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Original Research Article

Prevalence of Sports-Related Musculoskeletal Injuries Among Adolescents and Young Adults

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Abstract:

Background: Sports-related musculoskeletal injuries are a major public health concern among adolescents and young adults due to increased participation in physical activities and growth-related vulnerabilities.

Aim: To assess the prevalence, types, and anatomical distribution of sports-related musculoskeletal injuries among adolescents and young adults.

Methodology: A hospital-based cross-sectional study was conducted among 80 participants aged 10–25 years at Netaji Subhas Medical College and Hospital, Bihta, Patna in Bihar over six months. Data were collected using a structured questionnaire covering demographics, sports participation, and injury history. Statistical analysis was performed using SPSS version 27.0.

Results: The overall prevalence of musculoskeletal injuries was 62.50%. The majority of participants were aged 16–20 years (37.50%) and male (60.00%). Recreational sports participation was most common (35.00%). Strains (25.00%) and sprains (22.50%) were the most frequent injuries, while fractures accounted for 15.00%. The lower limb was the most affected site (48.00%).

Conclusion: A high prevalence of sports-related injuries was observed, particularly among late adolescents and young adults, highlighting the need for preventive strategies and awareness programs.

Keywords: Musculoskeletal Injuries, Adolescents, Sports, Prevalence, Strain, Sprain.

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Introduction

Musculoskeletal injuries stand as the primary injury type that youth sports athletes sustain which creates significant public health issues for adolescents and young adults [1]. The number of young people who participate in organized and recreational sports has increased which results in more cases of both acute and overuse injuries. The transitional period between childhood and adolescence shows this trend because it involves rapid physical development and physiological changes that make people more vulnerable to injuries. The system of biological development together with physical activity and outdoor conditions produces a complicated injury risk system which affects sports-related musculoskeletal injuries for this group of people.

The growth spurts and maturity-related changes of adolescents cause them to become more prone to injuries. The body experiences fast skeletal development during this period because bones grow quickly while their surrounding muscles and tendons and ligaments develop at different times [2]. Bones experience fast length growth while soft tissues grow at a slower rate which creates tightness and limits their flexibility. The imbalance between these two elements creates increased stress on growth plates and apophyses and musculotendinous units which raises the likelihood of sustaining injuries. The scientific community remains divided about the degree of flexibility loss that occurs during activities yet they all agree that the resulting biomechanical stress leads to musculoskeletal injuries.

The period of peak height velocity (PHV) establishes the primary factor which determines the risk of athletic injuries. The adolescents during PHV undergo rapid height growth together with quick developments in their limb lengths while their muscle

strength and coordination skills develop at a slower pace [3]. The temporary phase when skeletal growth happens faster than muscles develop causes changes in movement patterns which lead to decreased athletic abilities. The abnormal movement patterns which adolescents develop during this phase lead to increased risk of physical injuries. The linear growth of bones creates a temporary period during which bone mineralization fails to complete, resulting in bones that become weaker and more porous. The condition creates a substantial fracture risk because it affects the growth plates, which are structurally weaker than other bones. The link between PHV and peak fracture incidence provides evidence that supports this finding.

The structural and functional vulnerability of growth cartilage during adolescence represents an essential aspect that needs to be evaluated. The composition of growth cartilage consists mainly of active chondrocytes who perform metabolic functions while it lacks the capacity to endure repeated microtrauma and mechanical stress because of its slim extracellular matrix. The body of an adolescent shows higher risks for overuse injuries especially in sports that require them to perform their running and jumping and throwing movements repeatedly. The risk of injury increases during rapid growth periods because neuromuscular factors decrease coordination and balance abilities [4]. The athletic performance of athletes receives impairment from these deficits while they simultaneously increase their chances of experiencing both contact and non-contact injuries.

The risk of injury for young athletes becomes more complicated because their maturity levels create different effects on their athletic performance. Children of the same chronological age may differ significantly in their biological maturity which leads to differences in their physical size and strength and skill level [5]. The competition becomes unbalanced because early developing athletes gain physical advantages which result in higher injury rates for their later developing counterparts. It has been reported that approximately one-third of players within a single age category may not fall within the expected maturity range which demonstrates how players in that age group show different patterns of development. The existing differences between athletes require development of personalized training programs which should include specialized injury prevention techniques based on their current biological maturation stage.

The rising number of adolescent and young adult athletes in sports requires research about their injuries and the factors that cause those injuries. People who participate in sports activities receive multiple health advantages which include physical benefits and mental benefits and social benefits but they also face different levels of injury risk based on their exercise patterns which include different types and intensities and amounts of exercise [6]. Effective injury prevention and management practices depend on two critical elements which include identifying high-risk populations and studying the factors that lead to injuries. Athletes can benefit from understanding their injury patterns because this information helps develop effective methods to reduce injuries and improve their sports performance.

The complete examination of sports-related musculoskeletal injuries among adolescents and young adults requires epidemiological studies that demonstrate their actual occurrence in this particular research domain. The studies examine which sports activities lead to injuries while showing how different levels of participation affect injury risk. Researchers can find essential risk elements through the study of injury trends which occur with various levels of physical activity and training intensity and body growth. The research study will measure how common sports-related musculoskeletal injuries are among adolescents and young adults while specifically studying which injuries and body parts occur in different sports participation levels.

Methodology

Study Design: The present study was a hospital-based cross-sectional observational study conducted to assess the prevalence of sports-related musculoskeletal injuries among adolescents and young adults. The study followed the STROBE guidelines for reporting observational studies. Ethical approval was obtained from the Institutional Ethics Committee prior to the commencement of the study. All participants provided informed written consent, and in the case of minors, consent was obtained from their guardians. The study adhered to the ethical principles outlined in the Helsinki Declaration.

Study Area: The study was carried out in the Department of Community Medicine, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India.

Study Duration: The duration of the study was six months.

Study Participants

Inclusion Criteria

- Adolescents and young adults aged 10–25 years
- Individuals engaged in any form of sports activity (recreational, school-level, or competitive)
- Participants willing to provide informed consent
- Participants available during the study period

Exclusion Criteria

- Individuals with congenital musculoskeletal abnormalities
- Participants with chronic debilitating illnesses affecting mobility

- Individuals with a history of recent major surgery
- Participants unwilling to participate or provide consent

Sample Size: A total of 80 participants were included in the study using a convenient sampling method.

Procedure: Data collection was conducted using a structured and pre-tested questionnaire adapted from standard epidemiological tools assessing sports-related injuries. The questionnaire included sections on socio-demographic details, type and level of sports participation, frequency and duration of physical activity, and history of musculoskeletal injuries over the past six months. A clear definition of injury was provided to participants as any musculoskeletal complaint resulting from sports participation that required medical attention or resulted in restriction of activity.

Participants were categorized into different groups based on their level of sports participation, such as recreational, school-level, and competitive athletes. Information regarding the type of injury (strain, sprain, fracture), site of injury (upper limb, lower limb, spine/trunk), and mechanism of injury was recorded. Data collection was carried out through face-to-face interviews, ensuring clarity of questions and minimizing reporting bias.

Anthropometric measurements such as height and weight were recorded using standard procedures. Additional relevant clinical details were obtained from hospital records wherever available. The investigator supervised the data collection process to ensure accuracy and completeness. All collected data were anonymized and kept confidential.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to summarize the data. Inferential statistical tests, including the Chi-square test, were applied to determine the association between categorical variables such as type of sports participation and occurrence of injuries. A p-value of less than 0.05 was considered statistically significant. The results were presented in the form of tables and graphs for better interpretation.

Result

Table 1 shows the distribution of participants according to age group among a total of 80 individuals. The majority of participants belonged to the 16–20 years age group, comprising 30 individuals (37.50%), followed by the 21–25 years group with 28 participants (35.00%). The 10–15 years age group included 22 participants (27.50%), representing the smallest proportion of the study population. This distribution indicates that most participants were in the late adolescent to young adult age range, suggesting a higher representation of individuals in the 16–25 years category in the study.

Table 1: Distribution of Participants According to Age Group (n = 80)

Age Group (years)	Frequency (n)	Percentage (%)
10–15	22	27.50%
16–20	30	37.50%
21–25	28	35.00%
Total	**80**	**100%**

Table 2 shows the distribution of participants according to gender among a total sample size of 80 individuals. The majority of participants were male, comprising 48 individuals (60.00%), while females accounted for 32 participants (40.00%). This indicates a higher representation of males compared to females in the study population, suggesting a possible gender disparity in participation or exposure related to the study context. Overall, males constituted nearly two-thirds of the total sample, whereas females represented a comparatively smaller proportion.

Table 2: Distribution of Participants According to Gender (n = 80)

Gender	Frequency (n)	Percentage (%)
Male	48	60.00%
Female	32	40.00%
Total	**80**	**100%**

Table 3 shows the distribution of participants based on the level of sports participation among a total of 80 individuals. The majority of participants were involved at the recreational level, comprising 28 individuals (35.00%). This was followed by both school-level and competitive-level participation, each accounting for 26 individuals (32.50%). The nearly equal proportion of participants in school-level and competitive sports indicates a balanced representation of moderately and highly engaged individuals, while the slightly higher percentage of recreational participants suggests that a larger seg-

ment of the study population engages in sports primarily for leisure and fitness rather than structured or professional competition. Overall, the data reflect a fairly even distribution across different levels of sports participation with a slight predominance of recreational involvement.

Table 3: Distribution Based on Level of Sports Participation (n = 80)		
Level of Participation	**Frequency (n)**	**Percentage (%)**
Recreational	28	35.00%
School-level	26	32.50%
Competitive	26	32.50%
Total	**80**	**100%**

Table 4 shows the prevalence and types of musculoskeletal injuries among the study participants (n = 80). The findings indicate that the majority of individuals, 30 (37.50%), reported no injury, while 50 participants (62.50%) experienced some form of musculoskeletal injury. Among the injured participants, strain was the most common type, affecting 20 individuals (25.00%), followed by sprain in 18 participants (22.50%). Fractures were the least common injury type, reported in 12 individuals (15.00%). This distribution suggests that soft tissue injuries such as strains and sprains are more prevalent compared to more severe injuries like fractures in the study population.

Table 4: Prevalence and Type of Musculoskeletal Injuries (n = 80)		
Injury Type	**Frequency (n)**	**Percentage (%)**
No Injury	30	37.50%
Strain	20	25.00%
Sprain	18	22.50%
Fracture	12	15.00%
Total	**80**	**100%**

Table 5 shows the distribution of injuries according to body site among the injured participants (n = 50). The majority of injuries were reported in the lower limb, accounting for 24 cases (48.00%), indicating that it is the most commonly affected region. This was followed by injuries to the upper limb, with 16 cases (32.00%), representing a considerable proportion of total injuries. Injuries involving the spine or trunk were the least common, observed in 10 participants (20.00%). Overall, the findings suggest that lower limb injuries predominate among adolescents and young adults engaged in sports activities, possibly due to greater mechanical stress and involvement of the legs in most physical movements.

Table 5: Distribution of Injury According to Body Site (Among Injured Participants, n = 50)		
Injury Site	**Frequency (n)**	**Percentage (%)**
Lower Limb	24	48.00%
Upper Limb	16	32.00%
Spine/Trunk	10	20.00%
Total	**50**	**100%**

Discussion

The current research found that 62.50% of participants showed sports-related musculoskeletal injuries in the study, which involved adolescents and young adults who mostly belonged to the 16–20 years age group and the 21–25 years age group. The results of this study match earlier studies which found that late adolescence and early adulthood periods show the highest rates of sports participation together with increased risk of athletic injuries. Costa e Silva et al. found that 58 to 65 percent of adolescents who practiced sports regularly experienced at least one musculoskeletal injury, which occurred during their training periods and times of competitive exposure (Costa e Silva et al., 2017) [7]. The study by Schneider et al. found that adolescent athletes showed 60% injury prevalence because their bodies needed more physical activity while their growing musculoskeletal systems made them more susceptible to injuries (Schneider et al., 2012) [8]. The present study found a slightly higher prevalence rate, which still matches the range that previous studies reported.

The study results showed that male participants made up 60% of the total while female participants formed 40% of the total which matched previous research findings. Adirim and Cheng (2003) [9] reported that males constituted approximately 65–70% of sports injury cases due to greater participation in physically demanding and contact sports. Male adolescents sustained injuries at a rate which Merkel (2013) [10] found to be 1.5 times higher than their female counterparts because of their different training methods and risk-taking patterns. Certain

evidence shows that female athletes possess a higher danger of developing particular overuse injuries. Schroeder et al. (2015) [11] found that female high school athletes sustained overuse injuries at a rate of 54% while male athletes sustained overuse injuries at a rate of 46%. The results show that males sustain more injuries but females exhibit higher vulnerability to specific injury types which include overuse injuries and stress-related injuries.

The current research displayed equal distribution of sports participation which showed that recreational participants (35.00%) exceeded both school-level and competitive participants who each had 32.50% of the total. Previous research demonstrates that participation level directly affects injury patterns according to this finding. Fragoso et al. (2016) [12] reported that recreational athletes accounted for approximately 30–40% of injury cases, often due to inadequate supervision and improper techniques. According to Jayanthi et al. (2015) [13], athletes who participated in organized competitive sports faced a 1.5 to 2 times higher injury risk because of their repetitive stress training combined with early specialization and their demanding training routines. The current research shows that all participation levels experience injuries which result from different factors according to two different viewpoints.

The present research shows that the most common injury type occurred through strains which made up 25 percent of cases while sprains followed at 22.5 percent and fractures reached 15 percent. Young athletes most commonly sustain soft tissue injuries according to existing research which matches the current distribution. Maffulli and Caine (2005) [14] reported that strains and sprains together accounted for nearly 50 60 of all sports injuries in children and adolescents. Rosa et al. (2014) [15] found that collegiate athletes sustained muscle strains at a rate of 28 percent and ligament sprains at a rate of 24 percent which closely matched the current research results. Some studies have found that sprains occur more frequently than strains. Schneider et al. (2006) [16] discovered that sprains made up approximately 30 of all injuries while strains accounted for 25 of cases. The observed variation between studies results from three different factors which include the sports activities which were studied together with the training conditions and study participant groups.

The study shows that 15.00% of fractures occurred in this research which matches previous research findings that show fractures happen less often but result in more severe injuries. Swenson et al. (2012) [17] reported that fractures constituted approximately 10–15% of sports-related injuries among high school athletes, closely aligning with the current results. Changstrom et al. (2015) [18] found that adolescent athletes experienced fracture rates of approximately 12% because they showed clinically important fractures which required extended healing time and included potential medical problems. According to research younger adolescents experience higher fracture rates because their bones have not fully mineralized and they face growth-related dangers (Shanmugam & Maffulli, 2008) [19].

The study results match existing literature about the high occurrence of musculoskeletal injuries among adolescents and young adults who participate in sports. The study shows that 62.50% of participants experienced injuries, which represents a higher prevalence rate than previous studies but shows similar patterns of injury types and linked risk factors. The different results between studies stem from variations in sample size study design and the different types of sports played at various participation levels. The comparison results show that specific preventive measures must be developed through organized training systems and qualified supervision and injury prevention education during growth periods and times of high sports activity.

Conclusion

The present study highlights a substantial burden of sports-related musculoskeletal injuries among adolescents and young adults, with a prevalence of 62.50%. The majority of participants were in the 16–25 years age group, indicating higher vulnerability during late adolescence and early adulthood. Males constituted a larger proportion, suggesting greater exposure to physically demanding activities. Recreational participation was slightly more common, though injuries were observed across all levels of sports involvement. Strains and sprains emerged as the most frequent injuries, while fractures were less common but clinically significant. The lower limb was the most affected site. Overall, the findings emphasize the need for targeted preventive strategies, proper training, and increased awareness to reduce injury risk in this population.

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