



The Epidemiology of Pediatric Basketball Injuries Presenting to US Emergency Departments: 2011-2020

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Introduction

Basketball is one of the most popular sports in the United States and accounts for 26% of all pediatric sports injuries, or roughly 260,000 injuries each year¹⁻². Previous epidemiologic studies have evaluated trends of pediatric and adolescent basketball injuries in the early 2000's²⁻⁴. Several studies have described injuries in basketball by focusing on middle school⁵, high school^{3,6-8}, or college athletes⁸. While these earlier studies have established trends, such as common injury locations and gender specific injury rates^{6,9}, there is a paucity of literature examining trends in injury epidemiology since the advent of the COVID-19 pandemic. This study updates the national epidemiology of basketball-related injuries in children and adolescents, offers insight into the trends of these injuries during the decade of the 2010's, and describes the effect of the COVID-19 pandemic on injury patterns.

Methods

Data Source

The US Consumer Product Safety Commission operates a statistically valid injury

reporting system called the National Electronic Injury Surveillance System (NEISS). NEISS data represent cases of sport or product-related injury presenting to a representative sample of 100 US EDs.^{11,12} NEISS data include detailed patient and injury information. Cases of injury in patients less than 20-years-old associated with the product code 1205 (basketball and related equipment) between January 1st, 2011 and December 31st, 2020 were included in the analysis. No cases were excluded.

The NEISS database contains a variable characterizing injury diagnosis which was grouped for purposes of analysis. Diagnoses were categorized as laceration (lacerations, punctures, amputations, and nonbone avulsions), soft tissue injury (contusions and/or abrasions and hematomas), fracture, strain or sprain, concussion (including nerve injury), dislocations, and other (dental injury, foreign body, hemorrhage, internal organ injury, tympanic membrane rupture).

Statistical Analysis

An interrupted time series analysis was performed with pre- and post- linear trend estimation using March 1, 2020 as the

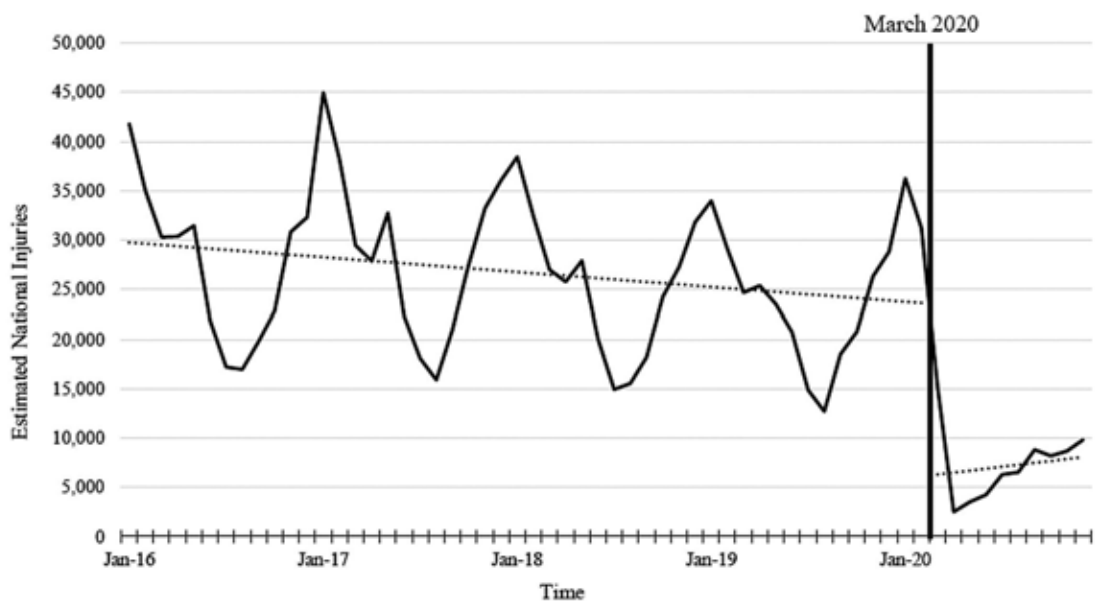


Figure 1. Effect of COVID-19 on Trends of National Basketball-Related Injuries: 2016-2020. Dotted lines demonstrate the national trend of injuries before and after the start of the COVID-19 pandemic in March 2020.

Table 1. National Estimates and Characteristics of Pediatric Basketball Injuries: 2011-2020

Characteristic	Cases, n	Estimates	%	95% CI	
				Lower	Upper
Total	104046	3210953	100.0%	2655812	3766094
Sex					
Male	80245	2445248	76.2%	1993552	2896944
Female	23801	765705	23.8%	648690	882721
Age Group					
under 5	739	17315	0.5%	13217	21414
5 to 9	7687	206621	6.4%	162101	251141
10 to 14	47498	1389462	43.3%	1143051	1635872
15 to 19	48122	1597555	49.8%	1323101	1872010
Injury Type					
Laceration	7846	253462	7.9%	209642	297283
Soft Tissue	12058	373248	11.6%	301932	444564
Fracture	18655	524426	16.3%	433398	615455
Strain/Spain	36915	1221958	38.1%	1014269	1429647
Concussion	4960	124801	3.9%	98327	151274
Dislocation	2996	94841	3.0%	79176	110505
Other	20616	618218	19.3%	444064	792371
Body Part					
Shoulder	3558	113244	3.5%	95011	131477
Elbow	5520	152644	4.8%	123925	181362
Hand	24467	767704	23.9%	628936	906472
Knee	12828	377790	11.8%	305414	450167
Foot	26292	863252	26.9%	711714	1014790
Head	13021	378862	11.8%	308688	449036
Face	10451	319400	9.9%	264391	374409
Trunk	7111	211992	6.6%	167453	256530
Other	798	26066	0.8%	16916	35216
Disposition					
Released	102158	3169934	98.7%	2622574	3717293
Hospitalized	1879	40854	1.3%	29610	52099
Fatalities	3	68	0.0%	-28	164
Unknown	6	97	0.0%	-36	231
COVID-19					
Before March 2020	101275	3137284	97.7%	2595651	3678917
After March 2020	2771	73670	2.3%	54019	93320

interrupting timepoint. The pre-COVID-19 trend was used as a baseline predictor to estimate the total difference in injuries attributable to the COVID-19 pandemic from March to December 2020. US census data for each corresponding year was used to calculate the rate of injury. This study was exempt from institutional review.

Results

During the 10-year study period there were 3,210,953 (95% CI = 2,655,812 – 3,788,094) basketball-related injuries nationwide in persons < 20 years-old corresponding to an incidence of 391 per 100,000 population. Overall estimates and injury characteristics are shown in Table 1. The mean age of injury was 14.4 years (95% CI 14.3-14.5). Over 93% of

injuries occurred in children > 10 years old with over half of all basketball-related injuries occurring in 15–19 year-olds. Basketball-related injuries followed an expected seasonal pattern with 43% of injuries presenting between December and March—the period coinciding with national middle- and high school basketball seasons. August had the fewest number of basketball-related injuries. Males accounted for 76.2% of the injuries, while females accounted for 23.8% of injuries. The ratio of male-to-female injury was similar across all age groups.

Strain or sprain was the most common injury type (38.1% of injuries) followed by fractures (16.3% of injuries) and soft tissue injuries (11.6% of injuries). Half of all injuries were to the hands or feet (23.9% and 26.9% of injuries, respectively). The head and the knee were injured at the same rate (11.8%). Concussions and dislocations each made up 3% of total injuries during the study period. The majority of injuries did not result in hospitalization (98.7%).

Effect of COVID-19

There was a decrease in injuries coinciding with the COVID-19 pandemic shutdowns in March and April 2020. From March–December 2020, during the COVID-19 pandemic, 155,638 fewer basketball-related injuries occurred than would have been expected based on pre-COVID-19 trends ($p < 0.001$, Figure 1). From January 2011 to March 2020, basketball related injuries had been declining at a rate of 77 injuries/month (924 per year). The post-COVID-19 trend indicates that basketball-related injuries increased at a rate of 196 injuries/month as the country slowly reopened during the remainder of 2020. There were no significant changes in the type of basketball injuries presenting during the COVID-19 pandemic ($p > 0.5$ for all age groups).

Discussion

To our knowledge, this is the first study using national data to classify basketball related injuries in the latter half of the 2010 decade. While there was a general trend of decreased injuries in total, there was not a notable shift in proportions of injury type and location as compared to similar studies using data before this study period. Most injuries were seen in males and in individuals ages 10 to 19 years old. Overall, the most common injuries seen were strain/sprains or fractures of the foot or hand. These kinds of injuries have consistently been shown to be the most common in basketball.^{3,8}

The COVID-19 pandemic has had a profound impact on all aspects of daily life for children, including participation in recreational and organized sports. This study's estimated reduction in basketball injuries during the COVID-19 pandemic matches the trend seen in single center and multicenter studies evaluating all pediatric sports injuries during COVID-19¹⁰. Such studies have postulated that despite the decrease in the overall number of injuries, basketball was one of the sports that continued to cause injuries during the pandemic as it could be played at home or outside in groups. This was noted by an increase in the proportion of injuries occurring in or around the home as a result from low or high-energy falls.¹⁰

Strengths & Limitations

This study has several limitations related to the use of the NEISS database. The data only represent injuries presenting to United States Emergency Departments and are therefore unable to account for subclinical injuries. Because of this, our analysis likely underestimates the true incidence of basketball-related injury. Strengths of this study include its nationally representative nature, and its 10-year timeframe.

Conclusion

The COVID-19 pandemic caused a significant decrease in the number of basketball injuries in 2020, but there was no significant shift in the injury pattern or characteristics on a national level.

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