

UNIVERSIDADE FEDERAL DE CIÊNCIAS DA SAÚDE DE PORTO ALEGRE
PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS DA REABILITAÇÃO

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**Desvendando as lesões na elite do
futebol feminino brasileiro: um
estudo de coorte prospectivo**

UFCSPA
Universidade Federal de Ciências da Saúde
de Porto Alegre

Porto Alegre

2023

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Dissertação submetida ao Programa de Pós-Graduação em Ciências da Reabilitação da Universidade Federal de Ciências da Saúde de Porto Alegre como requisito para a obtenção do grau de Mestre

Orientador: Prof. Dr. Bruno Manfredini Baroni

Porto Alegre

2023

Catálogo na Publicação

Gasparin, Gabriela Bissani

Desvendando as lesões na elite do futebol feminino brasileiro: um estudo de coorte prospectivo / Gabriela Bissani Gasparin. -- 2023.

48 f. : il., tab. ; 30 cm.

Dissertação (mestrado) -- Universidade Federal de Ciências da Saúde de Porto Alegre, Programa de Pós-Graduação em Ciências da Reabilitação, 2023.

Orientador(a): Prof. Dr. Bruno Manfredini Baroni.

1. Futebol. 2. Feminino. 3. Epidemiologia. 4. Lesão.
I. Título.

**Desvendando as lesões na elite do futebol feminino brasileiro:
um estudo de coorte prospectivo**

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2023

AGRADECIMENTO

Ao Dr. Bruno Manfredini Baroni, por ter depositado sua confiança em mim para a realização deste projeto de extrema importância. Sou grata pela oportunidade ímpar que me foi concedida ao orientar-me não somente neste estudo, mas também durante o período final da minha graduação, permitindo-me colaborar em outros dois trabalhos já publicados em excelentes revistas científicas.

Às fisioterapeutas voluntárias por tornarem esse trabalho possível.

Aos professores do Curso de Fisioterapia e do Programa de Pós Graduação em Ciências da Reabilitação da Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA) pelos ensinamentos que recebi desde o meu ingresso na vida acadêmica.

Aos meus colegas do Grupo de Ciência no Esporte e Exercício pelos conhecimentos compartilhados ao longo dos anos.

Aos meus pais, Roberto e Luciana, minha irmã, Carolina, e meu namorado, João. Agradeço imensamente pelo apoio (em todos os sentidos da palavra), paciência e torcida ao longo da minha jornada até aqui.

A todos que de alguma forma contribuíram para que este projeto fosse desenvolvido.

RESUMO

O objetivo deste estudo foi examinar prospectivamente os padrões de lesões no futebol feminino de elite no Brasil. Foram coletados dados referentes a quatro clubes participantes da primeira divisão do Campeonato Brasileiro sobre as lesões, tempo de exposição em jogos e sessões de treinamento. Durante a temporada, 63 de um total de 133 jogadoras (47,37%) sofreram 112 lesões, resultando em uma média de 0,84 lesões por jogadora. O índice geral de lesões foi de 5,02 lesões a cada 1000 horas de exposição. As lesões de início súbito ocorreram com uma taxa de 3,99 a cada 1000 horas de exposição total, 15,88 a cada 1000 horas durante os jogos e 2,64 a cada 1000 horas durante as sessões de treinamento. Quarenta e oito por cento das lesões foram atribuídas a eventos não relacionados a contato direto. As lesões de início gradual representaram 21% do total, resultando em uma taxa de 1,03 lesões a cada 1000 horas de exposição total. O local mais afetado foi o joelho (30% de todas as lesões), seguido pela coxa (28%), tornozelo (17%) e quadril/virilha (13%). O tecido mais afetado foi o músculo/tendão (47% de todas as lesões), seguido por ligamento/cápsula articular (33%), osso (10%) e cartilagem/sinóvia/bursa (7%). Destaca-se que entorses de tornozelo, distensões de isquiotibiais e lesões do ligamento cruzado anterior (LCA) representaram mais de um terço das lesões. Lesões leves, moderadas e graves corresponderam a 40%, 43% e 17% dos casos, respectivamente. No geral, 18% dos casos foram classificados como re-lesões, e 40% dessas ocorreram dentro de 2 meses da lesão inicial. Este estudo forneceu informações inéditas sobre o perfil de lesões no futebol feminino de elite no Brasil. Essas informações devem orientar as equipes de saúde na elaboração de futuros programas de prevenção de lesões.

Palavras-chave: futebol; feminino; epidemiologia; lesão.

ABSTRACT

The objective of this study was to prospectively examine injury patterns in elite-level women's football in Brazil. Data on exposure time in matches and training sessions, as well as time-loss injury cases, were collected from four clubs participating in the Brazilian top-tier league. Sixty-three out of 133 players (47.37%) sustained 112 time-loss injuries along the season, leading to 0.84 injuries per player on average. The overall injury rate was 5.02 injuries per 1000 hours of exposure. Sudden onset injuries occurred at a rate of 3.99/1000 hours of overall exposure, with rates of 15.88/1000 hours during matches and 2.64/1000 hours during training sessions. Forty-eight percent of the time-loss injuries were attributed to non-contact events. Gradual onset injuries accounted for 21% of the injuries, resulting in a rate of 1.03/1000 hours of overall exposure. The most affected location was the knee (30% of all injuries), followed by thigh (28%), ankle (17%), and hip/groin (13%). Muscle/tendon was the most affected tissue (47% of all injuries), followed by ligament/joint capsule (33%), bone (10%), and cartilage/synovium/bursa (7%). Notably, ankle sprains, hamstring strains, and ACL injuries accounted for over one-third of the injuries. Mild, moderate, and severe injuries account for 40%, 43%, and 17% of cases, respectively. Overall, 18% of cases were categorized as re-injuries, and 40% of those occurred within 2 months of the index injury. In conclusion, this study has provided unprecedented insights into the injury patterns of Brazilian elite women's football. Such information should guide health staffs in designing future injury prevention programs.

Key-words: soccer; female; epidemiology; injury.

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LISTA DE ABREVIATURAS E SIGLAS

FIFA	Fédération Internationale de Football Association
USA	United States of America
ACL	Anterior Cruciate Ligament
MCL	Medial Collateral Ligament
DOMS	Delayed-Onset Muscle Soreness
CONMEBOL	Confederación Sudamericana de Fútbol

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1 CONTEXTUALIZAÇÃO

O futebol é considerado o esporte mais popular do mundo, sendo predominantemente praticado por indivíduos do sexo masculino. Em 2014 estimava-se que 80% dos atletas fossem homens (Arliani et al., 2014). Na última década é notório o crescimento do futebol feminino, a modalidade está despertando cada vez mais o interesse de torcedores, patrocinadores, emissoras, ligas e clubes historicamente masculinos (FIFA Benchmarking Report Women's Football, 2021) Fédération Internationale de Football Association 2019 Women's Football Strategy pretende dobrar as taxas de participação de mulheres no futebol chegando à 60 milhões até 2026 (Mayhew et al., 2021), além de desenvolver estratégias para que a modalidade seja cada vez mais reconhecida. No Brasil hoje existem 16 equipes profissionais que disputam a principal divisão do Campeonato Brasileiro de Futebol Feminino, sendo 94% das equipes associadas a um clube inicialmente fundado para o futebol masculino (FIFA Benchmarking Report Women's Football, 2021).

As altas demandas físicas da rotina de treinamentos e jogos e as exposições ao contato físico (direto e indireto) colocam as atletas em um potencial risco de lesão (Lopez-Valenciano et al., 2021). O processo de ascensão do futebol feminino no Brasil tende a aumentar a competitividade entre as equipes, o que provavelmente resulte em um proporcional aumento do número de lesões (Rodriguez et al., 2018). As lesões acabam sendo motivo para a aposentadoria de alguns jogadores (Drawer & Fuller, 2001), podendo reduzir a capacidade funcional e qualidade de vida por diversos anos após a aposentadoria (Cunningham et al., 2020).

Apesar do desenvolvimento do futebol feminino em todo o mundo os estudos científicos voltados à essa modalidade ainda são escassos. Um artigo recente (Kirkendall, 2020) buscou a história do futebol como objeto de trabalhos acadêmicos e demonstrou que apenas 25% dos artigos incluíam participantes do sexo feminino. Sabe-se da necessidade de pesquisas epidemiológicas que descrevam as características das lesões com o objetivo de preveni-las (Roe et al., 2017). Sendo assim, existem estudos que visam guiar e padronizar trabalhos que buscam verificar a incidência de lesões no futebol (Bahr et al., 2020; Fuller et al., 2006). Esses guidelines recomendam a coleta de uma série de dados

visando a caracterização de lesões com o objetivo de categorizá-las, além disso, orientam quanto ao registro do tempo de exposição de atletas à treinos e jogos.

Ao registrar uma lesão é necessário que a mesma seja vinculada à uma atleta, portanto, devem ser coletados dados basais como: nome da jogadora, idade, dominância, posição, estatura e peso. Informações como lado lesionado, momento da lesão, modo de início e mecanismo de lesão são imprescindíveis (Bahr et al., 2020; Fuller et al., 2006). O tipo de lesão deve ser categorizado, recomenda-se a divisão (Bahr et al., 2020): músculos e tendões, sistema nervoso, ossos, cartilagens e seus componentes, ligamentos e cápsula articular, tecidos superficiais e pele, e, órgãos internos. Além disso, o local corporal afetado também deve ser registrado (Bahr et al., 2020; Fuller et al., 2006).

Para obtenção das taxas de incidência de lesões, apresentadas como desfechos, é necessário o registro do tempo de exposição de cada atleta, ou seja, deve ser realizado um monitoramento individual da quantidade de horas em que cada jogadora esteve exposta à períodos de treinamento ou jogos (Bahr et al., 2020; Fuller et al., 2006). Os guidelines recomendam que esse controle deve ser feito por meio de planilhas de forma diária ou no máximo semanal. As taxas de incidência de lesões devem ser descritas no seguinte formato: número de lesões/1000 horas (Bahr et al., 2020). A exposição deve ser dividida em jogos, sendo definidos como qualquer partida entre times diferentes, e, treino, onde estão contempladas as atividades físicas individuais e em equipe, períodos de aquecimento pré-jogo e resfriamento pós jogo (Fuller et al., 2006).

Uma revisão sistemática com metanálise publicada nesse ano (Horan et al., 2023) reuniu 17 estudos com dados de incidência de lesões no futebol feminino de elite publicados até 2021. Como resultado, foi encontrada uma taxa de incidência geral de lesões de 5,63/1000 horas de exposição. A incidência de lesões durante jogos foi quase 6 vezes maior do que em treinos (19,07 lesões/1000 horas e 3,27 lesões/1000 horas, respectivamente). As lesões musculares e tendíneas foram as mais frequentes. O membro inferior foi o mais afetado, seguido pelas lesões de cabeça e pescoço. A maior parte das lesões foi considerada como de severidade moderada.

Outra revisão sistemática com metanálise publicada recentemente (Lopez-Valenciano et al., 2021) reuniu 22 estudos com dados de incidência de lesões no futebol feminino publicados entre 1989 e 2019, sendo a amostra

composta por atletas profissionais e amadoras. Em relação à nacionalidade: 4 trabalhos continham dados de países combinados, 5 estudos foram realizados na Suécia, 4 na Alemanha, 4 nos Estados Unidos, 3 na Noruega, 1 na Nigéria, 1 na Espanha e 1 em Trindade e Tobago. Como resultado, foi encontrada uma taxa de incidência geral de lesões de 6,1/1000 horas de exposição. A incidência de lesões durante jogos foi quase 6 vezes maior do que em treinos (19,2 lesões/1000 horas e 3,5 lesões/1000 horas, respectivamente). As lesões musculares e tendíneas foram as mais frequentes, seguidas por lesões articulares e ligamentares, frequentemente associadas à algum mecanismo traumático. O membro inferior foi o mais afetado, seguido pelo tronco e pelas lesões de cabeça e pescoço. Especificamente em relação à extremidade inferior, foram contabilizadas em maior quantidade lesões de tornozelo, joelho, coxa, canela/tendão de Aquiles e quadril/virilha. A maior parte das lesões foi considerada como de severidade leve, em segundo lugar foram registradas lesões de severidade moderada. As lesões graves ocorreram na proporção de 1,1/1000 horas, sendo considerados eventos mais raros em relação as demais. O mecanismo de lesão foi dividido em apenas duas categorias nesse estudo, sendo a incidência de lesões traumáticas superior às que ocorreram por overuse/uso excessivo (4,1 e 1,6 respectivamente.).

Chama a atenção que as revisões supracitadas (Horan et al., 2023, Lopez-Valenciano et al., 2021) não tenham encontrado qualquer artigo que apresentasse a incidência de lesões do futebol feminino brasileiro ou tenha discutido as diferenças entre os achados estratificados por nacionalidade. Curiosamente, a mesma escassez de estudos epidemiológicos é observada no futebol masculino. Apesar da imensa tradição do Brasil no futebol masculino, não há estudos prospectivos acerca da incidência de lesões em atletas profissionais que atuam no futebol brasileiro. Um estudo prospectivo recente foi publicado com dados provenientes das categorias de base (10 a 20 anos de idade; n=228) de futebol masculino (Cezarino et al., 2020), mostrando que a taxa de incidência geral de 1,86 lesões a cada 1000 horas de exposição (8,14 lesões/1000 horas e 1,41 lesões/1000 horas de jogos e treinamentos, respectivamente). Porém, no que tange os atletas profissionais, existe uma lacuna tanto no futebol masculino quanto feminino do Brasil.

Apesar da ascensão do futebol feminino no Brasil e no mundo, diversos fatores colaboram para que o contexto seja consideravelmente diferente do futebol masculino. Uma análise superficial das realidades dessas duas modalidades permite concluir que, em geral, clubes de futebol feminino apresentam inferioridade em termos de estrutura física e de recursos humanos em relação aos seus pares do futebol masculino. Além disso, há especificidades relacionadas ao sexo, ao perfil das atletas, as rotinas de treinamento e ao calendário de competições, distanciando o futebol masculino do feminino. Como consequência, a utilização de informações provenientes de estudos desenvolvidos com atletas de futebol masculino pelos profissionais de saúde que atuam no futebol feminino pode levar a tomadas de decisão precipitadas. É imprescindível que estudos sejam desenvolvidos exclusivamente com o futebol feminino para que os processos internos, por exemplo, em relação às estratégias de prevenção de lesões, tenham maior possibilidade de sucesso possível. Nesse sentido, conhecer a realidade que permeia a epidemiologia das lesões que afetam as atletas profissionais de futebol feminino que atuam no Brasil é um passo fundamental.

2 OBJETIVOS

Objetivo Geral

Verificar a incidência de lesões em atletas profissionais de futebol feminino no Brasil.

Objetivos Específicos

- Verificar a taxa de lesões geral, em treinamentos e jogos envolvendo atletas profissionais de futebol feminino do Brasil;
- Verificar os mecanismos de lesões mais frequentes em atletas profissionais de futebol feminino do Brasil;
- Verificar as regiões corporais mais afetadas em atletas profissionais de futebol feminino do Brasil;
- Verificar os tipos de lesões mais frequentes em atletas profissionais de futebol feminino do Brasil;
- Verificar o tempo de afastamento das diferentes lesões em atletas profissionais de futebol feminino do Brasil;
- Verificar a recorrência das diferentes lesões em atletas profissionais de futebol feminino do Brasil.

3 ARTIGO 1

(Formatado conforme normas do periódico *Scandinavian Journal of Medicine & Science in Sports* – Qualis A1, Fator de Impacto 4.645)

Section IV: Sports Medicine & Orthopaedics

Uncovering Injuries in Brazilian Elite Women's Football: A Prospective Cohort Study

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Acknowledgements

G.B.G. thank CAPES-Brazil for the scholarship.

B.M.B. thank CNPq-Brazil for the research productivity fellowship.

Uncovering Injuries in Brazilian Elite Women's Football: A Prospective Cohort Study

ABSTRACT

The objective of this study was to elucidate the injury profile in Brazilian elite women's football. Data on match and training exposure time, as well as time-loss injury cases, were collected from four clubs participating in the Brazilian top-tier league. Sixty-three out of 133 players (47.37%) sustained 112 time-loss injuries along the season, leading to 0.84 injuries per player on average. The overall injury incidence rate was 5.02 injuries per 1000 hours of exposure. Sudden onset injuries occurred at a rate of 4.22/1000 hours of overall exposure, with rates of 15.88/1000 hours during matches and 2.90/1000 hours during training sessions. Forty-eight percent of the time-loss injuries were attributed to non-contact events. Gradual onset injuries accounted for 16.07% of the injuries, resulting in a rate of 0.81/1000 hours of overall exposure. The most affected location was the knee (29.46% of all injuries), followed by thigh (28.57%), ankle (17%), and hip/groin (13%). Muscle/tendon was the most affected tissue (47% of all injuries), followed by ligament/joint capsule (33%), bone (10%), and cartilage/synovium/bursa (7%). Ankle sprains, hamstring strains, and anterior cruciate ligament injuries accounted for over one-third of the injuries. Mild, moderate, and severe injuries account for 40%, 43%, and 17% of cases, respectively. Overall, 18% of cases were categorized as re-injuries, and 40% of those occurred within 2 months of the index injury. In conclusion, this study has provided unprecedented insights into the injury profile of Brazilian elite women's football. Such information should guide health staffs in designing future injury prevention programs.

Key-words: soccer, female, epidemiology, injury.

INTRODUCTION

In the past decade, women's football (soccer) has experienced remarkable growth and has garnered increasing interest from fans, sponsors, broadcasters, leagues, and historically male-dominated clubs¹. Women's football is played in more than 100 countries and the 2019 Women's Football Strategy, by the *Fédération Internationale de Football Association* (FIFA), aimed to double participation rates to 60 million by 2026². The evolution of this sport is unmistakably reflected in the dynamic nature of the matches played at the elite competition level. Although the average total distance covered by athletes seems to have remained around 10,000 meters per match over the past decade^{3,4}, there is an undeniable increase in the match intensity. As an example, the distances covered per match by national teams in the highest speed zone witnessed a significant increase of 29% from the Canada 2015 Women's World Cup to the France 2019 Women's World Cup⁵. At the same time, there is a trend towards an increased number of matches being played per season by elite clubs. In 2022 season, for instance, winners from the United States of America (USA) top-tier league and the top-4 European leagues (France, Germany, Spain, and England)⁶ played 22 to 30 official matches.

The intense physical requirements of training and matches, along with the likelihood of both direct and indirect physical contact, expose female footballers to potential injury risks⁷. Injuries can significantly impact both the performance and financial aspects of a team⁸, as well as harming the health and career of players⁹. Consequently, injury prevention stands as a primary concern in modern football medicine. The initial step towards addressing this concern involves determining the scope of the injury issue, including understanding the incidence, severity, and injury profile¹⁰. In the context of elite women's football leagues, prospective injury surveillance studies have been conducted in Europe (Germany^{11,12}, Belgium/Netherlands¹³, Norway^{14,15}, Sweden¹⁶⁻¹⁸, Spain¹⁹, and Ireland²⁰), Africa (Nigeria)²¹, Central America (Trinidad and Tobago)²², and North America (USA)²³. According to a recent systematic review including 10 elite club football injury surveillance studies, players have sustained 5.63 injuries per 1000 hours of overall exposure, being 19.07/1000 hours and 3.27/1000 hours of match and training exposure, respectively²⁰. Collectively, data from different national leagues suggest that lower limb joint, ligament, muscle, and tendon injuries should be the focus of prevention programs for female footballers²⁰.

It is intriguing to observe that injury incidence rate is quite variable between the national leagues investigated so far, ranging from 12.5¹⁸ to 55.5²¹ injuries per 1000 hours of match exposure, and from 1.4¹² to 10.9²¹ injuries per 1000 hours of training exposure. This further emphasizes the importance of designing preventive programs that

are rooted in context-specific epidemiological data ²⁴. In this regard, the lack of epidemiological studies focusing on women's football in South America is striking, particularly given the prominent legacy of Brazil in this sport. The Brazilian women's national team has accomplished remarkable success, securing silver medals in both the Olympic Games and FIFA World Cup, in addition to eight South American Cup and three Pan American Games titles. Brazilian clubs have demonstrated their dominance in continental competitions, emerging victorious in 11 out of the first 14 editions of the *Copa Libertadores de America*. Over the course of the initial 10 editions of the Brazilian top-tier league, six distinct teams have risen as champions, underscoring the equilibrium inherent in this competition.

In summary, Brazilian women's football is acknowledged for its prominent position on the global stage of this sport, with the top-tier league experiencing a notable upward trajectory. Despite a few investigations describing factors related to the athletes' physical characteristics ²⁵ and match demands ²⁶, there is a lack of studies examining the injury profile in the elite level of Brazilian women's football. This gap poses a challenge to health staffs, as epidemiological data serves as the cornerstone for crafting targeted prevention programs. Hence, we conducted a prospective injury surveillance study with the aim of elucidating the injury profile within the realm of Brazilian elite women's football.

METHODS

Study design

We extended invitations to the top eight teams, based on the final standings of the 2021 season's Brazilian top-tier league, to partake in a prospective injury surveillance study in the 2022 season (January to December, according to the Brazilian football calendar). The health staff of the participating clubs diligently documented the time-loss injuries and the players' exposure time throughout the entire season. The study was approved by the ethics committee of the Federal University of Health Sciences of Porto Alegre (Porto Alegre, Brazil). All clubs granted informed consent to provide data for the survey. During the data collection process, athletes were assigned codes to ensure the confidentiality of their information.

Data collection and definitions

The instruments used to collect the data were developed in accordance with the International Olympic Committee (IOC) consensus statement ²⁷ and its football-specific extension ²⁸. Players' exposure in training and match play were recorded in Microsoft Excel spreadsheets shared online with investigators (see Supplementary material, S1).

For injury recording, an injury surveillance form was developed in the Research Electronic Data Capture – REDCap (Vanderbilt University, Nashville, TN, USA) (see Supplementary material, S2). Both instruments were created in Brazilian Portuguese language. Baseline characteristics of players, such as age, body mass and height, were gathered from the teams' preseason assessments or from the first assessment carried out by the health staff for athletes recruited during the season.

Prior to initiating data collection, the investigators conducted online training with the clubs' physical therapists. This was done to ensure precise data recording on both exposure spreadsheets and injury surveillance forms. Physical therapists received a concise guide containing written instructions detailing the study procedures. Furthermore, an investigator was accessible via WhatsApp anytime during the season to address any queries or uncertainties. The same investigator carried out a weekly follow-up of the spreadsheets and forms, and maintained systematic contact with the clubs' physical therapists to ensure consistent and accurate data capture.

Training exposure was defined as team-based and individual physical activities conducted by the team's coaching or fitness staff that were aimed at maintaining or improving players' football skills or physical fitness. Match exposure was defined as any participation in official and friendly matches along the season, including matches played by the club and by the national team.

Current consensus ^{27, 28} define injury as a *'tissue damage or other derangement of normal physical function, resulting from rapid or repetitive transfer of kinetic energy'*. In the present study, time loss from football activities served as the criterion for defining an injury occurrence. Hence, an injury was defined as any physical complaint incurred by a player during participation in a football match or training session that resulted in the player being unable to participate fully in a future football match or training session ²⁸. The study included only injuries that occurred during the 2022 season. It means that if a player was injured when entering the study, that injury was excluded from the analysis.

Injuries were stratified in sudden onset injuries and gradual onset injuries ^{27, 28}. A sudden onset injury was characterized as an injury in which there was an identifiable event. These injuries were stratified into training-related and match-related injuries, and classified by mechanism into non-contact (i.e., no evidence of disruption or perturbation of the player's movement pattern), direct contact (i.e., contact of a player or object over the injured site) and indirect contact (i.e., contact with body parts other than the injured site). A gradual onset injury was defined as being of insidious onset without any identifiable event. As recommended by consensus statements ^{27, 28}, injuries were categorized by location (e.g., thigh, knee, ankle), tissue (e.g., muscle/tendon, bone, ligament/joint capsule) and types (e.g., muscle injury, tendinopathy, joint sprain).

A player was considered injured until the club's health staff allowed her to return to full unrestricted participation in training or adjudged her to be available for match selection²⁸. Injuries were split into 3 categories of severity based on the number of days absent: mild (<7 days), moderate (8-28 days), and severe (>28 days)²⁷. A re-injury was defined as an injury of the same type and at the same site as an index injury, which occurs after a player has returned to full participation from the index injury)²⁷. An "early recurrence" consisted of a re-injury occurring within two months of a player's return to sport. If re-injury occurred between two to 12 months after a player's return to sport, it was considered a "late recurrence". Finally, if a re-injury occurred more than 12 months after a player's return to sport, it was considered a "delayed recurrence".

Data analysis

Descriptive statistics were calculated to characterize the players' exposure [mean, standard deviation (SD), 95% confidence interval (CI), and minimum and maximum]. The injury incidence rates (sum of injuries/sum of exposure hours × 1000) categorized by body region, tissue and type were calculated for overall exposure, as well as separately for match play and training for sudden onset injuries. Gradual onset injury incidence rates were calculated using the overall exposure. Distribution of minimal, moderate, and severe injuries were calculated, as well as distribution of early, late, and delayed re-injuries. Time loss from football activities was calculated for each specific injury type.

RESULTS

Sample characteristics

Six out of the eight invited clubs agreed to participate in the study. Two clubs discontinued their participation during data collection due to changes in the health staff. Consequently, four clubs completed the study and were included in data analysis. Overall, 133 players took part of this study. They were 23.48 ± 5.16 years old (range from 17 to 36 years old), $1.67 \text{ m} \pm 0.6$ cm height (1.49 to 1.89 m), 61.47 ± 6.95 kg body mass (43 to 81 kg).

Match and training exposure

During the 2022 season, the four clubs included in this study participated in their respective State Championships as well as the National Championship. Furthermore, one club played the top-tier continental competition (*Copa Libertadores de America*) and three clubs played friendly short tournaments. Clubs played 24 to 35 matches each and

performed 176 to 204 field training sessions along the season. Additionally, six players were selected for the senior national team, and 11 players for the under-20 national team. Those players participated in 19 national team matches (eight tournament matches and 11 friendly matches). Figure 1 illustrates the month-by-month exposure to match play and training along the season.

The total player exposure on the football field amounted to 22,292 hours, with 2,268 hours dedicated to match play and 20,024 hours allocated to training sessions (Table 1). Eighteen out of the 133 players had no participation in matches throughout the season. The average exposure per player was 17.05 ± 15.98 hours in match play and 150.56 ± 61.63 hours in training sessions (Table 1).

<< Table 1 >>

<< Figure 1 >>

Injury epidemiology

Sixty-three out of 133 players (47.37%) sustained 112 time-loss injuries along the season. Out of the total injuries, 94 cases (83.93%) were categorized as sudden onset injuries. These injuries have occurred by a non-contact mechanism in 54 cases (48.21% out of the total injuries), while 13 (11.61%) and nine (8.04%) injuries have occurred by direct and indirect contact events, respectively. Injury mechanism cannot be identified in 18 cases (16.07% out of the total injuries). The injury incidence rate was 5.02/1000 hours of overall exposure. The rate of sudden onset injuries was 4.22 injuries per 1000 hours of overall exposure, with a rate of 15.88/1000 hours during match play and 2.90/1000 hours during training. There were 18 cases (16.07% out of the total injuries) classified as gradual onset injuries, resulting in an incidence rate of 0.81 injuries per 1000 hours of overall exposure. Figure 1 provides a visual representation of the monthly distribution of sudden and gradual onset injuries throughout the season.

Players incurred 0.84 injuries per season on average. The most affected location was the knee (29.46% out of all injuries), followed by thigh (28.57%), ankle (16.96%), and hip/groin (13.39%) (see further details in Table 2). Muscle/tendon was the most affected tissue (47.32% of all injuries), followed by ligament/joint capsule (33.04%), bone (9.82%), and cartilage/synovium/bursa (7.14%) (see further details in Table 3).

Fifteen injured players did not return to sport before the end of the 2022 season, including 10 ACL injuries, 2 ankle sprains, 1 groin pain, 1 bone oedema in the knee, and 1 non-specific knee injury. Out of the 97 cases in which players returned to sport during the 2022 season, 40.21% of injuries resolved within 1 week, indicating a mild severity.

Moderate injuries, resulting in 8-28 days of lost playing time, accounted for 43.30% of cases, while severe injuries leading to more than 28 days of lost playing time constituted 16.49% of cases.

Twenty cases (17.86%) were categorized as re-injuries. Among these cases, 40% occurred within 2 months of the index injury (early re-injuries), 40% transpired between 2 and 12 months of the index injury (late re-injuries), and 20% transpired more than 12 months after the index injury (delayed re-injuries).

Collectively, ankle sprain, hamstring strain, and anterior cruciate ligament (ACL) injury accounted for over one third (38%) of the specific injuries sustained by players throughout the season (Table 4). Muscle fatigue/DOMS also contributed to a significant number of time-loss cases (14%), followed by adductor and quadriceps strain injuries (6% and 4% respectively), MCL injury (4%), and bone edema in the knee (4%). Table 4 presents the incidence rate and number of days lost due to the most prevalent injuries experienced by players during the 2022 season.

<< Table 2 >>

<< Table 3 >>

<< Table 4 >>

DISCUSSION

To the best of our knowledge, this study is the first prospective investigation on the injury profile among elite female footballers in South American teams. We adhered to the consensus statements on injury definitions and data collection procedures for football studies^{27, 28}, which allowed us to present comprehensive data on injury rates, as well as injury situation (match or training), mechanism (sudden or gradual onset), location, tissue/type, severity, and recurrence.

Injury incidence rate

The injury incidence rate observed in our study (5.02/1000 hours of overall exposure) was close to those reported in meta-analyses encompassing elite female footballers^{7, 29, 30}, which reported injury rates ranging from 5.6 to 6.1/1000 hours of overall exposure. Our findings indicate that players, on average, encountered 0.84 injuries per season, resulting in approximately 25 time-loss injuries for a 30-player team squad. Given that less than half (47%) of the study participants experienced the reported injuries and considering that approximately half of the squad consistently participates in the majority of the season's matches (representing the highest risk of injury), our findings

imply that the health staff of a Brazilian club should anticipate the likelihood of multiple injuries for each athlete in the starting lineup throughout the season.

When examining the injury rate throughout the season (see Figure 2), our findings draw attention to three specific time-points with increased risk of injury. Firstly, the pre-season period (January) is characterized by a high volume of training following the athletes' vacation period. Secondly, the start of the competitive season (March/April) brings forth the routine of high-intensity matches in the top-tier national competition. Lastly, the end of the season (November), where the accumulated fatigue from the year aligns with the state championship play-offs and finals. These findings serve as a valuable alert for practitioners to be mindful of these critical periods of heightened injury risk.

Situation and mechanism of injury

Our injury rate for match exposure (15.88/1000 hours) was slight smaller than the 19.1-19.5/1000 hours of match play previously reported ^{7, 29, 30}. Lopez-Valenciano et al.⁷ highlighted that top-5 leagues presented similar overall incidence rates than non-top 5 world ranking leagues, but higher match injury rate. It is noteworthy that the match injury rate identified in the Brazilian top-tier league is more similar to that of the top-5 world leagues (19.3/1000 hours) than to the non-top leagues (10.7/1000 hours)⁷. Furthermore, it is essential to clarify our rationale for exclusively considering sudden onset injuries in the specific tally of training/match injuries, as gradual onset injuries are likely attributed to a combination of both training and match workload scenarios. This approach has been used by recent prospective injury surveillance studies in woman' football ²⁰. Remarkably, the distribution of gradual onset injuries exhibited a relative consistency, regardless of fluctuations in training and match exposure over the course of the season (see Figure 2). This finding provides additional evidence in favor of presenting a unified rate of gradual onset injuries for the overall exposure.

In our study, 83.93% of injuries were categorized as sudden onset injuries. This percentage slightly surpasses the 76% of sudden onset injuries reported by a recent study conducted using similar data collection methods in the premier Irish league ²⁰. Non-contact injuries accounted for 48% of all reported injuries. Considering that a portion of the sudden onset injuries with unidentified mechanisms likely occurred without contact, our distribution of non-contact injuries would exceed half of the injuries recorded in this study. This notable incidence of sudden onset non-contact injuries presents an encouraging opportunity for health staffs to implement prevention programs. Certain injuries commonly associated with this type of mechanism, such as hamstring strain injury^{31, 32}, ankle sprain, and ACL, have shown positive responses to specific preventive

programs within women's football ^{31, 32}. In contrast to the relatively stable incidence of gradual onset injuries, the occurrence of sudden onset injuries exhibited significant variation throughout the season (see Figure 2). Notably, the month of July recorded the lowest number of cases, which coincided with the suspension of matches during the continental tournament for national teams (*CONMEBOL Copa America*). This observation suggests a plausible and likely association between match exposure and the occurrence of sudden onset injuries.

Injury location and tissue/type

Consistent with previous elite club injury surveillance studies, which reported an frequency ranging from 60% ³³ to 92% ¹⁹ of all time-loss injuries occurring in the lower limbs, our findings confirm that lower limb injuries were the predominant concern in Brazilian elite women's football, accounting for 95% of all recorded injuries. Collectively, injuries to the knee, thigh, and ankle comprised three-quarters of all recorded injuries in the current study. These body regions emerge as the top three most commonly injured locations in elite women's football ^{7, 30} and men's football ³⁴. However, while the thigh is consistently reported as the most frequently injured region in male athletes, some studies have identified the knee as the predominant injury site in elite-level female players ^{11, 12, 16}, while others have highlighted the thigh ^{13, 17, 18} or the ankle ^{15, 21, 35} as the most frequently affected location. Our data suggested a very close incidence rate of 1.53 and 1.39 injuries per 1000 hours for knee and thigh, respectively.

Our analysis reveals that muscle/tendon and ligament/joint capsule injuries had the highest incidence, accounting for rates of 2.38 and 1.66 injuries per 1000 hours of overall exposure, respectively. Our findings align with systematic reviews indicating that muscle/tendon injuries have the highest overall injury rate in elite-level female footballers (ranging from 1.8 to 2.7/1000 hours), followed by ligament/joint capsule injuries (ranging from 1.5 to 2.6/1000 hours) ^{7, 29}. Nevertheless, it appears that the distribution of muscle injuries compared to ligament injuries was more balanced in studies conducted worldwide ^{7, 29} when compared to the current Brazilian cohort. From a practical standpoint, it is advisable for the health staffs of Brazilian clubs to place even greater emphasis on the prevention of muscle/tendon injuries.

Injury severity and recurrence

The days lost due to injury has been largely used to assess the injury severity ²⁸. Injuries in our study exhibited distributions of 40% for mild cases (less than 7 days lost), 43% for moderate cases (8-28 days lost), and 16% for severe cases (more than 28 days lost). The literature presents inconsistent findings regarding the predominant severity of

injuries in women's football, with varying studies reporting conflicting results on whether most injuries are mild or moderate in nature ^{7, 29, 30}. It is essential to emphasize that in the present study, the reported number of days lost pertains specifically to the 2022 season. This implies that the total time away from sport was not documented for players who did not resume the team's full training routine before the end of the season. Among the recorded cases, ten players experienced an ACL rupture and did not return to sport within the 2022 season. In the case of a specific player who suffered an ACL injury during the finals of the state championship, only 16 days of absence were accounted for before the conclusion of the season (see table 4). As a result, the average duration of 160 days lost due to ACL injuries in this study is significantly lower than the typical expected recovery time for football players to return to sport ³⁶. In other words, injuries such as ACL ruptures impose an even greater burden on the players availability to the coach, as they result in longer absence periods beyond what was reported exclusively for the 2022 season in the current study.

Approximately 18% of all cases documented in the current study were identified as re-injuries. Among these cases, 40% occurred within 2 months of the index injury, 40% occurred between 2 and 12 months of the index injury, and 20% occurred more than 12 months after the index injury. Muscle strains were the most prevalent type of re-injury, with five out of nine muscle re-injuries occurring within 2 months after the return to play. Muscle strains typically has high re-injury rates among football players, which has been attributed to an inadequate rehabilitation program, a premature return to sport, or a combination of both ³⁷. The high number of recurrences of muscle injuries serves as a warning to clubs about the importance of investing in tertiary prevention by adopting evidenced-based rehabilitation programs and respecting criteria for returning athletes to play ³⁸.

Focus for injury prevention programs

Perhaps the most valuable information of this study towards designing of injury prevention programs for elite women's football clubs in Brazil is presented in Table 4. In this table, practitioners can establish the scope of the injury issue ¹⁰, including the incidence and severity of the main specific injuries sustained by female footballers through this one-season prospective study. When examining the injury severity, even considering that the time off calculated only the days lost in the 2022 season, the ACL injury emerges as the main focus. In addition to a long absence time following ACL reconstruction surgery ³⁶, football players have presented poorer performance and shorter career duration after ACL ruptures ³⁹. When examining only the injury rate, the focus of prevention programs should be on ankle and knee sprains, especially on the

etiology related to ACL and MCL ruptures. Our findings revealing an overall incidence rate of ACL injuries among Brazilian footballers (0.54/1000 h) over twice as high as previously reported in some elite European women's football scenes (0.09-0.24/1000 h) were alarming^{12, 19, 20, 23}. Muscle strains of the hamstrings, hip adductors, and quadriceps should also be a focus of prevention, further supporting findings from previous trials^{19, 20}. Hopefully, there is evidenced-based prevention programs for reducing the risk of ankle and knee injuries in football players as well as effective strategies to mitigate the muscle strain injury issue in this population^{31, 32}. Although muscle complaints related to fatigue/soreness result in short-term absence, their high incidence underscores the need for health staff care. Further attention seems advisable to bone oedema in the knee, groin pain, patellofemoral pain, and meniscus injury.

Limitations

We acknowledge the limitations of this study. Only four out of the 16 teams participating in the Brazilian top-tier league took part of this study. The inclusion of a larger number of teams and the extension of the study over multiple seasons would enhance the robustness of the results. Nevertheless, as the first South American injury surveillance study in women's football, this study rigorously quantified training/match exposure and injury cases from 133 elite players, aligning with the current consensus statements^{27, 28}. This methodological rigor ensures the reliability of the reported results, even considering the limited number of participating clubs. Considering that injury recording was conducted by the physiotherapists of the participating clubs, it is important to acknowledge the possibility of underreporting, particularly for minor injuries. This exposure time appears to be negligible when compared to the over 20,000 hours of training exposure recorded in the present study, indicating that it is unlikely to have a significant impact on the reported injury rates.

Perspective

Our study has provided unprecedented insights into the injury profile of Brazilian elite women's football. In summary, the overall injury rate aligned with previous studies conducted in women's football leagues worldwide, although the match injury rate was slightly lower compared to the top-ranked leagues. On average, players experienced 0.84 injuries per season, which equates to approximately 25 time-loss injuries for a squad of 30 players. Sudden onset injuries accounted for more than 80% of all time-loss injuries, with a six-fold higher rate during match play compared to training sessions. Approximately half of the time-loss injuries were attributed to non-contact events, underscoring the potential impact of preventive measures targeting intrinsic factors of

athletes in mitigating injury rates. Notably, ankle sprains, hamstring strains, and ACL injuries accounted for over one-third of the specific injuries sustained throughout the season, while fatigue/soreness frequently led to short absence periods. Other knee injuries like MCL rupture, patellofemoral pain, and meniscus tear, as well as muscle strains at the hip adductors and quadriceps, and groin pain, should also be prioritized by injury prevention programs designed to the context of elite-level women's football in Brazil.

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TABLES

Table 1. Match, training and total exposure of players.

	Overall exposure	Exposure per player		
		Mean (SD)	95% CI	Min - Max
Match				
Number of matches	142	15.30 (12.13)	13.22 to 17.38	0 - 39
Exposure hours	2,268	17.05 (15.98)	14.31 to 19.79	0 - 61
Training				
Number of sessions	761	127.97 (52.55)	118.96 to 136.98	7 - 201
Exposure hours	20,024	150.56 (61.63)	139.99 to 161.13	7.25 - 227.48
Total				
Number of exposures	903	143.27 (60.23)	132.94 to 153.60	7 - 226
Exposure hours	22,292	167.61 (70.89)	155.45 to 179.77	7.25 - 260

CI, confidence interval; Min, minimum; Max, maximum; SD, standard deviation

Table 2. Injury frequency and incidence rates by body region.

	% of all injuries	Injury/1000h (number of injuries)			
		Overall	Match	Training	Gradual*
Head and neck	0.89	0.05 (1)	0.44 (1)	-	-
Head	0.89	0.05 (1)	0.44 (1)	-	-
Neck	-	-	-	-	-
Upper limb	2.68	0.13 (3)	0.44 (1)	-	0.09 (2)
Shoulder	1.79	0.09 (2)	-	-	0.09 (2)
Upper arm	-	-	-	-	-
Elbow	-	-	-	-	-
Forearm	-	-	-	-	-
Wrist	0.89	0.05 (1)	0.44 (1)	-	-
Hand	-	-	-	-	-
Trunk	0.89	0.05 (1)	0.44 (1)	-	-
Chest	-	-	-	-	-
Thoracic spine	-	-	-	-	-
Lumbosacral	0.89	0.05 (1)	0.44 (1)	-	-
Abdomen	-	-	-	-	-
Lower limb	95.54	4.80 (107)	14.55 (33)	2.90 (58)	0.72 (16)
Hip/groin	13.39	0.67 (15)	0.88 (2)	0.50 (10)	0.13 (3)
Thigh	28.57	1.44 (32)	2.65 (6)	1.10 (22)	1.18 (4)
Knee	29.46	1.48 (33)	5.73 (13)	0.75 (15)	0.22 (5)
Lower leg	4.46	0.22 (5)	0.88 (2)	0.05 (1)	0.09 (2)
Ankle	16.96	0.85 (19)	3.53 (8)	0.50 (10)	0.05 (1)
Foot	2.68	0.14 (3)	0.88 (2)	-	0.05 (1)

* *Gradual onset injuries.*

Table 3. Injury frequency and incidence rates by tissue and type.

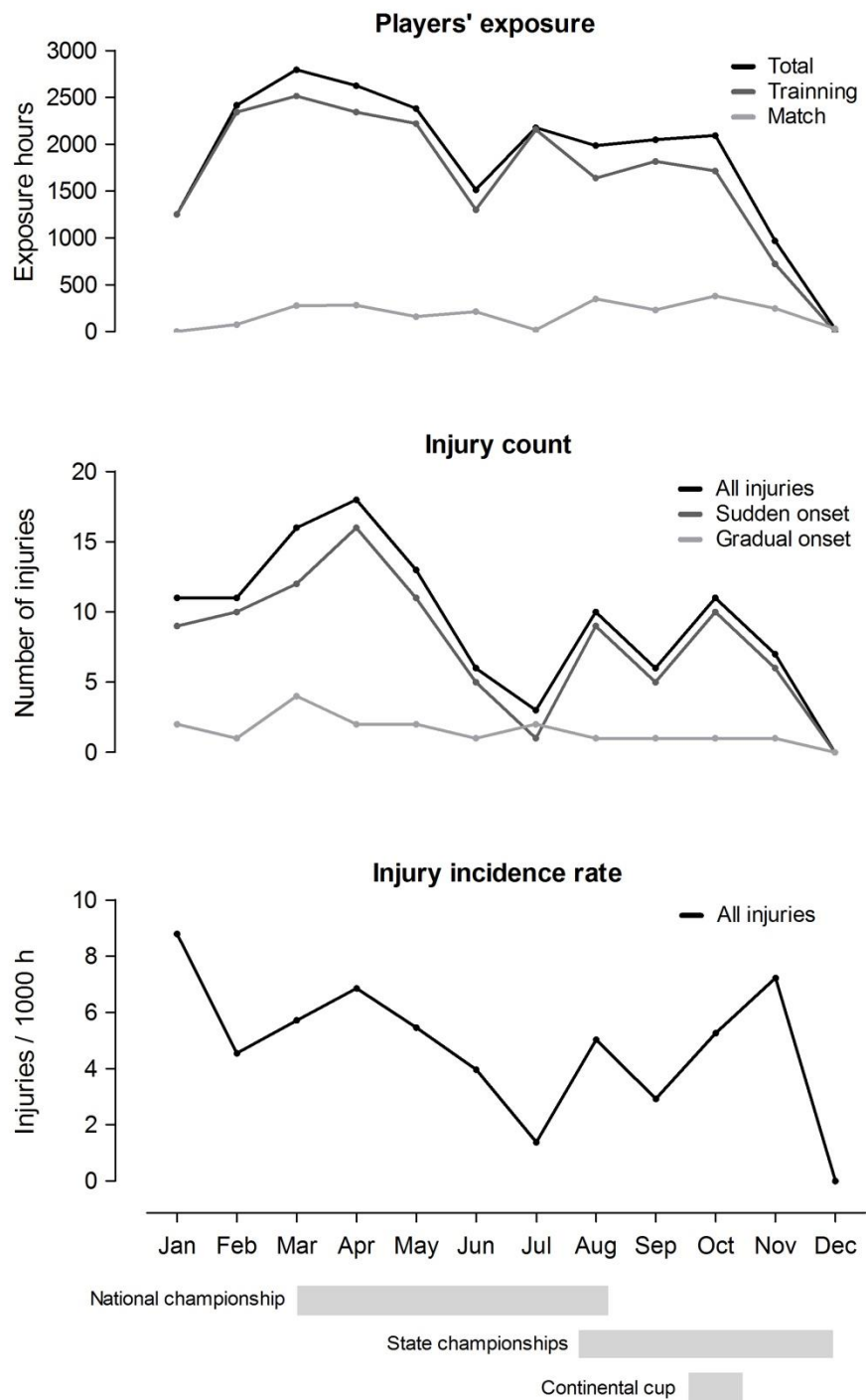
	% of all injuries	Injury/1000h (number of injuries)			
		Overall	Match	Training	Gradual*
Muscle/Tendon	47.32%	2.38 (53)	5.29 (12)	1.60 (32)	0.40 (9)
Muscle injury	37.50%	1.88 (42)	2.21 (5)	1.55 (31)	0.55 (6)
- with structural damage	20.54%	1.03 (23)	1.32 (3)	1.00 (20)	-
- without structural damage	16.96%	0.85 (19)	0.88 (2)	4.85 (11)	0.27 (6)
Muscle contusion	6.25%	0.31 (7)	3.09 (7)	-	-
Compartment syndrome	-	-	-	-	-
Tendinopathy	2.68%	0.13 (3)	-	-	0.13 (3)
Tendon rupture	0.89%	0.04 (1)	-	0.05 (1)	-
Nervous	-	-	-	-	-
Brain/spinal cord injury	-	-	-	-	-
Peripheral nerve injury	-	-	-	-	-
Bone	9.82%	0.49 (11)	2.21 (5)	0.05 (1)	0.22 (5)
Fracture	0.89%	0.04 (1)	0.44 (1)	-	-
Bone stress injury	7.14%	0.36 (8)	1.32 (3)	-	0.22 (5)
Bone contusion	1.79%	0.18 (2)	0.44 (1)	0.05 (1)	-
Avascular necrosis	-	-	-	-	-
Physis injury	-	-	-	-	-
Cartilage/Sinovium/Bursa	7.14%	0.36 (8)	0.44 (1)	0.15 (3)	0.18 (4)
Cartilage injury	5.36%	0.27 (6)	0.44 (1)	0.10 (2)	0.13 (3)
Arthritis	-	-	-	-	-
Synovitis/Capsulitis	0.89%	0.04 (1)	-	-	0.04 (1)
Bursitis	0.89%	0.04 (1)	-	0.05 (1)	-
Ligament/Joint capsule	33.04%	1.66 (37)	7.06 (16)	1.05 (21)	-
Joint sprain	31.25%	1.57 (35)	6.22 (15)	1.00 (20)	-
Chronic instability	1.79%	0.09 (2)	0.44 (1)	0.05 (1)	-
Superficial tissue/skin	0.89%	0.04 (1)	0.44 (1)	-	-
Laceration	0.89%	0.04 (1)	0.44 (1)	-	-
Abrasion	-	-	-	-	-
Non-specific	1.79%	0.09 (2)	0.44 (1)	0.05 (1)	-
Injury without tissue type specified	1.79%	0.09 (2)	0.44 (1)	0.05 (1)	-

* Gradual onset injuries.

Table 4. Frequency, incidence rates and time lost due to the most common specific injuries.

	% of all injuries	Injury/1000h (number of injuries)				Days lost per injury in 2022 season		
		Overall	Match	Training	Gradual*	Mean (SD)	Median (IQR)	Min - Max
Ankle sprain	16.07	0.81 (18)	3.53 (8)	0.50 (10)	-	20.5 (28.13)	8.5	2-109
Muscle fatigue/DOMS	14.29	0.72 (16)	0.44 (1)	0.45 (9)	0.27 (6)	4.69 (4.87)	3	1-20
Hamstring strain injury	11.61	0.58 (13)	1.32 (3)	0.50 (10)	-	21.77 (11.44)	8.5	6-58
ACL injury	10.71	0.54 (12)	3.09 (7)	0.25 (5)	-	159.58 (82.19)	200.5	16-256
Adductor strain injury	6.25	0.31 (7)	0.44 (1)	0.30 (6)	-	15.43 (12.90)	12	3-42
MCL injury	4.46	0.22 (5)	0.44 (1)	0.20 (4)	-	26.60 (19.09)	35	4-48
Bone edema in knee	4.46	0.22 (5)	1.32 (3)	0.10 (2)	-	63.00 (80.74)	36	35-205
Quadriceps strain injury	3.57	0.28 (4)	-	0.20 (4)	-	31.50 (27.91)	20	13-73
Thigh contusion	1.79	0.09 (2)	0.88 (2)	-	-	7.50 (9.19)	7.5	1-14
Groin pain	1.79	0.09 (2)	0.44 (1)	-	0.04 (1)	81.00 (108.89)	81	4-158
Shin splints	1.79	0.09 (2)	-	-	0.09 (2)	13.50 (16.26)	13.5	2-25
Patellofemoral pain	1.79	0.09 (2)	-	-	0.09 (2)	16.50 (12.02)	16.5	8-25
Meniscus injury	1.79	0.09 (2)	0.44 (1)	0.05 (1)	-	96.50 (48.79)	96.50	62-131
Medial knee pain	1.79	0.09 (2)	-	0.10 (2)	-	5.00 (4.24)	5	2-8
Rotator cuff injury	1.79	0.09 (2)	-	-	0.09 (2)	9.00 (1.41)	9	8-10
Others**	16.07	0.81 (18)	3.53 (8)	0.20 (4)	0.27(6)	13.89 (18.58)	9	1-69

ACL, anterior cruciate ligament; DOMS, delayed-onset muscle soreness; IQR, interquartile range; MCL, medial collateral ligament; Min, minimum; Max, maximum; SD, standard deviation; * Gradual onset injuries; ** Injuries with a single case.

FIGURE**Figure 1.** Players' exposure, injury count, and injury incidence rate throughout the season.

Supplementary material – S1

Formulário de Registro de Lesão

Projeto de pesquisa vinculado a(o):

Universidade Federal de Ciências da Saúde de Porto Alegre Programa de Pós-Graduação em Ciências da Reabilitação Grupo de Ciência no Esporte e Exercício Prof. Dr. Bruno Manfredini Baroni FORMULÁRIO DE REGISTRO DE LESÃO Definição de LESÃO: Qualquer reclamação de ordem física que resulte em uma atleta ser incapaz de participar totalmente (ou ser afastada por decisão do DM) de uma sessão de treinamento ou de um jogo da equipe.

- | | | |
|----|---|--|
| 1) | Código da atleta | _____ |
| 2) | Data de ocorrência da lesão aguda ou data de afastamento para lesão de início insidioso | _____ |
| 3) | Lado lesionado | ☐ Direito
☐ Esquerdo
☐ Não se aplica (ex: cabeça, coluna) |
| 4) | Momento de ocorrência da lesão (apenas para lesões agudas) | ☐ Durante jogo
☐ Durante aquecimento para jogo
☐ Durante treino no campo
☐ Durante treino fora do campo (ex.: academia)
☐ Lesão ocorreu fora do ambiente de treinos/jogos do clube |
| 5) | Mecanismo de lesão (apenas para lesões agudas) | ☐ Lesão sem contato
☐ Lesão por contato direto (trauma sobre o local da lesão)
☐ Lesão por contato indireto (contato/trauma em local diferente da lesão)
☐ Não foi possível identificar o mecanismo de lesão |
| 6) | Início dos sintomas (apenas para lesões de início insidioso) | ☐ Menos de 2 semanas
☐ Menos de 1 mês
☐ Menos de 2 meses
☐ Menos de 3 meses
☐ Mais de 3 meses |
| 7) | Localização da lesão | ☐ Cabeça/rosto
☐ Pescoço/coluna cervical
☐ Ombro/clavícula
☐ Braço
☐ Cotovelo
☐ Antebraço
☐ Punho
☐ Mão/dedos
☐ Peito (inclui esterno, costelas e órgãos torácicos)
☐ Coluna torácica
☐ Coluna lombar, sacro e pelve
☐ Abdômen (inclui órgãos abdominais)
☐ Quadril e virilha
☐ Coxa
☐ Joelho
☐ Perna (inclui canela, panturrilha e tendão de Aquiles)
☐ Tornozelo
☐ Pé/dedos
☐ Regiões não especificadas
☐ Múltiplas regiões (lesão acometendo mais de uma região) |

8) Tipo de lesão: - MÚSCULO/TENDÃO	☐ Lesão muscular (estiramento e ruptura) ☐ Contusão ☐ Síndrome compartimental ☐ Tendinopatia (inclui ruptura parcial de tensão) ☐ Ruptura de tendão (somente ruptura completa) ☐ Dor/fadiga muscular (sem lesão estrutural)
9) Tipo de lesão: - NERVOSA	☐ Lesão cerebral ou de medula espinhal (inclui concussão) ☐ Lesão de nervo periférico
10) Tipo de lesão: - OSSO	☐ Fratura (traumática e por avulsão; dentes) ☐ Lesão por estresse ósseo (inclui fratura por estresse, edema da medula óssea e periostite) ☐ Contusão óssea (lesão traumática óssea sem fratura) ☐ Necrose avascular ☐ Lesão de fise
11) Tipo de lesão: - CARTILAGEM/SINÓVIA/BURSA	☐ Lesão de cartilagem (inclui lesões meniscais, labrais, de cartilagem articular e osteocondrais) ☐ Osteoartrite (inclui osteoartrite pós-traumática) ☐ Sinovite/capsulite (inclui impacto articular) ☐ Bursite
12) Tipo de lesão: - LIGAMENTO/CÁPSULA	☐ Entorse articular (ruptura parcial/total de ligamento, lesão ligamentar/capsular não-específica, (sub)luxação e instabilidade aguda) ☐ Instabilidade articular crônica
13) Tipo de lesão: - PELE/TECIDOS SUPERFICIAIS	☐ Contusão, hematoma, dano vascular ☐ Laceração ☐ Abrasão
14) Tipo de lesão: - ÓRGÃOS INTERNOS	☐ Órgão interno (exceto cérebro): inchaço relevante nos órgãos especializados não mencionados anteriormente (pulmões, abdômen e órgãos pélvicos, tireóide, mama).
15) Tipo de lesão: - NÃO-ESPECÍFICA	☐ Lesões não específicas (sem especificação de patologia tecidual)
16) Diagnóstico detalhado da lesão (segundo o DM do clube)	_____
17) Recorrência (lesão do mesmo tipo e no mesmo local de uma lesão anterior)	☐ Não é uma recorrência ☐ Recorrência em até 2 semanas após o retorno ☐ Recorrência em até 1 mês após o retorno ☐ Recorrência em até 2 meses após o retorno ☐ Recorrência entre 2 e 12 meses após o retorno ☐ Recorrência em mais de 12 meses após o retorno

Supplementary material – S2

Preencher com os **MINUTOS** de exposição de cada atleta em cada dia

Marcar com fundo **AMARELO** as exposições em **TREINO**

Marcar com fundo **AZUL** as exposições em **JOGO**

Em caso de **LESÃO** acesse: <https://redcap.ufcspa.edu.br/surveys/?s=318ME93I>

Em caso de **RETORNO** acesse: <https://redcap.ufcspa.edu.br/surveys/?s=HLFH83TX8N>



CÓDIGO	1-out.	2-out.	3-out.	4-out.	5-out.	6-out.	7-out.	8-out.	9-out.	10-out.	11-out.	12-out.	13-out.	14-out.	15-out.	16-out.	17-out.	18-out.	19-out.	20-out.	21-out.	22-out.	23-out.	24-out.	25-out.	26-out.	27-out.	28-out.	29-out.	30-out.	31-out.
G01																															
G02	0		70	40	93	60	60		47		100	70	100	70	40	58		100	50	90	40		93	80	96	70	60	60	0		80
G03	0		70	40	93							70	100	70	40	38		100	50	90	40		93	80	96	70	60	60	0		80
G04																															
G05	21		70	40	5	60	60		92		100	70	100	70	40	58		100	50	90	40		22	80	96	70	60	60	48		80
G06																															
G07	94		70	40	98	60	60		92		100	70	100	70	40	95		100	50	90	40		93	80	96	70	60	60	0		80
G08	33		70	40	79	60	60		47		100	70	100	70	40	79		100	50	90	40		0	80	96	70	60	60	63		80
G09	94		70	40	0	60	60		45		100	70	100	70	40	17		100	50	90	40		0	80	96	70	60	60	96		80
G10	0		70	40	98	60	60		62		100	70	100	70	40	95		100	50	90	40		71	80	96	70	60	60	0		80
G11																							0	80	96	70	60	60	85		80
G12	94		70	40	0	60	60		0		100	70	100	70	40	0		100	50	90	40		0	80	96	70	60	60	80		80
G13	94		70	40	98	60	60		92		100	70	100	70	40	95		100	50	90	40		46	80	96	70	60	60	0		80
G14																															
G15	0		70	40	85	60	60		92		100	70	100	70	40	72		100	50	90	40		93	80	96	70	60	60	0		80
G16	94		70	40	0	60	60		0		100	70	100	70	40	17		100	50	90	40		0	80	96	70	60	60	96		80
G17	0		70	40	98	60	60		92		100	70	100	70	40	95		100	50	90	40		93	80	96	70	60	60	0		80
G18	21		70	40	19	60	60		45		100	70	100	70	40	0		100	50	90	40		31	80	96	70	60	60	96		80
G19	0		70	40	98	60	60		62		100	70	100	70	40	95		100	50	90	40		93	80	96	70	60	60	0		80
G20																															
G21	33		70	40	98							70	100	70	40	38		100	50	90	40		62	80	96	70	60	60	0		80
G22	73				0				0							0		100	50	90	40		47	80	96	70	60	60	48		80
G23	0		70	40	13	60	60		92		100	70	100	70	40	95		100	50	90	40		46	80	96	70	60	60	0		80
G24																							0	80	96	70	60	60	96		80
G25	61		70	40	0	60	60		0		100	70	100	70	40	0		100	50	90	40		0	80	96	70	60	60	33		80

4 CONCLUSÃO GERAL

Realizamos um estudo pioneiro com o objetivo de avaliar a incidência e as características das lesões em clubes de elite do futebol feminino no Brasil, sendo também o primeiro do gênero na América do Sul. Essa lacuna pode ser explicada, pelo menos em parte, pelas restrições impostas por alguns clubes no que tange o compartilhamento de informações sobre as suas atletas. Duas das oito equipes inicialmente convidadas a participar do estudo declinaram. Outro aspecto importante é a dificuldade de se manter um banco de dados atualizado com todas as informações acerca das lesões e, principalmente, tempo de exposição das atletas a treinos e jogos. Devido a troca de profissionais e consequente interrupção da coleta sistemática dos dados, duas equipes não deram prosseguimento à participação no estudo. Mesmo diante destas e outras dificuldades, o presente estudo demonstra que a execução de um coorte prospectivo com duração de uma temporada é possível de ser realizado no contexto da elite do futebol feminino no Brasil.

Em síntese, nossos achados sugerem uma taxa geral de lesões próxima à média reportada por investigações realizadas em ligas de futebol feminino ao redor do mundo. As atletas sofreram, em média, 0,84 lesões por temporada, o que corresponde a cerca de 25 lesões com afastamento para um time de 30 jogadoras. As lesões de início súbito representaram quase 80% de todas as lesões, com uma taxa de ocorrência seis vezes maior durante os jogos em comparação com as sessões de treinamento. Cerca de metade das lesões foram atribuídas a eventos sem contato físico com outra atleta, enfatizando a importância de medidas preventivas que visem os fatores intrínsecos das atletas para reduzir as taxas de lesões.

Entorses de tornozelo, distensões de isquiotibiais e lesões do ligamento cruzado anterior (LCA) representaram mais de um terço das lesões específicas ocorridas ao longo da temporada, enquanto a fadiga e o desconforto muscular frequentemente resultaram em curtos períodos de ausência. Outras lesões no joelho, como ruptura do ligamento colateral medial (LCM), dor patelofemoral, lesões meniscais, distensões musculares (adutores de quadril e quadríceps), e dor na virilha, também devem ser priorizadas nos programas de prevenção de lesões destinados aos clubes de elite do futebol feminino no Brasil.

5 IMPACTOS DO TRABALHO

Além do impacto científico desta ser a primeira investigação a reportar o perfil de lesões de atletas de elite do futebol feminino no continente da América do Sul, a principal contribuição deste estudo observacional e de caráter epidemiológico é fomentar os profissionais que trabalham nos clubes de elite do futebol feminino brasileiro com informações que auxilie na tomada de decisões acerca do planejamento e implantação de programas voltados à prevenção de lesões neste contexto. Uma vez que estes programas sejam bem-sucedidos no seu objetivo primário de reduzir a incidência e/ou severidade das lesões ocorridas nas atletas ao longo de uma temporada competitiva, é possível vislumbrarmos alguns dos impactos descritos a seguir.

Para os clubes de futebol, uma menor incidência e/ou severidade de lesões representa maior disponibilidade de atletas para os jogos ao longo da temporada. Esse fator aumenta a competitividade da equipe diante dos seus adversários e, conseqüentemente, a chance de sucesso nas competições. Considerando que o melhor desempenho em competições leva a premiações, maior visibilidade e, conseqüentemente, maior investimento por parte de patrocinadores, entre outros aspectos, um programa de prevenção de lesões eficiente é capaz de impactar positivamente em aspectos econômicos do clube.

Também é importante destacar o potencial impacto sobre as atletas de futebol. As lesões geram experiências dolorosas e frustrantes que podem afetar a saúde mental das atletas. Elas também têm um papel prejudicial e, muitas vezes, determinante no sucesso e longevidade da carreira das atletas. Algumas lesões podem, ainda, levar a sequelas que prejudicam a funcionalidade e qualidade de vida das atletas após a aposentadoria. Portanto, o desenvolvimento de programas capazes de reduzir o risco de lesões tem potencial impacto em diversos âmbitos da vida das atletas, incluindo questões biológicas, psicológicas, econômicas e sociais.

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ANEXO A - Parecer de aprovação ética do projeto

UNIVERSIDADE FEDERAL DE
CIÊNCIAS DA SAÚDE DE
PORTO ALEGRE

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: INCIDÊNCIA DE LESÕES NO FUTEBOL FEMININO PROFISSIONAL: UM ESTUDO PROSPECTIVO EM CLUBES DE ELITE DO BRASIL

Pesquisador: Bruno Manfredini Baroni

Área Temática:

Versão: 1

CAAE: 54740021.8.0000.5345

Instituição Proponente: Universidade Federal de Ciências da Saúde de Porto Alegre

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 5.201.133

Apresentação do Projeto:

O futebol feminino é uma modalidade em ampla ascensão no cenário brasileiro e mundial. No âmbito do futebol profissional, as lesões podem afetar negativamente a carreira das atletas e o desempenho de suas equipes, de modo que grande destaque têm sido dado recentemente aos programas de prevenção de lesões. Porém, são necessárias pesquisas epidemiológicas que descrevam o perfil das lesões para que programas de prevenção possam ser planejados. Até o presente momento, não existe qualquer estudo acerca da incidência de lesões em atletas do futebol feminino no Brasil. **Objetivo:** Verificar a incidência de lesões em atletas profissionais de futebol feminino no Brasil. **Métodos:** Este é um estudo de coorte prospectivo. Serão convidados a participar da pesquisa profissionais de Fisioterapia que atuam nos departamentos de saúde de clubes que disputam o Campeonato Brasileiro de Futebol Feminino Série A1, no ano de 2022. Considerando uma população composta por 16 clubes deste nível competitivo, e considerando as dificuldades de adesão dos profissionais do futebol profissional a pesquisas científicas desse tipo, acredita-se

que a obtenção de um número de participantes que represente metade do total da população se configura em uma amostra adequada e representativa. Portanto, o tamanho amostral almejado para o presente estudo é de 8 clubes participantes, constituindo uma coorte de aproximadamente 200 atletas. Os profissionais de Fisioterapia que concordarem em participar do estudo, ao longo de toda a temporada 2022, fornecerão dados referentes ao tempo de exposição

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PORTO ALEGRE**



Continuação do Parecer: 5.201.133

das atletas em treinamentos e jogos, bem como informações acerca das lesões sofridas por elas e tempo de retorno ao esporte. Todas as informações serão fornecidas por meio de formulários vinculados à plataformas on-line, especialmente confeccionados para o presente estudo. Ao final do estudo, a taxa de lesões (ou seja, o número de ocorrências a cada 1000 horas de exposição) e suas características (situação, mecanismo, região anatômica, tipo de lesão e tempo de afastamento) serão determinadas.

Objetivo da Pesquisa:

Verificar a incidência de lesões em atletas profissionais de futebol feminino no Brasil.

Avaliação dos Riscos e Benefícios:

Riscos: A participação no presente estudo não confere riscos. Registre-se que o voluntário será indenizado por qualquer evento adverso comprovadamente decorrente da pesquisa. Um possível risco que pode existir é a sensação de desconforto ao responder alguma questão.

Benefícios: Ao final do estudo, será fornecido um relatório no qual os pesquisadores apresentarão os achados referentes ao conjunto de clubes participantes.

Comentários e Considerações sobre a Pesquisa:

Do ponto de vista acadêmico e profissional é importante a realização da pesquisa para produção de conhecimento e informações sobre o tema proposto pelo pesquisador.

Considerações sobre os Termos de apresentação obrigatória:

Em concordância com a proposta da pesquisa.

Recomendações:

Informar como vai ser a divulgação para captação de participantes e como se deu a definição do N amostral.

Conclusões ou Pendências e Lista de Inadequações:

Aprovado.

Considerações Finais a critério do CEP:

De acordo com o parecer do Relator.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1879910.pdf	30/12/2021 10:14:38		Aceito

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**UNIVERSIDADE FEDERAL DE
CIÊNCIAS DA SAÚDE DE
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Continuação do Parecer: 5.201.133

Folha de Rosto	folhaDeRosto_assinada.pdf	30/12/2021 10:11:23	Bruno Manfredini Baroni	Aceito
Declaração de concordância	TCER.pdf	30/12/2021 10:06:47	Bruno Manfredini Baroni	Aceito
Declaração de Pesquisadores	TCDU.pdf	30/12/2021 10:06:32	Bruno Manfredini Baroni	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE.pdf	30/12/2021 10:05:42	Bruno Manfredini Baroni	Aceito
Projeto Detalhado / Brochura Investigador	Projeto_GabrielaGasparin.pdf	30/12/2021 10:05:23	Bruno Manfredini Baroni	Aceito

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

PORTO ALEGRE, 14 de Janeiro de 2022

**Assinado por:
Fernanda Bordignon Nunes
(Coordenador(a))**

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