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ORIGINAL RESEARCH

THE INCIDENCE OF LOW BACK PAIN IN NCAA DIVISION III FEMALE FIELD HOCKEY PLAYERS

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ABSTRACT

Purpose/Background: The authors speculated that there may be an increased incidence of low back pain (LBP) in NCAA Division III female field hockey (FH) players. FH players may experience LBP for a variety of reasons including trauma from collisions or falls. Excluding these types of direct trauma, FH players may experience LBP due to excessive stress to spinal structures related to the forward flexed posture that predominates in field hockey. The authors speculated that because of the postural stresses inherent to field hockey there may be an increased incidence of LBP in this population. Therefore, the purpose of this study was to survey NCAA Division III female FH players and an age matched control group to determine if field hockey participation results in an increased incidence of LBP. The anticipated finding of an increased incidence of LBP would provide a rationale for the development of prophylactic interventions for this population.

Methods: Subjects: Female NCAA Division III FH players (n = 90) ranging in age from 18-24 years old who participated in the 2008 season were surveyed in regards to the incidence of LBP. A female age-matched control group from Misericordia University (n = 98) without a history of field hockey participation was also surveyed. Both groups of subjects completed a voluntary pen and paper survey on the incidence of LBP not related to menstruation. Questions included but were not limited to; whether a significant episode of LBP had been experienced, the mechanism or injury, the duration and nature/location of symptoms. Responses from both groups were anonymous and confidential.

Results: There was no difference in the incidence of LBP between the female FH players and the control group (p = 0.951). The incidence of LBP was 56% (50/90) in the female FH players and 55% (54/98) in the controls. There was no difference in pain characteristics including pain referral patterns between the 2 groups. However, survey responses revealed a similar mean age of onset of LBP for both groups (16.23 +/- 1.80 years of age for FH players and 16.45 +/- 2.12 years of age for controls).

Conclusions: The data did not support the authors' speculation of a higher incidence of LBP in NCAA Division III female FH players compared to female age-matched controls. This suggests postures associated with field hockey do not appear to significantly increase the incidence of LBP in this population. However, the data revealed that females from both surveyed groups experienced an onset of LBP at a mean age of sixteen.

Key Words: field hockey, low back pain

Level of Evidence: 2b

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This study (Protocol # 23-07-T1) was approved by the Institutional Review Board of Misericordia University.
The authors would like to acknowledge Robin Fedor, Misericordia University's field hockey coach for her assistance with the study.

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INTRODUCTION

Field hockey is a popular sport and played around the world. It is played in many countries and ranks second to soccer as a team sport.[1] Injuries to the lumbar spine as the result of participation in field hockey have been reported in epidemiological studies.[1,2,3] Murtaugh[3] investigated the rates and types of injuries experienced by field hockey players and reported that the low back was the most commonly injured region. Murtaugh reported that 59% of female field hockey players experienced low back pain that they related to playing the sport. Reilly and Seaton[4] reported that 53% of male field hockey athletes reported low back pain. Several authors have linked forward flexion of the spine to the incidence of low back pain.[5,6,7] Sustained forward flexed lumbar postures when coupled with rotation have been demonstrated to be stressful to structures of the lumbar spine.[8,9,10,11] These postures are routinely used by field hockey players when assuming the ready position, pursuing the ball, striking the ball, and defending (Figure 1). The crouched position has been demonstrated to create greater loads to the lumbar spine as compared to normal ambulation and is thought to contribute to low back pain in field hockey players.[3,4]

The stress and strain associated with the flexed spinal postures assumed during field hockey participation could render any number of spinal structures vulnerable to injury resulting in low back pain. Lumbar musculature, tendons, ligaments, joint capsules, the annulus fibrosis of the intervertebral discs, nerve tissues, and osseous structures have been reported to be potential sources of low back pain.[5,12]

The authors contend that the prevalence of flexed lumbar postures that accompany participation in field hockey renders the athletes susceptible to injuries of the lumbar spine at a rate significantly greater than the non-field hockey playing population.

Therefore, the purpose of this research is to describe the incidence of low back pain in a population of NCAA Division III intercollegiate female field hockey players and compare it to the incidence of low back pain in an age-matched cohort. Additionally, the null hypothesis that there would be no significant difference in incidence of back pain between field hockey players and controls, was investigated.

METHODS

Since there may be a higher incidence of low back pain in NCAA Division III intercollegiate female field hockey players as compared to age-matched females, the authors developed a questionnaire that was used to survey athletes and age-matched controls (non-field

Figure 1. *Example of a stressful posture frequently assumed by field hockey players.*

hockey players) in order to investigate this possibility (Appendix A). Human subject research approval was obtained from the Institutional Review Board at Misericordia University.

Participants

The field hockey group were NCAA Division III intercollegiate female field hockey players recruited for participation from five NCAA Division III schools (n = 90) and the other group (controls) were a group of age-matched females, recruited from Misericordia University (n = 98). (Table 1)

Questionnaire

The authors developed the pen and paper survey questionnaire utilized in this study (Appendix A). Pen and paper administration was chosen because email survey questionnaires do not often produce the highest response rates for adequate sample size.[13] Prior to utilization a survey questionnaire is recommended to be evaluated for validity.[14] Face validity was determined to exist as prior to utilization in the study the questionnaire was subjected to pilot testing.[13] The pilot representative sample was comprised of 20 non-study participants including 10 female field hockey players and 10 age-matched females. After receiving instructions, the participants in the pilot study read the questions for clarity and provided feedback. Minimal editing was performed in order to improve question clarity. An integral low back pain question was modified and clarified to ensure that low back pain reported on the questionnaire was not associated with menstruation.

Four experts (three doctoral trained physical therapist educators experienced in classification, evaluation, and treatment of patients with low back pain and an experienced MSPT/field hockey coach also reviewed the questionnaire for content validity prior to its utilization. After minor modifications and editing the experts demonstrated agreement regarding the content validity of the questionnaire.

Procedure

Prior to surveying the female field hockey players group, an informational packet was sent to the athletic directors and field hockey coaches of five NCAA Division III schools. The packet contained an informative cover letter, a sample survey, and a consent form. The consent form was completed by all participating institutions prior to the administration of the survey. Control group participants were obtained by responding to a posted notice at Misericordia University explaining the study. All participants were informed that survey information was strictly anonymous, was to be kept confidential, and was to be destroyed after the study was completed. Participants were told that they could in fact turn in a blank form, so those choosing not to participate could not be identified (to ensure blinding). Inclusion criteria were females 18-24 years of age with a self reported episode of low back pain lasting greater than 24 hours that was not associated with menstruation. Additional inclusion criteria included self-reported good general health and no prior history of back surgery. Participation was strictly voluntary. Questionnaire completion was considered assent and evidence of agreement to participate in the study.

RESULTS

Descriptive data was obtained from completed survey questionnaires of both the female field hockey player group and the control group. The descriptive data illustrates similarities in the incidence of low back pain in

Table 1. *Field Hockey and Control Group Demographics.*

Female Field Hockey Players	Age-matched controls (Non-hockey players)
n = 90	n = 98
Age (years) 19.22 +/- 1.19 Range (years) 18-22	Age (years) 19.89 +/- 1.45 Range (years) 18-24

the female field hockey player group compared to the control group. The incidence of low back pain in the control group was 55% (54/98) and 56% (50/90) in the field hockey group respectively. (Table 2)

The data illustrate some additional interesting descriptive findings. (Table 2) The average onset age of low back pain for the controls and the field hockey group was 16.45 +/- 2.12 years old and 16.23 +/- 1.80 years old respectively. Duration of symptoms was also similar for both groups as 85% (46/54) of the controls and 82% (41/50) of the field hockey group had LBP lasting less than 21 days (3 weeks). Additionally, subjects reporting low back pain lasting longer than 1 month were similar in both groups. The percentage of controls that experienced an episode of low back pain of 1 month or longer was 15% (8/54) compared to 14% (7/50) in the field hockey group. Also, 78% (42/54) of controls compared to 94% (47/50) of the field hockey group reported no trauma as a factor in their low back pain. Both groups included similar numbers of subjects who had low back pain with forward bending. In the control group 57% (31/54) reported pain with forward bending as compared to 50% (25/50) of subjects in the field hockey group. In addition, there were similarities in referred pain (associated pain distal to the buttock) in both groups. Referred pain was reported by 39% (21/54) of the control group compared to 36% (18/50) of field hockey players. Twenty-four percent of

Table 2. *Questionnaire Results for Field Hockey Players and Controls.*

	Field Hockey Players (n = 90)	**Controls** (n = 98)
Low Back Pain	50/90 (56%)	54/98 (55%)
Onset age (years)	16.23 +/- 1.80	16.45 +/- 2.12
Duration of Symptoms:		
1-7 days	32/50 (64%)	41/54 (76%)
8-14 days	5/50 (10%)	4/54 (7%)
15-21 days	4/50 (8%)	1/54 (2%)
22-28 days	1/50 (2%)	0/54 (0%)
1-3 months	5/50 (10%)	4/54 (7%)
> 3 months	2/50 (4%)	4/54 (7%)
Trauma	3/50 (6%)	12/54 (22%)
No Trauma	47/50 (94%)	42/54 (78%)
LBP w/ forward bending	25/50 (50%)	31/54 (57)%
Pain referral:	18/50 (36%)	21/54 (39%)
Buttock	4/18 (22%)	8/21 (38%)
Thigh	11/18 (61%)	8/21 (38%)
Calf	2/18 (11%)	4/21 (19%)
Foot	1/18 (6%)	1/21 (5%)

controls (13/54) reported referred pain distal to the buttock into the thigh, calf and foot regions while 28% (14/50) of the field hockey group reported the same. To summarize, the pain characteristics of the two groups were similar.

The descriptive data above was compiled and subjected to statistical analysis. Levene's test for equality of variances (p = 0.901) demonstrated that the variances within groups for pain duration were not significantly different.[13] (Table 3) A 2 tailed t-test (p = 0.951) demonstrated that there was no significant difference in the equality of the means of the 2 groups with regard to incidence of pain, (Table 4) or, otherwise stated, there was no significant difference in the incidence of low back pain between the female field hockey player group and the control group. Thus, the null hypothesis that there is no difference between the groups was unable to be rejected. A post hoc power analysis was performed and the power computed to be 92% which exceeds the suggested 80% power value necessary to provide reasonable protection against making a Type II error (stating that there is no significant difference when there is a significant difference). In other words, in the current study there was a 92% probability that the authors would have correctly demonstrated a statistical difference and rejected the null if hypothesis if an actual difference existed between the groups with regard to the incidence of low back pain.

DISCUSSION

The 56% incidence of low back pain in field hockey players reported by the authors herein is similar to the rates of 59% and 53% reported by Murtaugh,[3] and Reilly and Seaton[4] respectively. However, an increased incidence of low back pain was not present in the female field hockey players in the current study when compared to age-matched controls who were not field hockey players. The incidence of low back pain was similar in both groups, with a 56% (50/90) incidence of low back pain in the field hockey group and a 55% (54/98) incidence of low back pain in the control group. Furthermore, the authors' descriptive statistics revealed that both groups had similarities in regards to the average age of onset of low back pain, in the nature of the pain experienced, in pain distribution, and in pain duration. Based on these findings, a reason for why a difference in the incidence of low back pain was not observed between the groups could be that the flexion stresses on the lumbar spine inherent in field hockey participation (at least at the Division III level) may not be any more stressful than the flexion stresses on the lumbar spine incurred routinely by these populations during normal daily activities.

The authors believe that an important finding of the current study is that over 50% of females in both groups experienced a significant episode of low back pain at a mean age of sixteen. These findings are

Table 3. *Levene's Test for Equality of Variances for Pain Duration (>24 hours) within Groups.*

	F	Sig.
Pain duration > 24 hr Equal variances assumed	.015	.901
Equal variances not assumed		

Table 4. *2 tailed t-test for Equality of Means of the Groups for Pain Incidence (Pain > 24 hrs).*

	t	df	Sig. (2 tailed)	Mean difference
Pain > 24 hr Equal variances assumed	-.062	186	.951	-.005
Equal variances not assumed	-.062	184.662	.951	-.005

similar to those reported by Salminen[15] who reported that half of all children between the ages of 15-18 noted a history of low back pain regardless of athletic participation. In a study on the natural history of low back pain in adolescents Burton et al[16] reported similar findings with an incidence of low back pain onset in both boys and girls by the age of fifteen. Burton reported that higher prevalence of low back pain was associated with more strenuous sport activities. Burton also noted the incidence rate for low back pain in adolescents increased with age and by 15+ years of age 50% of adolescents in the United Kingdom experienced back pain.

Based on the data from previous studies the authors note that low back pain seems to occur frequently (incidence of 50%) in the general youthful female population (15-18 years of age). The authors' data suggests a slightly greater incidence of low back pain (55%) than reported or anticipated in the general youthful female population. Field hockey participation at 15-18 years of age is common to those matriculating to NCAA Division III participation and consequently why a question regarding age of onset was relevant to the questionnaire used in the authors' study. In fact, Sherker and Cassell[1] reported that data from Australian emergency departments showed that field hockey players aged between 10 and 19 years account for 50% of all hockey injuries.

The authors of this study are of the opinion that a greater than 50% incidence of low back pain in females in this age group is high, regardless of field hockey participation, and should be of concern especially if it may relate to a lifetime of low back pain. This concern should spurn questions of what factors may contribute to the high incidence of low back pain in this youthful population both of athletes and non-athletes alike. Previous studies have investigated such possible contributing factors. Harvey et al[17] reported that low back pain in adolescents may be due to growth spurts combined with increased activity levels. Harvey mentioned additional factors that may predispose adolescents to low back pain including inadequate strength of back extensor and abdominal musculature, as well as inflexibility of the lumbar spine.

In a study performed by Feldman et al,[18] rapid growth spurts, hamstring tightness, working at a job during the school year, smoking, and poor mental health were all found to be associated with low back pain in adolescents. Additional studies mentioned smoking to be associated with low back pain in adolescents.[19,20] Auvinen et al[21] investigated physical activity and its association to low back pain in adolescents and reported that male and female adolescents who participated in greater than 6 hours of brisk physical activity participation per week frequently experienced low back pain. A survey study performed by Hakala et al[22] showed that 14-16 year olds with a daily use of computers exceeding 5 hours experienced and reported low back pain. Sjolie[23] surveyed 88 adolescents (mean age 14.7) and found that a higher than mean body mass index and less than mean hamstring flexibility were associated with low back pain. Another survey study conducted by Sjolie[24] found that poor well-being and specifically poor self perceived fitness were associated with low back pain in adolescents.

As noted above, there are many factors that may contribute to a high incidence of low back pain in the general youthful population, a number of which are mechanical or postural in origin and therefore potentially amenable to intervention. Based on these findings future research could focus on identifying the most significant causes and appropriate intervention strategies to minimize the incidence of low back pain in the general female youthful population. This is opposed to the specific focus on low back pain in female field hockey players as was the authors' original intent.

When comparing the incidence and characteristics of low back pain in the 2 groups the authors would like to note some limitations of the current study. A concern of the authors is that some of the field hockey players were involved in pre-season or in-season back/core muscle strengthening programs. Also, some of the controls were engaged in sports, general exercise, and or exercise programs that may have targeted the back/core musculature. Although exercise and sports involvement were items on the questionnaire developed for and used during the current research, the responses were not of a consistent nature. The varying involvement in exercise and other sports activities may have had an influence on the incidence of low back pain in the two groups.

Another factor that may have influenced the results of the current study was the access to different health care professionals with differing interventions for

low back pain. For example the field hockey group may have had ready access to a team physician and or an athletic trainer for intervention whereas the controls most likely did not have this access and may have managed their condition independently. Varied interventions may have included diagnostic testing, medication and modality treatment, as well as different manual therapy and exercise. Each of these factors could have influenced the severity and duration of low back pain reported by the groups.

CONCLUSION

At the onset of this study the authors speculated that there would be an increased incidence of low back pain in NCAA Division III female field hockey players as compared to non-participating age matched female controls. No statistically significant differences in the incidence of low back pain or pain characteristics were found between the two groups. However, both subjects and controls presented with a high incidence of low back pain (>50%) with an onset of low back pain at a mean age of approximately sixteen.

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Appendix A: Questionnaire Used

Questionnaire Directions:
This is an anonymous questionnaire. No one including those doing the study will know who you are. Please answer each question as best as you can. If you are not sure, estimate as best as you can.

Age:

Have you ever experienced low back pain lasting more than 24 hours and not associated with menstruation?
Yes No

If yes, how old were you when you first experienced low back pain?
_____ years old

How long did the low back pain last?
1-7 days 8-14 days 15-21 days 22-28 days 1-3 months > 3 months

Was there a specific trauma involved?
Yes No

If yes, can you describe the trauma?
_____
_____

Where any imaging studies performed (x-ray, CT scan, MRI)?
Yes No

If yes, what were the findings?_____

Did your pain limit your ability to bend?
Yes No

Did you experience any pain in your buttock, thigh, calf or foot that appeared to be associated with the low back pain?
Yes No

If yes, what was the farthest point the pain was experienced down your leg.
Buttock Thigh Calf Foot

Did you ever experience any sensory changes in your back or leg such as numbness, tingling, or hot or cold feelings?
Yes No

If yes, what was the furthest the change in sensation was experienced down your leg?
Buttock Thigh Calf Foot

Have you ever felt that you experienced weakness in either leg that was associated with you back pain?
Yes No

Do you play any sports? Yes No

If yes, what sport or sports? And at what level (recreational, intramurals, club or NCAA)

Sport _____ Level _____
Sport _____ Level _____
Sport _____ Level _____
Sport _____ Level _____

If you do not play Field Hockey, stop here. Thank you for your participation.

Answer this section only if you play Field Hockey on a College or University NCAA sanctioned team.

What NCAA level do you play Field Hockey? (1, 2 , or 3) _____

Number of years you have played field hockey: _____years

Position you predominately play: Forward Midfield Defense

Have you ever injured your low back while playing field hockey?
Yes No

If yes, do you recall how it occurred?
_____
_____

Were you ever instructed on how to stand when the action on the field was away from you? (Ready position)
Yes No

If yes, please describe the position:

If yes, did you experience low back pain as a result of using this position?

Did the pain affect your ability to play the sport at the level that you expected to play?
Yes No

Did you ever miss time from either practice or games because of the pain?
Yes No

If yes, estimate the longest you were ever out for?
_____ Days_____ Weeks _____ Months
During the preseason do you do any exercise for you back muscles or abdominal muscles such as "core exercises or Pilates"?
Yes No

During the regular season do you do any exercise for you back muscles or abdominal muscles such as "core exercises or Pilates"?
Yes No

If yes, how often do you do the exercises?_____

Do you believe field hockey is strenuous on your low back?
Yes No

Thank you for your participation in this study.