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Original Research

The Epidemiology of Injury in English Women's Domestic Club Football: A Single Site Prospective Cohort Study

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Background

The epidemiology of injury at club level in the English Women's Domestic Club Football League is unknown. The aim of this study was to estimate the incidence, prevalence, and nature of injury in a single women's football squad over the course of one season.

Study Design

Prospective single site cohort study

Methods

Twenty-five female footballers competing in the English Women's Championship were observed. Data collection procedures followed the UEFA consensus guidelines (2006). Individual player exposure was recorded for all football related activity and incidence of injury per 1000h was estimated for total, match, and training activity. Prevalence, site, and type of injury was recorded. Epidemiologic incidence proportions, clinical incidence and severity was calculated to provide measures of injury burden and resource management statistics.

Results

A total of 18 injuries including re-injuries were sustained in 11 players providing a clinical incidence of 0.72 injuries per player. Epidemiological incidence proportion was 0.44 (95% CI: 0.24 – 0.74), thus the average probability that any player would sustain at least one injury was 44% (95% CI: 25% to 63%). The total incidence of injury was 8.0/1000h, 30.6/1000h during match play and 2.2/1000h during training. The most common sites of injury were the knee (5/18, 28%) and thigh (4/18, 22%). There was two (11%) non-time loss and 16 (89%) time-loss injuries recorded. Of the 16 time loss injuries, there were three (19%) severe, five (31%) moderate and six (37%) minor severity injuries. Of the five knee injuries, two (13%) were major severity ruptures of the anterior cruciate ligament. Injury burden was estimated to be 468 days lost/1000h.

Conclusions

This is the first prospective investigation capturing women's injury incidence data from a cohort of English domestic club players. Total, match, and training incidence rate estimates are comparable to rates of single site cohort studies in Europe. The days lost from knee injuries imposes an increased burden on a squad of this size. Multi-site prospective investigations of injury are required.

BACKGROUND

In England, adult elite women's football comprises the Women's Super League (WSL) established in 2010 and the Women's Championship (WC) (formally WSL 2) established in 2014.[1] Women's football is physically demanding requiring strength, power, endurance,[2,3] and the ability to accelerate, decelerate and change direction.[4,5] Research related to performance, recovery, diet and female football health[6] facilitates medical and performance staff teams to prepare these elite players for the demands of the game. Adequate physical preparedness likely is protective against

some mechanisms of injury.[7] However, increased training and competitive demands may result in increased injury occurrence[8,9] A recent systematic review and meta-analysis[10] of adult elite women's football estimated the total incidence rate of injury from ten studies to be 5.7/1000h (95% CI 4.3-7.2). The estimate of incidence rate of injury during competitive matches was 19.5/1000h (95% CI 16.2-22.8) and during training 3.2/1000h (95% CI 2.1- 4.3). In domestic club football, the knee (23%) was the most common site of injury, followed by the thigh (21%) and ankle (18%). Ligament sprains (28%) was the most common type of injury followed by muscle strains (19%).[10] In a pooled analysis of three studies female players had a 2.15 (IRR = 2.15, 95%CI: 1.27–3.62; I^2 = 0%) times higher rate of anterior cruciate ligament injuries than male players[11] which poses a significant injury burden within the game.[12]

Of note, these review papers[10,11] did not include data gathered from cohorts of women footballers based in the UK. There is a paucity of UK based published studies on elite women's football that utilise a prospective cohort design. In order to implement effective preventative measures it is important to understand the epidemiology of injuries and illnesses within specific sporting populations.[13]

The aim of our study was to conduct the first prospective cohort study to estimate the incidence, severity, location, and nature of injuries in an English elite adult women's domestic football squad over the course of one full competitive season.

METHOD

This report was prepared according to the Strengthening the Reporting of Observational Studies in Epidemiology Sport Injury and Illness Surveillance (STROBE-SIIS) checklist.[14]

DESIGN, PARTICIPANTS, RECRUITMENT AND SELECTION

A single site prospective cohort study was conducted during the 2018-2019 Women's Championship football season from 1st July 2018 to 31st May 2019 (Table 1). All players with a signed contract with the club were invited to take part in the study. Informed consent from individual players was obtained prior to data collection and participants were informed of their right to withdraw from the study at any time without consequence. Ethical approval was obtained from the School of Health Ethics Committee at Leeds Beckett University and was performed in accordance with the standards of ethics outlined in the Declaration of Helsinki.

PROCEDURE

Data was collected based on the guidelines set out in the Union of European Football Associations (UEFA) Consensus Statement (2006).[15] Prior to the study commencing, medical staff were provided with a guidance document that outlined why the study was taking place and the definitions of each variable that were required to be recorded and reported by medical staff. Anonymised data was sent electronically to the data custodian from the investigating team (LM) for the duration of the season.

Table 1. Player / Team Characteristics

Player / Team characteristics	
Total number of players	25
Age (years)	24 ± 3
Height (cm)	168 ± 6
Body Mass (kg)	69 ± 5
Exposure	
Total	2237
Training	1781
Match	456
Total hours/player	89 ± 20
Training hours/player	71 ± 13
Match hours/player	18 ± 16
Training sessions/player/month	7 ± 1.4
Matches/player/month	2.7 ± 0.8

Values are presented as mean ± SD

An injury was defined as an event sustained during football related activity (match play or training) which prevented a player from taking part in one or more subsequent days of football related activity (match play or training).[15] A recurrent injury was defined as an injury of the same type and at the same site as an index injury and which occurred after a player's return to full participation from the index injury.[15] An injury resulting from a specific, identifiable event was categorised as a traumatic injury occurrence. An injury resulting from an insidious onset without an identifiable event was categorised as a gradual onset injury occurrence.[15]

An illness was defined as a medical condition which prevented a player from taking part in match-play or training for one or more subsequent days following illness onset.[15] Time loss severity (of injury and illness) was categorised according to the duration that a player was unable to take part in training or match-play, and was based on current recommendations[14,15] as; 1-7 days (minor), 8-28 days (moderate), 29-89 days (severe), and ⩾ 90 days (major).

Injury and illness data was classified according to the Orchard Sports Injury Classification System (OSICS)[16] by the teams medial staff (Medical Doctor or Health Care Professions Council (HCPC) registered Physiotherapist) using their electronic medical record system. Paper-based injury and illness report forms[15] were available if access to the online records system was limited (e.g. temporary loss of access, loss of internet connectivity, traveling with teams) to ensure that records were completed in a timely manner.

Tracking exposure for the purpose of injury analysis was performed for match and training sessions which included total match minutes played per player per match, and total training minutes per player per football training session, recorded by individual GPS. Exposure was recorded by the team's sports science staff before data was forwarded to the data custodian (requested monthly) from the investi-

gating team (LM) and transposed to monthly Microsoft excel spreadsheets.

DATA ANALYSIS

Data analysis was conducted using SPSS for Windows version 24 (SPSS Inc. Chicago, Illinois) and Microsoft Excel 2011 (Microsoft, Redmond, WA, USA) with statistical significance set at $p < 0.05$. Descriptive statistics were used to describe total, match and training injury frequency tallies by injury site, injury type and injury severity. Tests for normality were analysed using Shapiro-Wilk test (sample < 50) and box plots were generated to check for outliers. Injury incidence (total, match, training) was expressed as the number of injuries per 1000 player hours with 95% confidence intervals (CI).[17] Injury burden was reported as the number of days lost to training or match play (severity) per 1000 hours of player exposure. A Wilcoxon signed rank test was used to determine differences in match and training injury incidence rates.

RESULTS

In total, 2237 hours of exposure (1781 hours of training and 456 hours of match play) were recorded for the duration of the study (Table 1). In a squad of 25 players there were eighteen injuries (new injuries, 12/18, 67%) including early (4/18, 22%) and delayed reoccurrences (2/18, 11%). Eleven players sustained at least one injury and therefore in a squad of 25 players the expected frequency of injury per athlete per season was less than 1 (0.7, 95% CI, 0.6-0.8). A total of 120 training sessions and 42 match days were missed due to injury. There were no illnesses reported.

Of the 18 injuries, 16 were time-loss and two were non-time-loss. The average probability that a player would sustain at least one injury during the season was 44% (95% CI: 25 – 63%). The probability of a player sustaining a subsequent injury during the same season was 45% (95% CI: 26 – 65%).

INCIDENCE OF INJURY

The total incidence of injury was 8.0 injuries/1000h of exposure (95% CI 4.3 – 11.8). The incidence of injury sustained during match play (30.6 injuries/1000h, 95% CI, 14.6 – 46.8) was significantly higher than the rate sustained during training (2.2 injuries/1000h, 95% CI, 0.1 – 4.4; $Z = -2.667$, $p = 0.008$) (Table 2).

LOCATION AND TYPE OF INJURY

Lower limb injuries accounted for 94% (17/18) of all injuries (Table 2). The knee (28%, 5/18) was the most common site of injury. The thigh (22%, 4/18) and foot/toe (17%, 3/18) were recorded as the second and third most common sites of injury.

Muscle injuries accounted for 28% (5/18) of all injuries followed by ligament sprains (22%, 4/18) and tendon strains (17%, 3/18). Knee ligament sprains (22%, 4/18) and thigh muscle strains (22%, 4/18) were the most common injured regions. The quadriceps was the most frequently injured muscle group, accounting for 60% (3/5) of all muscle strains and 17% (3/18) of all injuries, followed by anterior cruciate ligament and medial collateral knee ligament sprains both of which accounted for 50% (2/4) of all ligament sprains and 22% (4/18) of all injuries (Figure 1).

Five muscle injuries were sustained during match play of which two were minor (1-7 days; 2/5, 40%) quadriceps strains, two moderate (8-28 days, 2/5, 40%) quadriceps and adductor muscle strains and one severe (29-89 days, 1/5, 20%) hamstring muscle strain. All four knee ligament injuries were sustained during match play of which there was one (1/4, 25%) moderate severity (8-28 days) and one (1/4, 25%) severe (29-89 days) medial collateral ligament sprain. There were two major severity (90+days) anterior cruciate ligament (ACL) injuries sustained in two players during the season.

MECHANISM OF INJURY

Fourteen injuries (78%) resulted from a traumatic mechanism and four injuries (22%) resulted from a gradual onset. The incidence rate of traumatic injuries was 35.2 per 1000h (95% CI, 16.8 to 53.7) and for gradual onset injuries was 12.6 per 1000h (95% CI, 0.3 to 24.9). The incidence rate of contact injuries was 16.1 per 1000 hours (95% CI, 2.0 to 30.1) and for non-contact injuries was 31.8 per 1000h (95% CI, 14.5 to 49.1) (Table 2).

SEVERITY OF INJURY

There were more new injuries than recurrent injuries. Of the recurrent injuries 22% were early reoccurring (4/18) and 11% (2/18) were delayed reoccurrences of the index injury (Table 3). Of the 16 time loss injuries sustained, there was six (37%) minor (1-7 days), five (31%) moderate (8-28 days), three (19%) severe (29-89 days) and two (13%) major (90+ days) severity injuries (Figure 2).

BURDEN OF INJURY

The match injury burden for the squad was 580 (95%CI 545 to 615) days absent/1000h, while the training injury burden was 31 (95%CI 15 to 47) days absent/1000h. The median number of absent days for minor injuries (1-7 days) was five (interquartile range, IQR; 4), moderate (8-28 days) was 12 (IQR, 6) and severe injuries (29-89 days) was 55 (IQR, 45). The knee had the highest injury burden/1000h (394, 95%CI 368 to 420) and accounted for 84% (n = 881 days) of the total number of days absent (n = 1047 days). Ligament injuries (which all occurred at the knee) had the highest injury burden/1000h (393 days; 95% CI, 196 to 590) accounting for 84% (n = 879) of the total number of days lost.

There were two major severity (>90 days) anterior cruciate ligament (ACL) injuries where the mean number of days absent for both injuries was 392 days and accounted for 75% (n783) of the total number of days lost. Figure 3 presents an estimate of injury burden expressed as the likelihood (incidence) and consequence (severity) of injury per anatomical site in a squad of 25 players.

Table 2. Injury frequency, incidence, severity and burden in an adult women's English championship football squad

Injury	Frequency	Incidence (IR)	Injury Severity		Injury Burden
	Injury tally (%)	IR / 1000h (95% CI)	Total days lost (%)	Median days lost (IQR)	Timeloss days/1000h (95% CI)
Total	18	8.0 (4.3 to 11.8)	1047	10 (45)	468 (440 to 496)
Training	4 (22)	2.2 (0.1 to 4.4)	14	7 (7)	31 (15 to 47)
Match	14 (78)	30.6 (14.6 to 46.8)	1033	12 (55)	580 (545 to 615)
Mechanism					
Traumatic	14 (78)	35.2 (16.8 to 53.7)	1025 (98)	10 (55)	458 (430 to 486)
Gradual	4 (22)	12.6 (0.3 to 24.9)	22 (2)	5 (16)	10 (8 to 14)
Circumstance					
Contact	5 (28)	16.1 (2.0 to 30.1)	76 (7)	5 (42)	34 (26 to 42)
Non-contact	13 (72)	31.8 (14.5 to 49.1)	971 (93)	11 (64)	434 (407 to 461)
Injury episode					
First injury	12 (67)	30.2 (13.1 to 47.3)	197 (19)	8 (11)	88 (76 to 100)
Early recurrence	4 (22)	13.7 (0.28 to 27.23)	795 (76)	158 (413)	355 (331 to 380)
Delayed recurrence	2 (11)	18.5 (-7.1 to 44.1)	55 (5)	28 (n/a)	26 (18 to 31)
Severity					
1 – 7 days (minor)	6 (37)	15.1 (3.0 to 27.2)	29 (3)	5 (4)	13 (8 to 18)
8 – 28 days (moderate)	5 (31)	11.6 (1.4 to 21.8)	61 (6)	12 (6)	27 (20 to 34)
29 – 89 days (severe)	3 (19)	10.9 (-1.4 to 23.2)	174 (17)	55 (45)	78 (66 to 89)
> 90 days (major)	2 (13)	18.9 (-7.3 to 45.0)	783 (74)	394* (n/a)	350 (325 to 375)
Site					
Trunk	1 (5)	9.3 (-8.9 to 27.6)	5 (0.5)	n/a	2 (0.3 to 4)
Lower limbs	17 (95)	10.5 (5.5 to 15.6)	1042 (99.5)	69 (48)	465 (437 to 494)
Hip/groin	2 (11)	9.3 (-3.6 to 22.1)	19 (2)	9.5 (n/a)	8.5 (4.7 to 12.3)
Thigh	4 (22)	13.3 (0.3 to 26.6)	60 (6)	8 (23)	26.8 (20 to 33.6)
Knee	5 (28)	16.2 (2.0 to 30.5)	881 (84)	82 (383)	394 (368 to 420)
Lower leg	2 (11)	9.3 (-3.6 to 22.2)	17 (2)	9* (n/a)	0.7 (0.4 to 1.1)
Ankle	1 (6)	9.2 (-8.9 to 27.4)	0 (n/a)	n/a	n/a
Foot/toe	3 (17)	27.7 (-3.6 to 59.1)	65 (6)	32.5* (n/a)	29 (22 to 26)

%, percentage of the total number of injuries; CI, 95% confidence interval.
IRQ, data presented as the median and interquartile range; *, value presented is the mean of two numbers; n/a, not applicable

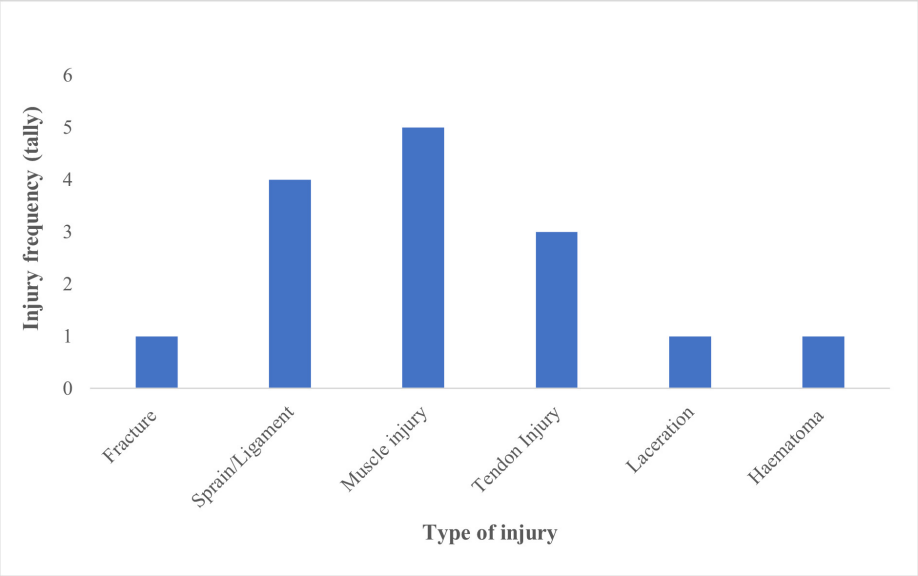

Figure 1. Injury frequency counts by category of injury

Table 3. Injury diagnosis, mechanism, circumstance, episode, and severity by anatomical site

Injury Diagnosis	Mechanism	Circumstance	Episode	Severity	OSICS10 code
Trunk					
Low back pain	Traumatic	Contact	New	5	LZXX
Hip/groin					
Adductor magnus tendon strain	Traumatic	Non-contact	New	3	GTMS
Adductor muscle strain	Traumatic	Non-contact	New	16	TMAX
Thigh					
Rectus femoris strain	Traumatic	Non-contact	New	7	TMQS
Quadriceps strain	Traumatic	Non-contact	New	7	TMQX
Biceps femoris strain	Traumatic	Non-contact	New	37	THMB
Rectus femoris strain	Traumatic	Non-contact	New	9	TMQS
Knee					
Knee laceration	Traumatic	Contact	New	2	KKXX
ACL rupture	Traumatic	Non-contact	Delayed	303	KJAC
MCL sprain grade 1	Traumatic	Contact	New	14	KJMA
MCL sprain grade 2	Traumatic	Non-contact	New	82	KJMB
ACL rupture	Traumatic	Non-contact	Delayed	480	KJAC
Lower leg					
Achilles tendinopathy	Gradual	Non-contact	Early	12	GTMS
Calf/ gastroc haematoma	Traumatic	Contact	New	5	QHMP
Ankle					
Ankle impingement	Gradual	Non-contact	Early	0	AZXX
Foot/toe					
Peroneal tendon strain	Gradual	Non-contact	New	10	ATPX
Lateral foot pain (XR - NBI)	Gradual	Contact	Early	0	FZXX
5th metatarsal fracture	Traumatic	Contact	Early	55	FFME

DISCUSSION

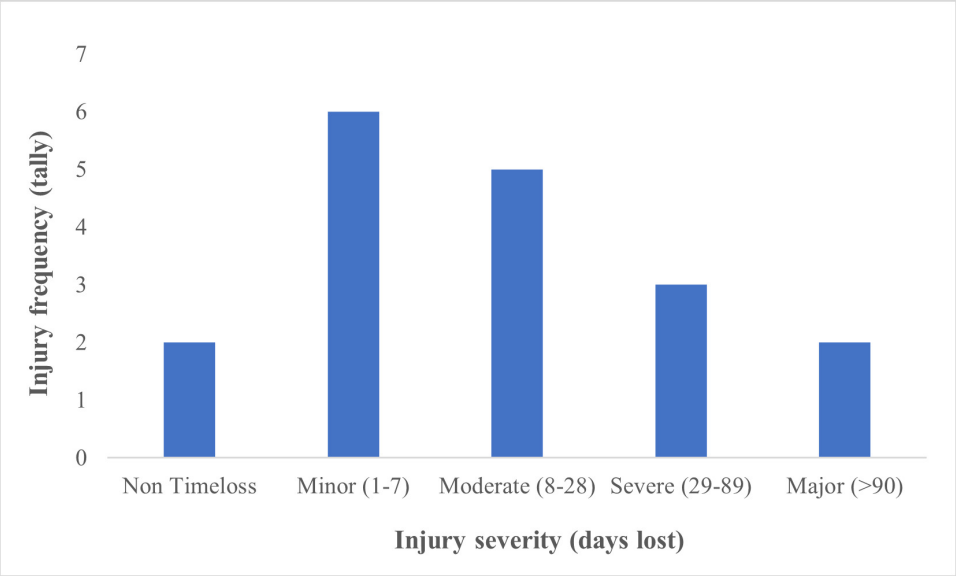

Figure 2. Injury frequency counts by severity (days lost)

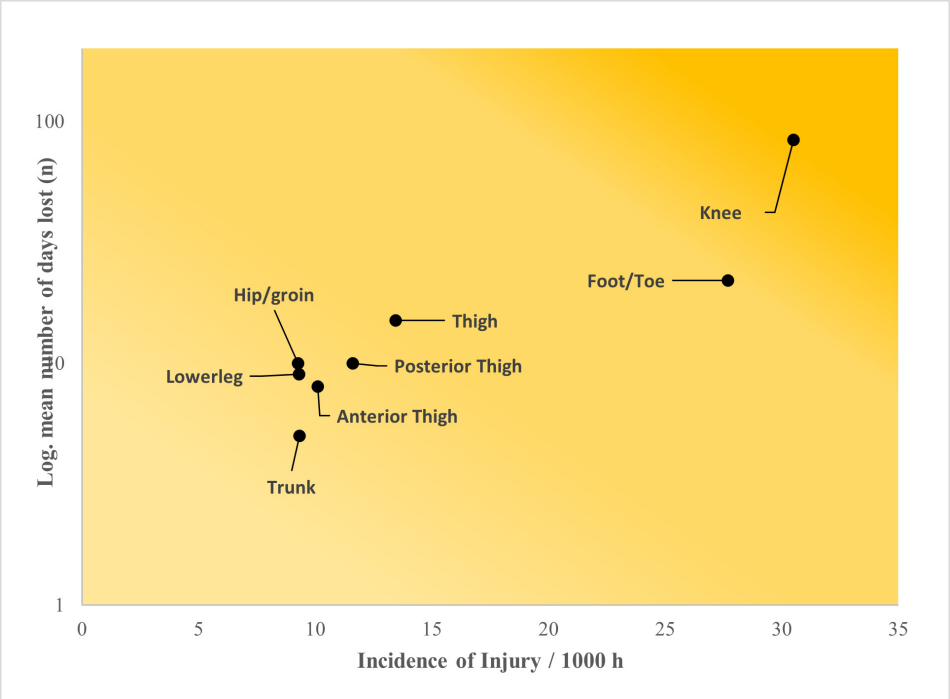

Figure 3. Burden expressed as the likelihood (incidence) and consequence (severity) of injury per anatomical site

PRINCIPAL FINDINGS

The aim of our study was to conduct the first prospective cohort study to estimate the incidence, severity, location, and nature of injuries in an English elite adult women's domestic football squad over the course of one full competitive season. The total incidence of injury was 8.0 (95% CI 4.3-11.8)/1000h of exposure and the rate sustained during match play (30.6, 95% CI 14.6-46.8)/1000h) was significantly higher than the rate sustained during training (2.2, 95% CI 0.1-4.4/1000h). The knee (n = 5, 28%) was the most common site of injury and muscle injuries (n = 5/18, 28%) were the most common injured tissue. The greatest burden to a squad of this size was the number of days lost to ACL injury.

MEANING OF THE PRINCIPAL FINDINGS

A prospective single site cohort study of elite women footballers from Spain (n = 35) by Larruskain et al. (2017)[18] reported the total incidence of injury to be 6.3 (95%CI 5.4 to 7.4), a match incidence of 22.6 (95% CI 8.1 to 28.1) and a training incidence of 3.4 (95% CI 2.7 to 4.3)/1000h. In a cohort study from Sweden which had a comparable squad sizes (n = 18 to 27 players), Jacobson and Tegner (2007)[19]

reported a total incidence rate of 4.6 (95% CI 3.4 to 5.8) and a match and training incidence of 13.9 (95% CI 8.2 to 18.5) and 2.7 (95% CI 1.8 to 3.6) injuries/1000h. Whilst single site cohort studies are sparse, rate estimates are comparable to that found here and fall within the pooled rate and range estimates (domestic club football) found in a recent systematic review and meta-analysis[10] of elite level data in prospective observational cohort studies (total: 5.7, 95% CI 4.3-7.2; match:19.5, 95% CI 16.2-22.8; training 3.2, 95% CI 2.1- 4.3). Further research is needed to determine whether these rates are reflective of the wider domestic elite level teams in the UK: as this currently remains unknown.

Whilst participation in football inherently increases the risk of injury,[8,9] the incidence proportion which is a measure of risk that any player would sustain at least one injury during the season is currently unknown in England. For a squad size of 25, the average probability that a player would sustain at least one injury during the season was 44%. In a recent multi-site cohort study from Ireland with a similar squad sizes (n = 22 players), players on average sustained 0.69 injuries per season, with each squad incurring approximately 15 injuries per season.[20]

However, it is not reported whether all players were free from injury and/or illness at the start of the season and importantly the exact number of players who sustained at least one injury during the season. This is important to know as it is widely accepted that subsequent injury is strongly associated with previous injury occurrence.

The knee (5/18, 28%) was the most commonly injured site, followed by the thigh (4/18, 22%). The most commonly injured tissue was muscle (5/18, 28%) followed by ligament injuries (4/18, 22%). These findings are comparable to studies with similar sized cohorts in adult women's football.[18,19,21] In contrast, pooled analysis of injury site data from larger scale multiple cohort surveillance studies found ligament injuries to be the most common tissue injury followed by muscle injuries in adult women's football.[10] Such differences may be related to sample size, training and match exposure/load, or as a consequence of normal variation in the number of injuries reported due to chance.

CLINICAL IMPLICATIONS

This study is the first to report injury severity and injury burden in domestic club football in England. Of the time loss injuries, 38% (6/16) were of minor severity and resolved within one week (1-7 days) and five further injuries (31%) resolved within 28 days (9-28 days; moderate severity), with the proportion of minor versus moderate injuries similar to pooled injury severity frequency counts.[10]

We found that the probability of those players (who sustained at least one injury) sustaining a subsequent injury during the same season was 45% and, of those re-injuries, there was one anterior cruciate ligament re-rupture. In a recent meta-analysis by Mayhew et al. (2021)[10] seven studies[19,22–27] in domestic club football reported the number of players sustaining at least one injury with incidence proportion (for a first injury) ranging from 33% to 81%. However, in the review, pooled incidence proportions for repeat and multiple injury occurrences could not be estimated out as the level of detail contained within existing studies was limited. In future studies, data on repeat and multiple injuries need to be clearly understood to tailor injury prevention strategies and target specific players.

The total injury burden for the squad was 468 absent days/1000h which is greater than twice that reported in by a single cohort study from Spain (216/1000h) and a multisite cohort study from Ireland (213/1000h)[20] Whilst burden estimates from Spain and Ireland have been compared previously,[20] readers should be cautious when interpreting burden from a single squad to a full league. We recorded individual match and training player exposure whilst a previous study[20] which recently estimated burden derived the value using team level estimates of exposure. Although this is considered an acceptable method to use it is recommended that when estimating exposure using team level estimates, events which reduce the number of players on a team (e.g., red card) for part of a game (this would over-estimate exposure time), and, events which would underestimate exposure time if games exceeded 90 minutes (e.g., injury time, extra time, penalty kicks) are accounted for.[28] This method only replicates results of individual-level exposure time calculations when training and matches are played with a consistent number of players under consistent exposure conditions.[28] Exposure that has been calculated in this way, without consideration of exposure-time reporting, will introduce error.[29] In our view, conducting analyses to generate such data is questionable when exposure is estimated in this way as the resultant statistic may at best be erroneous. The International Olympic Committee consensus statement on reporting epidemiological data on illness and injury in sport[14] recommend estimates to be calculated by using individual level data for injuries and exposure rather than team-level estimates.

For medical and performance teams interpreting burden at club level, additional resource management may have to be considered as this squad consisting of 25 players sustained 5 knee injuries in one season. Whilst the number is relatively small, the median time loss days absent due to knee injuries was 159/1000h. Two players sustained ACL injuries which accounted for 75% (n = 783 days) of the total days lost. As per recommendations, we tracked players from injury onset to return to play even if the return date led into 'off season' and the subsequent season.[15] This may part explain why our burden estimates are higher than those stated in previous studies[18,20] where it is not clearly stated in previous studies whether return to play (days lost) was recorded if the return date extended beyond the season under surveillance.

LIMITATIONS

The team trained two/three days per week, so it is possible that some injuries were not captured or had resolved before a player had an opportunity to report it. Nevertheless, the training frequency reported in our study was reflective of the norm within this league. Box plots identified two incidence rate outliers that were categorised as extreme (two ACL injuries). We opted not to remove these outliers as the results were not due to measurement error and were viewed

as a natural occurrence within a small sample under investigation. We presented the median and interquartile ranges for injury severity, as time loss days are likely to be right-skewed.[15] We acknowledge the limitations of a single site cohort study and readers should remain cautious in comparing data to published findings of multi-site cohort studies.

CONCLUSION

To our knowledge this one-year prospective injury surveillance study is the first to be conducted in adult elite women's football in the UK at domestic club level. The total incidence of injury was 8.0 (95% CI 4.3-11.8)/1000h of exposure and the rate sustained during match play (30.6, 95% CI 14.6-46.8)/1000h) was significantly higher than the rate sustained during training (2.2, 95% CI 0.1-4.4/1000h). The burden of injury was estimated to be 468 days lost /1000 hours. Two players sustained ACL injuries which accounted for 75% (n = 783 days) of the total days lost. For squads of this size resource management may become problematic if two or three players are lost due to long term injury. Further research is needed to determine whether the number and burden of ACL injuries found in this cohort are reflective of the wider domestic elite level teams in the UK: as this currently remains unknown. We hope that our findings catalyse larger scale injury surveillance projects in both elite and amateur women and girls' football in the UK so that practitioners can move towards confidently embedding injury prevention practices across the game.

Highlights

- The epidemiology of injury in the English Women's Club Football is unknown
- The total incidence of injury in a single squad was 8.0 injuries/1000h
- The total injury burden for the squad was 468 absent days/1000h
- Whether these rates are reflective of the wider teams in England remains unknown
- Multi-site prospective investigations of injury are required

FUNDING

No funding was received for this work

CONFLICTS OF INTEREST / COMPETING INTERESTS

In the previous 5 years MIJ's institution has received research and consultancy funding for work that he has undertaken for GlaxoSmithKline, Medi-Direct International, and TENScare Ltd

AVAILABILITY OF DATA AND MATERIAL

Data available is contained within the publication.

AUTHORS' CONTRIBUTIONS

LM lead author and data custodian. All authors contributed to the design and proof reading of the manuscript

ETHICS APPROVAL

Ethical approval was obtained from the School of Clinical Applied Sciences Ethics Committee at Leeds Beckett University and was performed in accordance with the standards of ethics outlined in the Declaration of Helsinki.

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