by the jostle with defenders to get the ball to score goals and the collision of the ball and defenders stick.

The rate of upper limb injuries results in current study according to player positions is highly in women. This result could be explained by the mechanism of field hockey sport, which requires flexion of the trunk for extended periods of time. This mechanism could be caused by the constant and repeated contraction of the abdominal muscles and led to

occurrence abdominal muscles cramp. The reason for the strikers and midfielders receiving back pain was described as them having to spend a longer duration at a higher physical intensity with a higher percentage of time spent dribbling the ball.

In overview, it's not surprising about the low back pain as a reason of the demands field hockey sport nature. The current study finding also consisted with study of (Walker, 2011) who reported that, the injury types which prevalent of hockey teams during the season were contusions 33%, strains 22%, sprains 17%, tears 11%, lacerations 6%, dislocations 6% and scratches 6%, and cleared no differences with previous studies in same direction. About low back pain explanations of current study, (Kjaer, 2003) suggested that, the flexion and torsional sports such as weight lifters, golf and racquet sports are more predisposed to disc disorders and low back pain.

In overview, the current explanations confirmed (Hardy et al., 2010) who referred to a good association between shoulder injuries and field sports such as rugby, and cleared that direct force to the shoulder in a violent collision between players. For example, may cause the head of the hummers (upper arm bone) to pull free of the shoulder socket, in the case of dislocation, or to pull partially free, in the case of subluxation.

Our results are consisted with study of (Dick et al., 2007) who reported 10% of all types of injuries was hand injuries and of these hand injuries the majority were caused by stick contact. In addition, (Livingston & Forbes, 2003) researched a stick entrapment of the thumb in lacrosse.

They stated that in sports using stick-like implements players commonly receive acute injuries to the hand and fingers from a forceful blow by an opponent's stick. (Livingston & Forbes, 2003) further report in the case study that the injury occurred to a female and gloves are not worn by females in lacrosse, whereas males wear heavily padded gloves.

The use of gloves in hockey is underutilized. On other hand, the percentage of ball and stick injuries indicates that the usage of preventative safety equipment for the face and groin is imperative and is supported by an injury which occurred to a participant face from a stick. In overview, it could be said that, the position that a hockey player holds may also affect the type and frequency of injury as different playing positions require the utilization of different tactics and techniques. For example, a goalie has to face the shots that are targeted at the goal, while midfield players have to run continuously and placing higher demands on their legs.

The results of cramp muscles injury could be explained by the overload training and muscular stress during continue competition matches. Also the artificial surfaces of play need more physical demands, which reflect a high stress on muscles during a sprinting or sudden change direction. This explanation consisted with (Reilly & Borrie, 1992) who suggested that, the natural grass surfaces are believed to provide a greater cushioning effect

and cause less strain to the lower limbs by absorbing 10% more energy on impact than artificial turf. This explanation consisted with (Walker, 2006) who suggested that, there are a number of factors that contribute to muscle and cramps, the main ones being, a poor flexibility and tight muscles.

The results of current study consisted with findings of (Murtaugh, 2001; Sherker & Cassell, 2002) who reported 16% and 11% of lower limb injuries was muscle strains of the calf and hamstring. The reason for this has been described as a decrease in length of the hamstring muscles which is a result of a muscle and connective tissue shortening adaptation (Hopper et al., 2005). Another study of (Merrett & McLaughlin, 2003) reported findings that supported (Dick et al., 2007) and (Sherker & Cassell, 2002) review, which were a higher frequency 80% of hockey injuries to the lower extremity limb.

In addition to, the strikers and midfielders were the most exposed to strain groin muscles injury as a reason of the tactical duties between defense and attack and sprinting. While strikers exposed to strain adductor muscles of groin as a reason of sudden change direction, dodge the ball and make trickery for defenders. The main factors that contribute to strain groin muscles is inadequate warm-up and lack stretching. In addition, midfielders spend the most time in long area between defender and striker lines, where the number of tackles and the intensity of play is increased. In fact, up to 20% of field hockey injuries have been attributed to tackling. It is possible that the high percentage of midfielder's player was due to greater fatigue or the type of defense that midfielders tend to use during play.

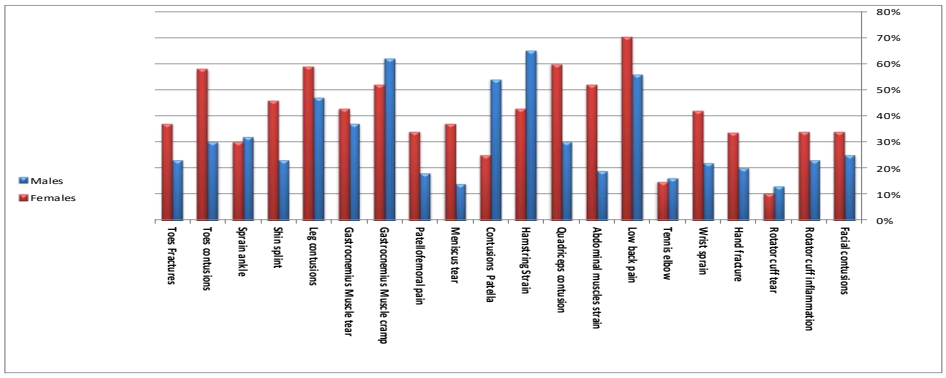
The sprain ankle injury in current study could be explained by two reasons, the first one is the footwear which linked with important proprioceptive functions in foot and the second reason is the water-based artificial surfaces, which occurred a poor traction and a loss of foot support. In addition, the poor balance training exercises could be a reason for sprain ankle injury. Also, the occurrence of knee joint injuries with a high rate could be explained by the lot of multi change directions movements during match play, which exposes them to friction with the opponent players. In addition, sudden stops and the nature of the field hockey mechanism achievement reflect those percentages of knee joint injuries. This results consisted with (Hardy et al., 2010) who cleared the reason of meniscus, and refer that, the meniscus commonly associated with sports such basketball and football, and usually could be a reason of forceful and twisting of the leg, when the football is planted on the ground and the knee is flexed.

Gender injury differences:

It appears that injury rates between matched sports are lightly similar, but injury patterns may be slightly different. In addition, it appears that there are some specific injuries that may be sex specific and not sport-specific. For example, women are more likely to sustain noncontact low back pain injuries

across several sports. (1-3,5,17-21) The current study seems to confirm this finding with female Field Hockey players. It also appears that women may sustain concussions at different rates, exhibit different signs and symptoms, and show different patterns of recovery.(6,9,11,12,13, 19,22). While this study showed similar rates of contusions, the rates of injury to the head, hand, and toes were quite different between men women.

The sport of field hockey could be considered a matched sport that would allow for the direct comparison of injury rates. Like soccer and basketball, the rules, equipment, and playing field for men's and women's hockey are essentially the same. However, upon closer examination, the male and female versions of this game may be played quite differently (7-14). Rotator cuff injuries are of great concern; they are typically associated with greater severity when defend by a greater time loss or as a precursor to surgery.7,20 This injury also has a high rate of recurrence.20,28 The men in this study sustained rotator cuff injuries events while the women sustained 18, which was not statistically different These differences may be a result of the disparate techniques of tackling utilized by men and women(1-5, 16-18)



Most studies have shown higher injury rates in collision and contact sports; since men tend to participate in these sports in greater numbers, they may have a higher overall fracture rate. When examining matched sports, these differences may diminish. The current study showed that women are more likely to sustain a fracture than the men. Although the rules of field hockey are exactly the same for both sexes, this disparity may be the result of the differences in the execution of the dribbling or differences in the speed of play or the size of the players between the men's and women's sides(3-9).

The addition of field hockey to the list of sports that have an increased rate of sprain ankle, tennis elbow and meniscus tear injuries for women rather than men may provide further evidence that the risk may not be attributable to the sports themselves as much as it is to physiological, anatomic, or biomechanical

characteristics that may be more prevalent among women. While many injury prevention programs are currently being utilized and studied with soccer and basketball players, it may be prudent to include female hockey players in these programs (14-16, 20-23).

Conclusion:

This study illustrates some key differences in injury patterns for female Egyptian field Hockey that may reflect underlying sex differences and contrasting playing styles. Specifically, male players often have field Hockey background where they are accustomed to tackling with helmets and protective padding, which are not used in field Hockey, whereas female players may have limited prior experience with collision sports and tackling.

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