INCIDENCE AND PATTERNS OF MUSCULOSKELETAL INJURIES AMONG YOUTH FOOTBALL PLAYERS IN NAIROBI: A PROSPECTIVE COHORT STUDY

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ABSTRACT

Background: Football poses a significant risk of musculoskeletal injuries. Despite its prominence among the Kenyan youth, there is limited data on the incidence and anatomical patterns of injuries in these young footballers.

Objective: This study aimed to determine the incidence and anatomical patterns of musculoskeletal injuries among players in a Kenyan youth football academy during a single football season.

Methods: A prospective cohort study was conducted at Express Soccer Academy in Nairobi, Kenya, involving 182 players aged 5–20 years. Participants were systematically recruited and followed for three months during the 2023 season. Data on injuries, including frequency, type, and anatomical site, were collected. Injury incidence rates were calculated per 1000 playing hours.

Results: The overall injury incidence was 17.22 per 1000 hours of playing time, with injuries occurring more frequently during matches (62%) compared to training sessions (38%). The ankle (20.21%) and knee (16.50%) were the most affected anatomical sites, with ligament sprains (40.96%) and muscle injuries (36.17%) being the most common types of injuries. Collisions with opponents were the leading mechanism of injury, accounting for 46% of reported cases.

Conclusion: This study highlights a high incidence of lower extremity football-related injuries among Kenyan youth players.

Key words: Musculoskeletal injuries, Youth football, Nairobi, Injury incidence, Injury patterns, Trauma, Football

INTRODUCTION

Football, globally recognized as the "beautiful game," holds the distinction of being the most popular sport in the world. It is estimated that over 250 million players actively engage in organized football across more than 200 countries, with youth forming a significant portion of this population. The sport offers numerous physical, psychological, and social benefits, including improved cardiovascular fitness, team-building skills, and enhanced mental well-being (1,2). However, football is also associated with a substantial risk of musculoskeletal injuries, which can significantly impact players' health and performance.

The dynamic and physical nature of football, characterized by rapid changes in direction, high-speed running, and frequent physical contact, predisposes players to a high injury burden. The risk is particularly pronounced among youth players who are undergoing rapid physical and neuromuscular development, which can compromise their biomechanical stability (3,4). Globally, injury incidence rates in youth football range from 2.0 to 19.4 per 1000 hours of play, with match play carrying a substantially higher risk compared to training sessions (5).

Injuries predominantly affect the lower extremities, with the ankle and knee being the most frequently injured anatomical sites (6). Ligament sprains, muscle strains, and contusions are common injury types, and contact with opponents is a leading mechanism of injury (7).

While extensive research has been conducted in Western and professional football settings (8), there is limited data from sub-Saharan Africa, particularly in amateur and youth contexts, where socioeconomic and environmental factors can influence injury patterns.

In Kenya, football is a widely played and celebrated sport among youth, yet there is a paucity of data on the epidemiology of football-related injuries in this demographic region (9). This knowledge gap hinders the development of effective prevention strategies tailored to the unique challenges faced by Kenyan youth players, such as inadequate access to protective equipment and suboptimal playing surfaces. Understanding the incidence, anatomical patterns, and mechanisms of injuries is essential for informing evidence-based interventions that can enhance player safety and promote sustainable athletic development.

This study aims to bridge this knowledge gap by investigating the incidence and patterns of musculoskeletal injuries among youth football players at a Kenyan football academy during a single season. In providing a comprehensive analysis of injury data, this research seeks to contribute to the global understanding of football injuries and support the implementation of targeted preventive measures in youth football.

MATERIALS AND METHODS

This study employed a prospective cohort design to investigate the incidence and patterns of musculoskeletal injuries among youth football players at the Express Soccer Academy in Nairobi, Kenya. Participants were followed over a three-month football season in 2023, during which exposure data and injury occurrences were systematically recorded.

The research was conducted at the Express Soccer Academy, located at GEMS Cambridge International School, Karen, Nairobi. The academy, established in 2013, offers professional football training to boys and girls aged 5–20 years, focusing on skill development and competitive participation. The academy's structured environment provided a suitable setting for capturing detailed injury and training data. The study included active players registered with the Express Soccer Academy during the 2023 football season. The sample size was determined using Fisher's formula which, with an estimated prevalence of 50% (assumed, since there was no prior regional data) and a margin of error of 5%, yielded a sample size of 182 participants after adjusting for the finite population of 349 players. Players whose parents or guardians declined to provide consent or with pre-existing injuries that limited participation at the start of the season were excluded.

Stratified random sampling was employed based on age categories. Proportional allocation ensured representation across all age groups, with participants randomly selected within each stratum. A structured interviewer-administered questionnaire was used to collect data on demographics (age, sex, and football experience), training practices—hours, type of exercises, and use of protective gear, injury data: Anatomical site, type, mechanism, and timing of injuries (match vs. training).

Injury data were verified through clinical assessments. The operational definition of injury was any musculoskeletal trauma sustained during football activities that resulted in reduced participation or medical intervention. Two research assistants, a sports medicine nurse and a certified physiotherapist, were trained to administer the tool and assess injuries.

Data were analyzed using SPSS version 25. Descriptive statistics summarized participant characteristics and injury patterns. Injury incidence was calculated as:

Injury incidence = Number of injuries/Total exposure hours $\times 1000$

Bivariate analyses, including Chi-square tests and independent t-tests, assessed associations between categorical and continuous variables, respectively. Descriptive data on the other hand was expressed as frequencies and proportions or means with standard deviations. Statistical significance was set at $p<0.05$.

Ethical approval was obtained from the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee. Parental or guardian consent and participant assent (for minors) were mandatory before enrollment. Confidentiality was maintained through anonymized data storage and secure handling of hard copies and digital files.

RESULTS

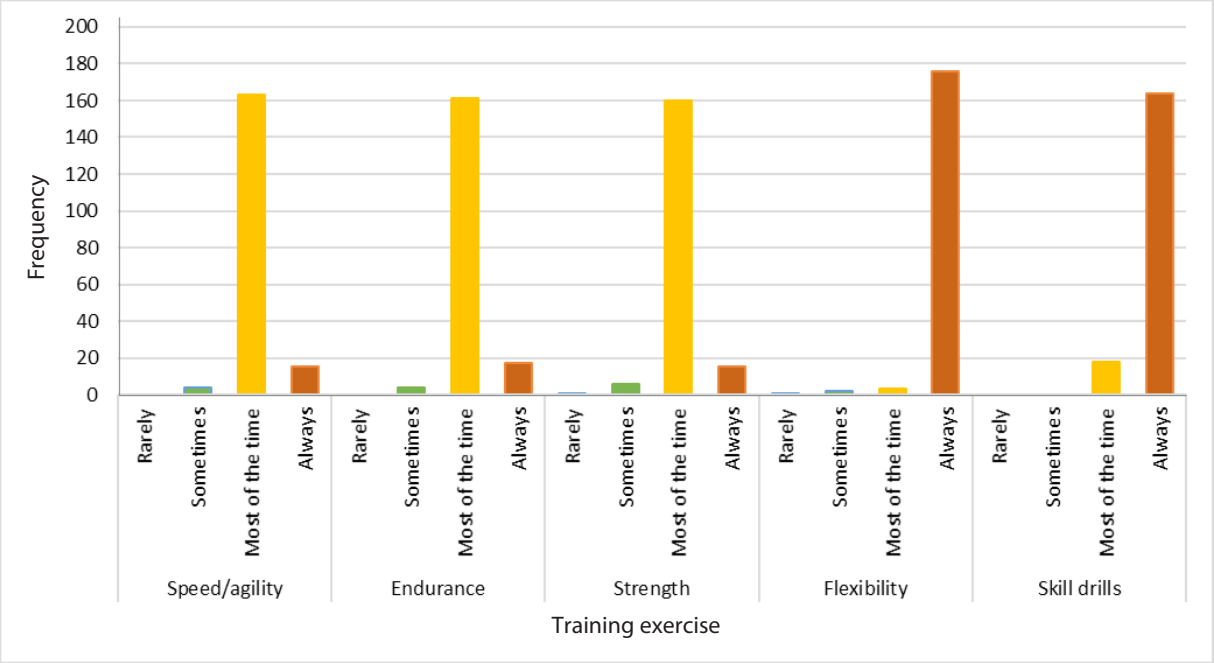
A total of 182 youth football players were enrolled in the study. Male participants dominated the cohort, accounting for 169 (92.9%), while female

participants comprised only 13 (7.1%) of the sample. The mean age of the players was 10.76 years (SD = 3.6), with a median of 10.50 years and a range of 5–20 years. The distribution of participants across age groups revealed the majority belonged to the Under-11 category, representing 39 (21.4%) of the sample.

Training practices: The majority of participants trained twice weekly (97.8%), with 4 hours per week being the most common training duration (96.2%). Skill drills and flexibility exercises were the most consistently performed activities, with 90.1% and 96.7% of players, respectively, engaging in these practices during training (Figure 1).

Figure 1

Training exercises among participants



Incidence of injuries: The study documented 188 injuries over a total exposure time of 10,920 hours, resulting in an incidence rate of 17.22 injuries per 1000 playing hours.

Anatomical patterns of injuries: Lower extremity injuries were the most prevalent, with the ankle (20.21%, n = 38) and knee (16.50%, n = 31) being the most affected sites (Table 1). The head and neck accounted for 13.82% (n = 26) of injuries, highlighting the significance of collision-related trauma.

Table 1

Anatomical distribution of injuries

Body part	Frequency (%)
Ankle	38 (20.21)
Knee	31 (16.50)
Head/Neck	26 (13.82)
Thigh	25 (13.30)
Leg	21 (11.17)

Types of injuries: Ligament sprains (40.96%) were the most common injury type, followed by muscle injuries (36.17%). Concussions accounted for 14.36%, underscoring the risks of head trauma in youth football (Table 2).

Table 2

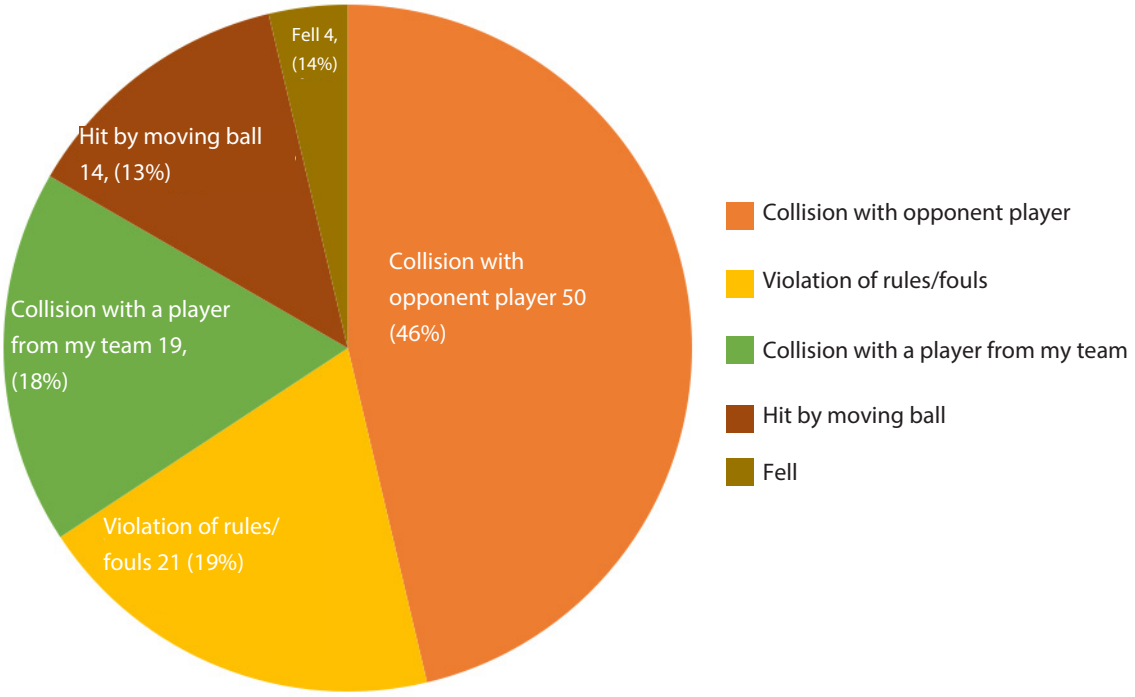
Distribution of injury types

Type of injury	Frequency (%)
Ligament sprains	77 (40.96)
Muscle injuries	68 (36.17)
Concussions	27 (14.36)
Skin injuries	10 (5.32)
Fractures	3 (1.60)

Mechanisms of injury: Collisions with opponents emerged as the leading mechanism of injury, accounting for 50 (46%) of cases. Other notable causes included rule violations (19%) and falls (4%) (Figure 2).

Figure 2

Mechanisms of injuries among participants



DISCUSSION

The study cohort comprised predominantly of male players (92.9%), reflecting gender disparities in football participation at the academy. This finding mirrors the general and specific gender disparities in sports participation globally. The low female participation warrants attention, as it may indicate gender-based barriers to sports involvement, including sociocultural norms or inadequate opportunities for girls. The mean age of participants was 10.76 years, with the Under-11 category representing the largest proportion (21.4%). Global trends report this higher youth engagement in football at younger ages (10).

Training practices were notably structured, with nearly all participants training twice weekly for an average of four hours per week. Flexibility exercises (96.7%) and skill drills (90.1%) were consistently prioritized, highlighting a focus on fundamental football techniques and injury prevention measures. However, lower engagement in strength (87.9%) and endurance (88.5%) exercises could suggest gaps in conditioning programs, potentially predisposing players to certain injury types. Strength and endurance training are critical for musculoskeletal resilience, and their incorporation into training routines may reduce injury rates.

The overall injury incidence of 17.22 per 1000 playing hours aligns with findings from international studies on youth football. Watson and Mjaanes (11) reported injury rates ranging from 2.0 to 19.4 per 1000 hours of play, with match play being more hazardous than training. Similarly, Faude et al. (3) documented match-specific injury rates between 15 and 20 per 1000 hours, consistent with this study's finding that 62% of injuries occurred during matches. The elevated risk during matches reflects the higher intensity, physical contact, and competitive nature of gameplay (12). The relatively high overall incidence in this study may be attributed to contextual factors such as inconsistent adherence to safety protocols, inadequate access to protective gear, and variable quality of playing surfaces in Kenyan football settings (13,14). This underscores the need for localized injury prevention strategies tailored to resource-limited environments.

Lower extremity injuries, particularly to the ankle (20.21%) and knee (16.50%), were the most common, consistent with global trends (6,15).

These injuries often result from rapid directional changes, pivoting, and physical tackles, which are intrinsic to football (16). The high prevalence of ankle injuries emphasizes the importance of neuromuscular training programs, including proprioceptive exercises and balance drills, to enhance joint stability (17).

The 13.82% incidence of head and neck injuries, including concussions, highlights the risks associated with physical collisions in football. This finding aligns with a study by Junge *et al*. (18), who noted that youth players are particularly susceptible to head trauma due to their developing musculoskeletal and neurological systems. Implementing stricter enforcement of rules, such as penalizing high-impact tackles, could mitigate this risk.

The predominance of ligament sprains (40.96%) and muscle injuries (36.17%) mirrors findings from European studies, where these injury types account for the majority of football-related trauma (19). Sprains often result from joint instability during rapid movements, while muscle injuries are typically linked to overuse or insufficient warm-up routines (20). The study's finding that all participants engaged in warm-up exercises before matches is encouraging but suggests that the quality and content of these routines should be examined to optimize their effectiveness. The less than 2% incidence of fractures in this study was relatively low compared to previous research, which attributes such injuries to high-impact collisions or falls (15). This could reflect differences in the playing environment or training practices at the academy.

Collisions with opponents (46%) emerged as the leading injury mechanism, underscoring the physical nature of football. Similar findings by Faude *et al.* (3) highlight that youth football carries inherent risks of direct trauma due to frequent contact during tackles and aerial duels. Efforts to minimize these risks should include stricter officiating, mandatory use of shin guards, and educational programs for coaches and players on safer playing techniques.

The findings of this study have several practical implications. First, injury prevention strategies should prioritize neuromuscular training programs to improve joint stability and reduce the risk of sprains and muscle injuries. Enforcing safety protocols, including proper officiating and mandatory protective gear, may also minimize the risk of collision-related injuries. Finally coaches and players should be educated on age-appropriate training and injury prevention techniques. Additionally, improving the quality of playing surfaces, as recommended by Arnason *et al*. (13), could further reduce the risk of non-contact injuries.

CONCLUSION

With an injury incidence rate of 17.22 per 1000 playing hours, the findings highlight a substantial risk of injuries in youth football, predominantly affecting the lower extremities, particularly the ankle and knee. Ligament sprains and muscle injuries were the most prevalent types, and collisions emerged as the leading mechanism, emphasizing the physical demands and contact nature of the sport. These findings underscore the need for targeted injury prevention strategies, including enhanced training on safe playing techniques, proper use of protective equipment, and increased focus on conditioning programs that build strength and flexibility.

Study limitations

This study, while offering important insights, is subject to several limitations. The research was conducted in a single football academy,which limits the generalizability of the results as the training practices, coaching styles, and playing conditions in this academy may not reflect those of other local institutions. The relatively short duration of data collection restricted the ability to capture injuries that occur over longer competitive cycles. Despite efforts to verify information, the study relied partly on self-reported data from players and parents, which introduced the possibility of recall bias and underreporting for minor overlooked injuries. Another important limitation was the imbalanced gender representation, only 7% female, which limited meaningful analysis of sex-specific differences in injury patterns. These limitations do not undermine the main findings of this study but they highlight areas where future research could build on the present work.

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