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Review article

Analysis of the most frequent injuries in lower limbs in football

Análisis de las lesiones más frecuentes en miembros inferiores en el fútbol

Análise das lesões mais frequentes nos membros inferiores do futebol

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ABSTRACT

Introduction: The present research originated from the notable increase in injuries in football players in Honduras.

Objective: The objective was to know the most frequent injuries and identify their location, classification and risk factors.

Material and methods: The study used the indirect or non-interactive qualitative empirical method: consultation of official documents through the search in the database, PMC US National Library of Medicine, the keywords were used: football, most frequent injuries and risk factors, remaining 28 documents directly related to the theme.

Results: The main results focus on the review carried out where it was verified that the most frequent lower limb injuries in football are located in: thigh-ankle, groin-hip, quadriceps-hamstrings, internal, cruciate and external ligaments. Regarding the classification, it was found that of the sports prevention group of the Spanish Society of Sports Medicine and that assumed by the Union of European Football Federations (UEFA) Champions League. Among the risk factors identified are: altered biomechanics of movement, body composition, previous injuries, flexibility deficit, insufficient development of endurance to isometric strength of the stabilizing muscles, muscle-tendon imbalance between quadriceps and hamstrings and the upper load volumes and training hours.

Conclusion: The present study allowed assessing the most frequent injuries of the in lower limbs in football.

Keywords: Injuries; Football; Location; Risk factors.

RESUMEN

Introducción: La presente investigación se originó a partir del notable incremento de lesiones en futbolistas de Honduras.

Objetivo: El objetivo fue conocer las lesiones más frecuentes e identificar su localización, clasificación y factores de riesgo.

Materiales y métodos: El estudio utilizó el método empírico cualitativo indirecto o no interactivo: consulta a documentos oficiales a través de la búsqueda en la base de datos, PMC US National Library of Medicine se utilizó las palabras claves: futbol, lesiones más frecuentes y factores de riesgos quedando 28 documentos relacionados directamente con la temática.

Resultados: Los principales resultados se centran en la revisión realizada donde se verificó que las lesiones más frecuentes de miembros inferiores en el fútbol se localizan en: muslo-tobillo, ingle-cadera, cuádriceps-isquiotibiales, ligamento interno, cruzado y externo. Referente a la clasificación se encontró la del grupo de prevención en el deporte de la Sociedad Española de Medicina del Deporte y la asumida por la Unión de Federaciones Europeas de Fútbol (UEFA) Champions League. Entre los factores de riesgos identificados se evidencian: la biomecánica alterada del movimiento, composición corporal, lesiones previas, déficit de flexibilidad, insuficiente desarrollo de la resistencia a la fuerza isométrica de los músculos estabilizadores, desbalance músculo-tendón entre cuádriceps e isquiotibiales y los altos volúmenes de cargas y horas de entrenamiento.

Conclusiones: El presente estudio permitió valorar las lesiones más frecuentes de miembros inferiores, su localización y factores de riesgo en el fútbol.



Palabras clave: Lesiones; Fútbol; Localización; Factores de riesgo.

SÍNTESE

Introdução: A presente pesquisa teve origem no notável aumento do número de lesões em jogadores de futebol em Honduras.

Objetivo: O objetivo era descobrir as lesões mais freqüentes e identificar sua localização, classificação e fatores de risco.

Materiais e métodos: O estudo utilizou o método empírico qualitativo indireto ou não interativo: consulta de documentos oficiais através de uma pesquisa no banco de dados da PMC US National Library of Medicine, utilizando as palavras-chave: futebol, lesões mais freqüentes e fatores de risco, deixando 28 documentos diretamente relacionados com o assunto.

Resultados: Os principais resultados estão centrados na revisão realizada onde foi verificado que as lesões mais freqüentes nos membros inferiores do futebol se localizam em: coxa, virilha, quadríceps-ischiotibial, ligamento interno, cruciforme e externo. Com relação à classificação, encontramos a do grupo de prevenção no esporte da Sociedade Espanhola de Medicina Esportiva e a assumida pela Liga dos Campeões da União das Federações Europeias de Futebol (UEFA). Entre os fatores de risco identificados, são evidentes os seguintes: biomecânica alterada do movimento, composição corporal, lesões anteriores, déficit de flexibilidade, desenvolvimento insuficiente da resistência isométrica de força de músculos estabilizadores, desequilíbrio músculo-tendão entre quadríceps e tendões e altos volumes de cargas e horas de treinamento.

Conclusões: O presente estudo nos permitiu avaliar as lesões mais freqüentes nos membros inferiores, sua localização e fatores de risco no futebol.

Palavras-chave: Lesões; Futebol; Localização; Fatores de risco.

INTRODUCTION

The injuries that occur in sports practice currently represent a field of study that is highly regarded, as Merayo (2011) points out:

Athletes in their search for perfecting sports techniques and obtaining a physical condition that leads to sporting achievements can make excessive increases in training loads. This could lead to overtraining, a state that decreases performance and there is an obvious physical cause, illness or injury. Situation that persists over time despite the existence of weekly or monthly periods of recovery (p 15).

Football is a sport that is currently on the rise, more and more people practice it, enjoy it, work and invest in it, where physical condition is essential together with the development of motor skills. This sport has moved to a higher level compared to other types of ball sports. A similar idea is proposed by the International Federation of Football Associations (FIFA) (FIFA, 2016 p.19) when stating: "Football is the sport with the greatest popularity and social impact worldwide. More than 200 million people practice this sport, both in the amateur and professional fields."



For his part, **Garcia et al. (2015)**:

Within the sample, 72.5 % were men and 27.5% women; as well as 74.4 % were subjects up to 35 years of age and the remaining 25.6 %, older than 35 years. The sport that generated the highest number of injuries was football, 27.6 % of all accidents... (p.1).

Regarding injuries in football, **Junge & Dvořák (2015)** specifically refer, "Analyzing the last absolute world championships, with an average of 1.68 injuries per game, training and game" (p.14). The high injury rate is striking, which should be considered surveillance, control and prevention.

The bibliographic search carried out on epidemiological data of sports injuries in Honduran football, so far no official studies have been found that reveal the incidence, prevalence and severity of injuries in the professional and amateur field. The objective was focused on knowing the most frequent injuries and identifying their location, classification and risk factors as a way to guide coaches, physiotherapists, physical trainers and administrative staff linked to the Honduran National Professional Football League.

To develop the study, the indirect or non-interactive qualitative empirical method was used: consultation of official documents according to **Estévez et al. (2004)**. 28 scientific articles found in the PMC database were consulted using the search term Football AND more frequent injuries OR risk factors for the period 2011-2021 and master's theses, doctoral theses and digital books that are related to the search term were analyzed.

DEVELOPMENT

Classification and types of sports injuries

At present, professionals linked to sports medicine have not found a single definition for sports injury.

The Sports Prevention Group of the Spanish Society of Sports Medicine (SEMED-FEMEDE) proposes the following classification of sports injuries **Valle et al. (2018) p. 10**, (Table 1).

Table 1. - Classification and types of sports injuries

According to the mechanism of injury	Acute	They have a sudden onset (traumatic or non-traumatic) caused by a fall, a collision with another athlete or an object, a bad technical gesture or a load that exceeds physiological limits.	
	Chronicles	They have a slow and insidious onset, with a gradual increase in discomfort, and do not depend on a single traumatic episode. Acute injuries that do not heal can also end up carnifying.	
	Due to overuse	It is due to the repetition of similar movement patterns or prolonged training sessions over time.	
According to gravity	Taking into account the days of sports leave	Very mild (0-1 day) Mild (2-3 days) Minors (4-7 days) Moderate (8-28 days) Serious (+ 28 days)	
According to the	Straight	Due to an agent external to the athlete (impact against an opponent or any object related to the sport)	



production mechanism	Indirect	No agent external to the athlete intervenes
Based on recurring injuries	Early	A recurrent injury that occurs within 2 months of the player's return to full sport participation.
	Late	If it occurs between 2 and 12 months after the player returns to sports practice.
	Delayed	If it occurs after 12 months of the athlete's return to sports activity

The following examples constitute an extension to what was proposed by *Valle et al. (2018)* in table 1:

- Rupture (tendons-ligaments) (acute injury).
- Pubalgia, plantar fasciitis, muscle tear (chronic injury).
- Cramps, stiffness, contractures (due to overuse).
- Pain due to accumulation of lactic acid (very mild), inflammation of the joint capsule of the knee (mild), stiffness (moderate), muscle contracture (serious).
- Fracture (direct injury).
- Heat stroke (indirect injury).
- Grade evaluation of a sprain (early injury).
- Evolution of dislocation to subluxation (late injury).
- Concussion to CVD (delayed injury).

A similar idea was addressed by Walden *et al.* (2007) in their study with teams from the European Union of Football Associations (UEFA) Champions League, making it possible to classify injuries according to severity (p. 13). (Table 2).

Table 2. - Classification and types of sports injuries in football assumed by the UEFA CHAMPIONS LEAGUE *Walden et al. (2007)*

Type of classification to consider	Injury condition	Lesion classification	Approximate time in injury situation
According to its severity	Taking into account the days of sports leave	Minor severity	(4-7 days)
		Mild	(+ 3 days)
		Moderate	(8-28 days)
		Severe	(+ than 28 days)

Incidence and severity of injuries have been found in football in Kosovo, where *Shalaj et al. (2016)* monitored the existence of injuries in 11 teams (143 players) from the 1st division of Kosovo. A total of 272 injuries were observed, highlighting the traumatic injuries that respond to 71 %. Injury incidence is listed per 1,000 hours of training



exposure. Strains and ruptures of thigh muscles, knee ligament, meniscus and cartilage injuries represent the most frequent.

Ligament injuries most often occur during dynamic movements, such as jump-landing decelerations, maneuvers in which high-risk movement patterns are present Read *et al.* (2016) and are related to muscle injuries that originate during eccentric muscle contraction Isern -Kebschull *et al.* (2020).

kuzhara *et al.* (2017) in their study verify the incidence of injury mechanisms in 89 football players during games and training in Nagoya, Japan. They note that the overall injury rate was 2.59/1000 athlete-hours (AHs). The injury rate in the game (6.43/1000 AHs) was significantly higher in training (1.49/1000 AHs; $p < .05$). The most common anatomical areas of injury during games and training were the lower limbs (62.5 % and 4.02/1000 HAs versus 38.5 % and 0.57/1000 HAs, respectively). Contusions (27.6 %) were the most frequent type of injury. Most of the injuries presented were due to body contact (43.8 %, 2.81/1000 AHs), considering that injuries from other types of contact (53.8 %, 0.83/1000 AHs) were the most prevalent in training.

Owoeye *et al.* (2017) express that 756 players aged 1832 years (356 males and 300 females) from 22 different teams in the Nigerian National Football Tournament were followed up on incidences of injuries. They found the overall incidence to be 113.4 injuries/1000 h (with a 95 % confidence interval of 93.7 to 136.0) equivalent to 3.7 injuries/match and the lost-time incidence to be 15.6 injuries/1000 for male players and 65.9 injuries/1000 h (with a 95 % confidence interval of 48.9 to 86.8) equivalent to 2.2 injuries/games and time-loss incidence of 7.9 injuries/1000 h for female players. The male player had a significantly higher risk of injury for an incidence rate that is understood as incidence rate ratio (IRR), $IRR = 1.72$ (with a 95 % confidence interval of 1.23 to 2.45). The most frequent lesions are located in the lower limbs for both genders ($n = 81$, 70 % and $n = 31$, 62 % for males and females, respectively). The lowest was contusion of the leg ($n = 22$, 19%) and sprain of the knee ($n = 9$, 18 %) was the most common specific injury in both sexes. The majority of injuries were as a result of contact with another player ($n=102$, 88%males and $n=48$, 96%females). Male players had a significantly higher risk of injury [$IRR = 1.72$ (95 % CI 1.232.45)].

Gaspar-Junior *et al.* (2019) demonstrated, that the number of injuries per athlete ranges between 0.92 and 1.43. Tendon muscle injuries, in localized joints and in the lower limbs are the most prevalent with significant differences compared to other types ($p < 0.05$).

The proportion of the lesion was defined by Lundblad *et al.* (2020) defined the injury rate as the number of injuries per 1000 hours (h) of games and in the study found that 128 athletes sustained injuries to the lateral cruciate ligament (LCL) and 28 to the posterior cruciate ligament (PCL). occurring during 2,554,686 h of exposure (rate 0.05 and 0.01/1000 h, respectively). Medial rest time for LCL lesions was 15 (Q1=7, Q3=32) days, for PCL lesions 31 days (Q1=15, Q3=74). It was found that 25 % of the rest time for LCL injuries is under 7 days and 75 % is under 32 days, in particular PCL injuries 25 % of the rest time is under 15 days and 75 % are below 74 days. The LCL injury rate in matches was 11 times higher than the injury rate in training (0.21 vs. 0.02/1000 h, rate ratio [RR] 10.5, 95 % CI 7.3 to 15.1 $p < 0.001$) and the rate of PCL injury in matches was 20 times higher than the injury rate in training (0.056 vs 0.003/1000 h, RR 20.1, 95 %, CI 8.2 to 49.6, $p < 0.001$).



The study by **Ralston et al. (2020)** between 2004 and 2014, reports that there were 439 hip or groin injuries in football players and a general injury rate of 0.57 per 1000 injuries and when football players were exposed (Aes). Injury occurrence was similar during the regular session and after the session (IRR, 0.96; 95% CI, 0.59-1.58). Injury occurrences were higher during competition (0.69/1000 Aes) than during training (0.52/1000 Aes) (IRR, 1.33; 95 % CI, 1.08-1.63).

A total of 255 injuries of 240 players from 8 professional football teams in Germany reported that the body area affected by the injury was: knee (78.2 %), foot (46.2 %), joint dislocation (100 %), ligament rupture (82.9 %), the fracture (73.3 %). More severe specific injuries were reported, such as in the Kruttsch anterior cruciate **ligament et al., (2020)**.

The most common injuries are located in the lower limbs (60-90 %), more frequently in the knee, ankle and thigh **Owoeye et al. (2020)** and hamstrings **Junge and Dvorák (2015)** and **Pfrrmann groin (2016)** on the players.

Injuries risk factors

Read et al. (2016b) refer to that the accumulation of high hours of training and the impact of increased volume for young athletes who are experiencing a range of growth and maturation influence the risk of injury. In this sense, the authors recommend proposals that include a reduced volume of training in the growth and maturation phases and guidelines for the provision of a greater variety of physical activities that are integrated into the components of the program.

The study by **Todeschini et al. (2019)** analyzed 39 professional football players, recording data such as: age, position on the field, Body Mass Index (BMI), weekly training load, duration of the race and history of thigh injuries. / knee and lumbar pain found in 15 players with pubalgia, two of them with inguinal hernia, referring an association between pubalgia and high BMI ($p=0.032$). Four players with pubalgia had alterations in the common aponeurosis of the rectus abdominis muscles/long abductors, while no participant in the control group had these alterations ($p=0.017$).

In this perspective, **Todeschini et al. (2019)** conclude that the evaluation of athletic pubalgia should be carried out with radiography, ultrasound and magnetic resonance imaging. A high BMI, muscle lesions, geodes and osteophytes are findings associated with pubalgia; US has low sensitivity for detecting lesions of the rectus abdominis/adductor longus muscle aponeurosis.

Orejel et al. (2021) mention as determining risk factors the: altered biomechanics of the Rum movement **et al. (2021)**, Morphology and Anatomical Factors **Sandrey et al. (2018)**, **Rappole body composition et al. (2017)**, Altered bone density or vitamin D level **Rappole et al. (2017)**, **Nagai age et al. (2017)**, **Nagai stress fractures et al. (2017)**, likewise, the following can be mentioned:

- Previous injuries.
- Physical overload and fatigue.
- Flexibility deficit.
- Insufficient development of the isometric strength endurance of the stabilizer muscles.



- Muscle-tendon imbalance between muscle contraction of the quadriceps, hamstring, and hamstrings.
- High volumes of loads and hours of training.
- Little eccentric training.
- Specific jobs such as intramuscular coordination.

Following the identification of injury risk factors, Read *et al.* (2016a) advocate the necessary development of individualized programs to reduce their risk and the most frequent injuries. It should be noted that from the field of intervention of physical activity and sport, physical exercise, warm-up, postural, strength, flexibility, balance, eccentric, proprioceptive training, for stabilizing muscles, can be implemented as primary prevention measures and work in arthromuscular imbalances are viable, accessible and feasible alternative to prevent injuries in football.

CONCLUSIONS

The present study allowed to assess the most frequent injuries of the lower limbs, their location and risk factors in football. The most vulnerable areas of the body to suffer injuries were ankle, knee and thigh. Among the risk factors identified, altered biomechanics of movement, body composition, previous injuries, lack of flexibility, insufficient development of endurance to isometric strength of the stabilizing muscles, muscle-tendon imbalance between quadriceps and hamstrings, stood out. the high volumes of loads per hour in the training and the control of the hours of games which must be considered to propose a design of physical exercise protocols and/or preventive training programs.

Regarding the classification, the following were found: that of the sports prevention group of the Spanish Society of Sports Medicine and that assumed by the Union of European Football Federations (UEFA) Champions League.

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Conflict of interests:

The authors declare not to have any interest conflicts.

Authors contribution:

The authors have participated in the writing of the work and analysis of the documents.



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