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Research Article

Systematic review of incidence of upper limb injuries in professional footballers

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Abstract

Introduction: Upper limb injuries affecting professional footballers are under investigated and under reported. I performed a systematic review evaluating current literature available on professional footballers to identify the incidence of upper limb injuries and types of injury. I further evaluated if players team position influenced the injury.

Methods: A systematic review was performed in June 2021 to identify appropriate articles in the following databases: PubMed, SPORTDiscus, Cochrane Library, Medline and CINHAL. The critical appraisal system program check list for cohort studies was used to score each article reviewed and a percentage score was given. Articles which scored below 50%, were deemed to be of poor quality. Further data was extracted to include country of origin, players demographic data, data extraction, data analysis and quality assessment, injuries, number of hours of exposure, injury incidence and injury severity.

Results: Thirteen articles were reviewed according to the critical appraisal system questionnaire checklist. Three articles were found to score highly. The number of players, injuries, exposure hours, overall incidence, incidence severity and upper limb incidence were recorded.

Conclusion: This systematic review supports previous literature and confirms that upper limb injuries are less common than lower limb injuries in footballers. Goalkeepers are five times more likely to sustain an upper limb injury than an outfield player. Shoulder acromioclavicular joint injuries were found to be the most common upper limb injury. Position specific results suggest that goalkeeper lay-off time is significantly greater than that of outfield players.

Keywords: Anterior cruciate ligament, international knee documentation committee, modified cincinnati rating system, functional outcomes

Statistics

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INTRODUCTION

Football is the most popular sport in the world with approximately 200,000 professional and approximately 240 million amateur players [1]. Elite football begins at a junior level, as players enter football academies' they are nurtured to develop into world class football players. Injuries to professional footballers have been shown to be around 1000 times higher than for industrial occupations generally regarded as high risk [2].

The incidence and prevalence of professional football injuries has been reported in literature [1,3,4]. The reporting of football injuries has been inconsistent and incomplete partly because of the variability of data collection. The FIFA Medical Assessment and Research Centre (F-MARC) published a consensus statement following the 2005 World congress in sports injury prevention in Oslo providing a template guide to streamline the collection of injury data for the medical teams treating footballers. Male elite football has been well established and researched to identify common injuries patterns to create programs to reduce the risks of injury. Women's elite football has recently gained popularity, but there is limitation with respect to available research regarding the injuries sustained.

Football is a contact sport with injuries occurring predominantly to the lower limbs [2]. Articles suggest that majority of the injuries are to the lower limb compared to the upper extremity mainly affecting the knees and ankles, followed by head injuries. Lower limb injuries are the predominate source of loss of hours of participation both in training and in matches. It has been estimated that a male elite team with 25 players can expect up 50 time-loss injuries each season.

Ekstrand et al studied male elite footballers who had sustained upper extremity injuries from the shoulder, upper arm, elbow, forearm, wrist, and hand. The paper found upper limb injuries represent 3% of all time-loss injuries to professional football players. There is a shortage of research into the incidence and type of upper limb injuries sustained by professional footballers.

Position specific research is further limited comparing outfield players to goal keepers when evaluating upper limb injuries. The injury pattern between outfield players and goal keepers are known to be different as the position does dictate which body part is more exposed. For outfield players they are expected to run longer distance, tackle more often than goalkeepers. Goalkeepers use the upper limb handling the ball and hands significantly more than the outfield players [5].

The primary aim of this systematic review is to evaluate the incidence and type of upper limb injuries in professional male footballers. The secondary aim is to compare the injuries of outfield players and goalkeepers.

MATERIALS AND METHODS

SEARCH STRATEGIES AND LITERATURE SCREENING:

A literature review was performed in June 2021 to identify appropriate articles in the following databases: PubMed, SPORT Discus, Cochrane Library, Medline and CINHAL. This was in line with the 2009 preferred reporting items for systematic review and meta-analysis statement. The titles and abstracts identified were screened for eligibility and those not meeting the inclusion criteria were excluded before full text review. Following the initial review, complete articles were critiqued. A search of the references of selected studies was conducted to ensure no other relevant studies were missed.

SEARCH TERMS

University College London online database library search allowed access to multiple databases to be searched simultaneously. PubMed, SPORT Discus, Cochrane Library, Medline and CINHAL were searched simultaneously. A full text search using search terms (football or soccer) and (Hand or Wrist injury) and (Incidence or epidemiology) was performed. Searching the databases simultaneously resulted in 3467 search results. Refining the search to filter for journal article abstracts in English which were published between 2000 and 2021 resulted in 682 search results. Limited the search from 2000 to 2021, to find more recent articles. Further filter to remove duplications and non-soccer articles resulted in 129 articles. The 129 article abstracts were reviewed. Studies were excluded from analysis if they were case reports and injuries not related to football or soccer. Injuries relating to the women super league were excluded. Articles which did not present findings on hand and wrist injuries were excluded.

The inclusion criteria:

1. Studies published in peer review journals.
2. Type of research-epidemiological, observational, cohort studies.
3. Studies reporting the incidence or prevalence of upper limb injuries in professional, elite, organised football/soccer players.
4. English language studies not restricted by age.
5. Gender specific to male players.
6. Year of publication between 2000 and 2021

The exclusion criteria:

1. Expert opinions, case reports, case series, case control series, randomised control trials and systematic reviews.
2. Duplicated studies.
3. Women's football studies for example Women's Super League.
4. Studies conducted other than football/soccer.
5. Studies conducted on multiple sports where no football specific injury data could be extracted.
6. Publications preceding 2000.

Data extraction:

1. Demographic data if available for age of player, weight, and height.
2. The country of origin of the teams, the league and position of the players.
3. The number of players reviewed.
4. Exposure in hours per 1000 hours exposure total and then divided into training and match play.
5. Injury incident in total and specific for upper limb/ hand and wrist.
6. The severity of injury resulting in time loss according to the consensus statement (Slight– 0 days, minimal –1 day-3 days, mild – 4 days-7 days, moderate 8 days-28 days, severe>28 days).
7. If available data specific to type of injury in the hand or wrist were not willing to attend the follow-up were excluded from the study.

DATA ANALYSIS AND QUALITY ASSESSMENT

All studies were critically appraised using the research type specific Critical Appraisal Skills Programme Checklists. The critical appraisal skills programme checklists are specific for different research methodologies. There are checklists available for randomized controlled trials, systematic reviews, qualitative studies, cohort studies, diagnostic study, case control study, economic evaluation study and clinical prediction rule study. The assessment tool checklist evaluated three broad issues when appraising the articles. Section A reviews the validity of results. Section B evaluated the results. Section C describes the outcome of the results to see if it would change the readers' clinical practice. The assessment tool used a series of questions to evaluate the internal validity of a study. The authors of the critical appraisal programme checklists have discouraged users from attempting to tally up the scores from the tool. The checklists are to be used as an educational pedagogic tool.

The checklist allowed me the ability to allocate a score as a percentage following the critique which reflects the quality of the article. Robinson et al used this method to assess the quality of articles

when performing a systematic review on musculoskeletal injures in professional golfers. The authors of the Quality Assessment Tool for Observational Cohort and Cross-sectional. Studies have discouraged users from attempting to tally up the scores from the tool. However, Robinson et al represented the number of applicable questions answered 'yes' for each study as a percentage. This allowed for scoring of the articles. Articles which could not correctly answer half the questions were deemed to be of poor quality.

A meta-analysis was not performed due to the heterogeneous nature of the data in each included paper. Data analysis was primarily reporting incidence of upper limb injuries and if available incidence of hand and wrist injuries comparing outfield players and goal keepers.

RESULTS

The literature search performed across PubMed, SPORT Discus, Cochrane, Medline and CINHAL databases resulted in a yield of 3,467 publications before the application of filters. Restricting the type of article to peer review journals, the language of the publication to English and year of publication between 2000-2021 resulted in 682 publications, a further restriction filter to remove duplicated articles and non-soccer related articles provided 129 journal articles abstracts initially screened. The full articles were reviewed according to the inclusion and exclusion criteria. Finally, 13 articles were included in the presentation which fulfilled the inclusion criteria. All articles included were epidemiological/ cohort studies; eight prospective and five retrospective studies were published between 2001 and 2021. The articles included were evidence Level 2 and 3. A flow chart diagram of the literature search has been presented in Fig. 1. A description of the included studies is presented in Table 1.

QUALITY ASSESSMENT

The selected articles were reviewed for my primary aim, upper limb injury incidence in professional male footballers. My secondary aim looking to see if player position impacts on the type of injuries sustained by goalkeepers and outfield players was also reviewed.

The quality assessment tool I used was the Critical appraisal system programme questionnaire checklist for cohort studies. The questionnaire provides a robust method to evaluate the papers. It has three clear objectives which are divided into sections. Section A reviews the validity of results. Section B evaluated the results. Section C describes the outcome of the results to see if it would change the readers' clinical practice. The assessment tool uses a series of questions to evaluate the internal validity of a study. Robinson et al previous used this critical appraisal tools to score articles for a systematic review.

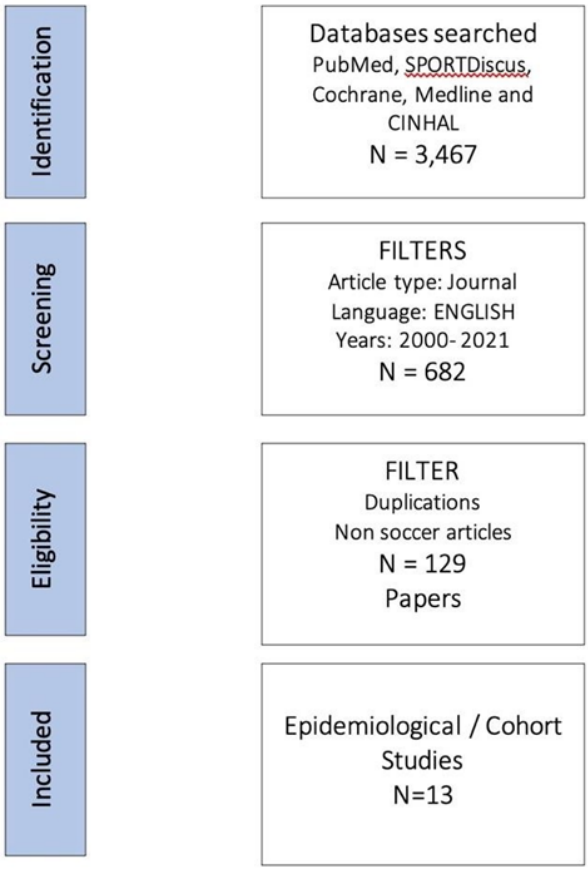

Fig. 1. Prisma flow diagram of search

Twelve questions were available. If all questions were answered well a score of 100% was achieved. Articles which scored less that <50% were deemed to be of poorer quality. I have represented the review by section as discussed above in a tabulated form. Table 2 provides a clear visual representation of my findings using the Critical appraisal system programme questionnaire checklist for cohort studies.

The mean score for all studies was 48.6% with a range 100% to 33%. Two studies evaluated upper extremity injuries in elite footballers. They provided incidence of injuries for the full group and divided it further into upper and lower limb. Anderson et al and Ekstrand et al scored the highest of the group as the project related closely to this review.

Ekstrand et al produced a good article which provides a clear rational for the study. They recognised the paucity of upper limb injury and further position specific research in current literature. The methodology and data collection utilising the instructions of data collection from the UEFA/FIFA consensus statement [6]. Using the validated method reduced variability in data collection and overall bias. The exposure time was reported for both training and match play providing further information to show if upper limb injuries are more common in training or matches. The statistics used for the article were in keeping with the data type. The articles evaluated position of the players comparing goalkeepers and outfield players. The article clearly presented a question, answered the question discussed bias and limitation. The article provided literature which would support further research into upper limb extremity injuries in elite footballers.

Anderson et al performed a descriptive epidemiological study specific to hand, wrist, and forearm injuries in male elite professional soccer players. The authors presented aims. The methodology, number of players reviewed and follow up was thorough. The results and statistics were clearly presented. The authors also reviewed player position. Overall I felt this paper did fulfil the checklist criteria presented in the appraisal tool.

The studies which fell short of achieving a higher score through the critical system appraisal tool showed heterogenous method of data collection, small player sample size. The papers showed global incidence of injury but were not specific to the upper limb injuries or did mention upper limb injuries at all.

UPPER LIMB INJURY INCIDENCE

Upper extremity injury incidence has been found to be between 1%-15.6% from reviewing the selected articles. This can be seen in Table 1.

There were three articles which specifically evaluated upper limb injuries in professional elite footballers. Anderson et al reviewed hand, wrist, and forearm injuries in the elite male footballers over eighteen years. A total of 6754 players form 558 teams were included in the study. The authors provided position specific results comparing outfield players and goalkeepers. They included 6052 were outfield players and 702 goalkeepers. 25462 injuries were recorded. The total hours of active exposure 3,686,838 hours, subdivided into training which represented 3136111 hours and 550727 hours in match play. The overall incidence was 0.65 per 1000 hours. For goalkeepers the injury incidence was 0.25 per 1000 hours exposure and outfield players 0.038 per 1000 hours of exposure. The incidence of injury was higher during match play compared to training. This was statistically significant $p<0.01$.

The incidence of upper extremity injuries in male elite football players was reviewed by Ekstrand et al. 57 European elite teams with a total of 2914 players were included in the prospective cohort study. 11750 injuries were recorded 355 (3%) upper limb injuries. The total exposure

Table 1. Description of included articles

Study	Country/ Region	Sex	Age	Level	Number of players (n)	Injuries (n)	Exposure hours	Injury Severity Major >28 days Layoff	Overall Injury Incidence	Injury Incidence upper limb
Anderson, Bengtsson, Walden, Karlsson, Ekstrand*^(2021)	Europe	M	Ad	E/P	6754	25462	3686838	0.206	0.065 per 1000 hrs of exposure	0.057 per 1000 hrs of exposure
Ekstrand, Hagglund, Walden (2009)	Europe	M	Ad	E	2226	4483	566000	0.16	8.0 per 1000 hrs of exposure	0.01
Renshaw, Goodwin^ (2016)	England	M	C	P	181	127	29346	0.26	% 127/121 = 0.7	0.05
De Putter,Van Beek, Burdoft, Borsboom, Toet, Hovius, Selles*-2014	Netherlands	M	C	P	168000	6756				UEF: 23%
Dauty, Collon (2011)	France	M	Ad	P	173	903	15 seasons	0.25	18.68 per 1000hr exposure	Goalkeeper 4.61 per 1000 hr
Hawkins, Hulse, Wilkinson, Hodson, Gibson^ (2001)	England	M	Ad	P	2376	6030	2 seasons	0.23	0.394	0.03
Walden, Hagglund, Ekstrand ^(2004)	Sweden	M	Ad	E	310	765	93356	0.095	0.259	0.0433
Ekstrand, Hagglund, Tornqvist, Kristenson, Bengtsson, Magnusson, Walden*^ -2021	European	M	Ad	E	2914	11750	1537936	0.23		UE 3%
Schniffner, Latz, Grassmann, Schek, Scholz, Windolf, Jungbluth, Schneppendahl (2017)	German	M	Ad	E	290	357	7.5 seasons	0.49	0.19/1000 hrs of exposure	UEF 24.9%
Blazkiewicz,Grygorowi cz, Bualostocki,Czaprowski (2018)	Poland	M	C	P	33 GKs	52	over 12 months			6.48/ 1000 hours of exposure
Bartels, Hevesi, Wylesm Macalena, Kakar, Krych (2019)	USA	M	C/Ad	P	899225	725	2 years	0.085	0.51 per 1000 hours of exposure	
Junge, Dvorak (2015)	Swiss	M	Ad	E	736	104	X5 FIFA World Cup 1998 -2014	0.17	50.8 injuries per 1000 hours played	0.096
Rossler, Junge, Chomiak, Dvorak, Faude ^(2016)	Swiss/ Czech	M	C	P	6038	417	395295	0.237	0.61 per 1000 hours of exposure	0.156

*Key: Ad=adult, C=Child, E=Elite, P=Pro, %=percent, UEF=upper extremity fracture, UE= upper extremity, GKs- goalkeepers, *Specific to upper limb, ^protocol as per UEFA/FIFA consensus statement

Table 2. Critical review scoring of articles reviewed

Study	Section A Are the results of the study valid?	Section B What are the results?	Section C Will the results help locally?	Score out of 12 (%)
Anderson, Bengtsson, Walden, Karlsson, Ekstrand (2021)	Yes – focused on hand, wrist and forearm injuries Clear injury incidence Position specific: Goalkeeper v outfield	Upper limb Injury incidence = 0.065 per 1000hrs	Yes Goalkeeper longer mean layoff compared to outfield players (23+/- 27 days v 15m+/- 27days)	0.92 Good overall paper omitted shoulder and elbow injuries
Ekstrand, Hagglund, Walden (2009)	No – less specific to the upper limb more global	Injury incidence 8.0 injuries per 1000hrs	Not for the upper limb	0.5 Focus on all injuries, compares training v match days
Renshaw, Goodwin (2016)	No – Academy football Less specific to the upper limb	Injury incidence 11 injuries per 1000 hrs	Not upper limb specific, difficult to extract data	0.33 Focus on academy and age groups
De Putter,Van Beek, Burdoft, Borsboom, Toet, Hovius, Selles -2014	Yes – focused on upper extremity fractures (UEF) in young male soccer players	UEF rate increased by 83.5%	Yes UEF increased	0.5 Not specific on types of fracture but did focus on upper limb
Dauty, Collon (2011)	Yes – Upper Limb is included	Injury incidence 4.7 +/- 5 per 1000 hr	Not Upper Limb specific	0.5 Not specific to the upper limb
Hawkins, Hulse, Wilkinson, Hodson, Gibson (2001)	No – all injuries not upper limb specific	1.3 injuries per player per season 3% ULL	Mention Upper Limb injuries no specifics	0.5 Interesting but not specific
Walden, Hagglund, Ekstrand (2004)	No – not specific to the upper limb		Place Upper limb injuries in section others	0.33 General paper not specific
Ekstrand, Hagglund, Tornqvist, Kristenson, Bengtsson, Magnusson, Walden -2013	Yes - specific for upper limb Also discussed position specific outfield players v goalkeepers	0.23 injuries per 1000 hrs	Yes – noted upper limb injuries less common than lower. Identified goalkeepers are prone to upper extremity injury x5 compared to outfield player	1 Excellent paper

Schniffner, Latz, Grassmann, Schek, Scholz, Windolf, Jungbluth, Schneppendahl (2017)	No – evaluate fractures sustained in the Bundesliga soccer players	0.19 per 1000 hrs	No – not specific to upper limb	0.33 Interesting but not specific
Blazkiewicz,Grygorowi cz, Bualostocki,Czaprowsk i (2018)	Yes – Discuss Upper limb injuries and position specific	6.48 per 1000 hrs	Yes – Identified hand injuries common in goalkeepers	0.83 Evaluated upper limb injury, and looked at the position of the player
Bartels, Hevesi, Wylesm Macalena, Kakar, Krych (2019)	Yes - specific to football Identified hand and wrist injuries	0.51 per 1000 hrs	Not position specific	0.33 Lacked information about injury type
Junge, Dvorak (2015)	Yes- large cohort, interesting paper	29.3 per 1000 hrs	Focused on all injuries and di discuss upper limb injuries	0.75 Good paper
Rossler, Junge, Chomiak, Dvorak, Faude (2016)	No – not specific to the upper limb	0.61% per 1000 hrs	Did mention upper limb injuries 15.6%	0.5 Interesting not specific

per 1000 hours played was 247 +/- 93. The upper extremity incidence was reported as 0.23 injuries per 1000 hours of football exposure. The injury incidence of injury during match play (0.83 per 1000 hours of play) was statistically significant compared to training (0.12 per 1000 hours of play). Hawkins et al article further supported that a higher incidence of injuries occurring during match play than in training. This article provided position specific results comparing goalkeepers to outfield players. They reported a higher incidence of upper extremity injuries being sustained by goalkeepers 0.80 per 1000 hours of exposure compared to outfield players 0.16 per 1000 hours of exposure.

De Putter et al reviewed upper extremity fractures in young male soccer players in the Netherlands between 1998 and 2009. He utilised a retrospective database which had collated information on fracture types sustained by professional male football players. 39 495 upper extremity fractures were reported in 168000 players. The authors noted an increase in the absolute number of upper extremity fractures representing an 83.5% increase. The authors feel this is due to the increase in the popularity of the sport.

SUBJECT DEMOGRAPHICS

The studies focused on male professional football teams across established leagues. The participants demographics were documented as a mean or a range in the papers reviewed. From the papers the age range was 5-30 years. The mean age of the footballers in the studies evaluated was 19.68 years. The mean height was 167 cm, and the mean weight was 63.9 kgs. Of the 13 studies three articles did not document the age of the patients but refer to the group as adult elite male players, and three provided range of age of the group this was for academy teams. The studies were performed mainly in Europe. (England, Netherlands, France, Poland, Czech Republic, Switzerland) and America (Table 1).

METHODOLOGY OF THE ARTICLES

Six studies followed the UEFA (Union of European Football Associations) and FIFA (Federation International Football Association) consensus statement to collate the data [4,7]. Anderson et al provided the medical teams with the UEFA study protocol, to further validate the study and make it robust. Four used established databases. De Putter et al obtained the data to evaluate the injuries in the upper extremity of young male soccer players in the Netherlands between 1998 and 2009 using the Dutch Inquiry Surveillance system database. three used questionnaires to collate the data.

Data was collected on the: number of players, injury numbers, time loss due to the injury was reported as described by the consensus statement. Injury severity was divided into categories; minimal 0 days, mild 1 to 3 days, moderate 8 days-28 days and severe greater than 28 days. Anderson et al and Blazkiewicz et al collated position specific data comparing injuries to outfield players to that sustained by goalkeepers. Exposure time was divided into training exposure time and match exposure time. Nine of the articles reported injury incidence rates as number of injuries per 1000 player hours. Four articles focused on incidence of upper limb injuries and provided further information on specific injuries sustained.

INJURY INCIDENCE GENERAL

The overall total injury incidence reported in the articles was represented as a ratio of injuries: to number of players by three articles. The ratio percentage (range 0.7% to 39.4%) as shown in the results (Table 1). The remaining ten papers represented the injury incidence per 1000 hours of exposure to football (range 0.065 to 8.0) as shown in the results (Table 1). Majority of injuries sustained by professional footballers were to the lower limbs. Hawkins et at performed an epidemiological prospective cohort study of injuries in professional football from July 1997 to the end of May 1999. 2376 players sustained 6030 injuries. They found 87% of injuries were to the lower limb with upper limb extremity injuries accounting for 3% [6]. The most common injuries were strains and sprains which represented over half of all injuries recorded. The most common site was found to be the thigh, followed by the ankle and the knee an average of 1.3 injuries was sustained per player per season.

INJURY SEVERITY AND LAYOFF TIMES

The consensus statement published by the governing bodies FIFA and UEFA provide a structured method to collate data on football injuries [5]. An important outcome for players and club following an injury is the amount of time a player is unable to participate in training and matches. Time loss following an injury has been graded into slight 0 days lay off, minimal 1 to 3 days lay off, moderate 8 days to 28 days lay off and severe represented by greater than 28 days lay off. This method was utilised by eleven of the articles reviewed. For the major severity category an average of 21% (range 8.5% to 49.0%) of participants' injuries resulted in greater than 28 days absence from football participation in training or matches. The major injury severity percentages for each study have been displayed in the table 1.

Walden et al published a prospective cohort study evaluating the risk of injury and injury patterns in Swedish elite footballers during 2001. The main outcome was to compare time loss and tissue injury. 310 players were included in the sample from 14 elite male teams. 238 players incurred 715 time-loss injuries (77%). 240 players sustained 765 tissue injuries (77%). The authors used the consensus statement time loss grading system. 67 players (9.5%) sustained an injury resulting in greater than 28 days of lay off. The average number of days the major severity group were absent was 82.6. Time loss injury incidence during training was found to be significantly higher and statistically significant during pre-season compared with competitive season time lost per 1000 training hours.

Renshaw et al reported the risk of injury to academy players in the English Premier League during a season. The prospective cohort study utilised the consensus statement to determine the incidence and pattern of injury during 1 season. 181 academy players between 9 and 18 sustained 127 injuries which occurred following 29346 hours of football exposure. 67% injuries were reported as moderate with players unable to play between 8 and 28 days. Severe injuries resulting in a lay off for greater than 28 days occurred in 26% of the 181 players included in the study.

Injury severity and layoff times for focused on the upper limb and position specific results have been provided by Anderson et al [7]. 6754 players (6052 outfield and 702 goalkeepers) sustained 25462 injuries with 238 affecting the hand, wrist and forearm. 91 players (38.2%) sustained moderate injuries and 49 players (20.6%) sustained severe injuries resulting in greater than 28 days absence. Position specific

results suggest that goalkeeper mean overall lay off time is significantly greater than outfield players. The mean duration of absence from football exposure was 23 days for goalkeepers compared to 15 days for outfield players. This was found to be statistically significant [7].

The UEFA injury study group reviewed the injury incidence and injury patterns in professional football [6]. They performed a prospective cohort study over seven consecutive seasons. 23 teams were recruited with 2226 players. 4483 injuries were recorded during 566000 hours of football exposure. 16% of injuries resulting in greater than 28 days lay off [6].

POSITION SPECIFIC INJURY INCIDENCE

The literature available evaluating upper limb injuries in professional and elite footballers is scarce. Published literature on incidence of elite football injuries show consensus that lower limb injuries account for higher probability of injury approximately 87% compared to upper limb injuries, 3% [2]. The article I have reviewed provide information on either the upper limb injury incidence per 1000 hours of exposure (range 0.057 to 6.48) or a percentage (range 1% to 24%).

The most recent article published earlier this year recognised the paucity of research relating to upper limb injuries in professional male soccer players [7]. Anderson et al found 0.9% of injuries were sustained in the hand, wrist and forearm. Of the 238 injuries reviewed in this group n=170 injuries occurred in the hand (71.4%), n=40 (16.8%) resulted in a wrist injury and n=28 (98.7%) forearm injuries were reported. 98.7% of the injuries were due to acute trauma. The most common injury 58.8% was a fracture to the metacarpal (n=140), this was followed by a fracture to the phalanx 10.1% (n=24). This paper provided patient specific results which showed a higher injury incidence in goalkeepers than in outfield players. As postulated a hand, wrist or forearm has been shown to result in a major injury in goalkeepers with a statistically significant lay off period [8]. Anderson et al article was limited to the hand, wrist, and forearm.

Football academies provide an environment for junior footballers to be trained and nurtured into elite professional players. De Putter et al recognised an increase in upper extremity fractures in young male soccer players in the Netherlands. The group evaluated age specific trends for players between the age of 5 to 18. Majority of the upper extremity fractures were of the wrist. They recognised an 83.5% increase in the absolute number of upper extremity fractures from 1998 to 2009. I feel this may be a result of the increase in the popularity of the football and increased participation.

Upper extremity injuries in male elite footballers were reviewed by Ekstrand et al [6]. 3% of injuries were located to the upper extremity. The incidence of injury to the upper extremities was seven times higher during match play compared with training. Out of the 355 injuries 36% involved the shoulder, 24% involved the hand/finger/thumb, 5% wrist and 4% forearm. Shoulder acromioclavicular joint sprain n=45(13%), shoulder dislocation n=44 (12%), hand metacarpal fracture n=29 (8%), shoulder rotator cuff tendinopathy n=22 (6%) and phalanx fracture n=21 (6%) were the most common injuries described in this article. Ninety percent of the upper limb injuries were traumatic. Goalkeepers had a significantly higher incidence of upper extremity injuries compared to outfield players $p<0.01$ [6].

Schiffner et al reviewed fractures sustained in elite German footballers of the Bundesliga first division over seven years. 24.9% of fractures were of the upper extremity. Goalkeepers compared to outfield players sustained a higher incidence of hand and finger fracture.

DISCUSSION

This systematic review further supports previous literature that lower limb injuries are more common than upper limb injuries [5]. Upper extremity injuries from the shoulder, elbow, forearm, and hand represent only 3% of all time loss injuries to elite footballers. This translates to an average 25 elite footballers have a potential to expect 1-2 injuries to the upper limb over a season. Position specific research is valuable as upper limb injuries in football maybe underestimated in outfield players as they might be able to train and play despite upper extremity injuries such as finger fractures and shoulder acromioclavicular joint injuries.

Upper limb injury incidence has been found to be between 1% - 15.6% from reviewing the selected articles. Whereas the total injury incidence reported in the articles 0.7% to 39.4%. From the papers they further support current literature suggesting lower limb injuries are more common than upper limb injuries and predominantly affect the thigh, the ankle the knee. Male elite team with 25 players can expect up 50 time-loss injuries each season. Upper limb injuries represent only 3% of all time loss injuries to elite footballers. The articles reviewed showed great variability in the incidence of upper limb injuries. This may be a result of the methodology and number of players reviewed. Only two articles were specific for upper limb injuries, and one article did not review shoulder injuries [7].

POSITION SPECIFIC

The position of the player does have an impact on the type of injuries. There is a significant difference in the incidence of upper limb injury specifically to the shoulder acromioclavicular joint between goalkeepers and outfield players. I agree with the finding represented. Player position does impact on the type of injury a player sustains. Goalkeepers handle the ball more than outfield players. The role of the goalkeeper does involve catching, throwing, punching the ball. Goalkeepers lay off time following an injury is significantly greater than that of outfield players. The mean duration of absence from football exposure was 23 days for goalkeepers compared to 15 days for outfield players. This was found to be statistically significant. An upper limb injury in a goalkeeper can be career ending as they cannot perform to a high level without the use of the arms and hand [8].

STRENGTHS

I identified an important topic to review as upper limb injuries are less common in professional football. My methodology allowed me to use multiple databases through the UCL library services to extract articles. I had clear inclusion and exclusion criteria. I used a validated critical appraisal questionnaire to review the articles and scored the articles to show my refection of the quality of the available papers. Data on upper limb incidence, types of injury and position was my focus. I used tables to aid visual representation of the information I extracted from the papers and also the critique of the papers (Table 2).

LIMITATIONS

I used the critical appraisal system program check list for cohort studies as a scoring system to review the articles selected for my systematic review. This was not in keeping with the instructions from the authors of the checklist as they suggested a group discussion for article review. All the articles reviewed were cohort studies (level 2 and 3 evidence). Higher level of research was not available such as randomised control trails and meta-analyses. The heterogenous nature of the data available precluded me form performing a meta-analysis. The incidence rates reported for injuries was not specific for all the articles relating to upper limb injuries. Furthermore, specific information regarding injury mechanism, type of injury, previous injury, treatment requiring surgical intervention was not provided. Limited articles provided player position specific comparing goalkeepers to outfield players. Two articles focused on player position. Professional women's football was excluded from the review. 13 articles were reviewed which fulfilled the inclusion criteria expanding the search would have provided more results [9].

CONCLUSION

There is a paucity in the literature regarding hand and wrist injuries in professional footballers. This systematic review supports previous literature and identifies upper limb extremity injuries are less common 1%-3% than lower limb injuries 87%.

Goalkeepers are five time more likely to sustain an upper limb injury than an outfield player. The most common upper limb injury related to the shoulder resulting in a shoulder acromioclavicular joint sprain

which is recognised as a severe injury. Representing 17% of all injuries sustained to the upper limb resulting in longer time off compared to outfield players.

Position specific results suggest that goalkeeper lay off time is significantly greater than outfield players especially if a goalkeeper sustained a shoulder acromioclavicular joint injury $p<0.05$. Further, high quality research is required to evaluate hand and wrist injuries in professional footballers.

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