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RESEARCH ARTICLE

Characteristics of pediatric emergency department visits for youth 10-15 years old with injuries due to interpersonal violence

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ABSTRACT

This retrospective cohort study at an urban academic pediatric emergency department (ED) in the United States identified all visits for youth 10-15 years of age for injury due to intentional interpersonal violence between January 2019 and December 2020. Demographic and clinical data were abstracted, including circumstances of the event. Data analysis included a comparison of pre-pandemic visits to pandemic visits after a statewide stay-at-home order was issued (March 30, 2020). Of 2780 10-15 year old youth evaluated for any injury, 819 (29.5%) had intentional/violence-related injuries. Most patients were male (53.1%), Black/African-American (84.1%), and were enrolled in a public insurance plan (75.0%). Although peer-violence related injuries comprised a substantial proportion (19.2%), the majority resulted from family violence (54.7%), which may include child maltreatment or physical fighting. Most injuries occurred at home (53.9%). Alcohol, drugs and weapons were significantly more likely to be involved in violent events during the pandemic in comparison to pre-pandemic (12.5 vs 5.0%, 11.4% vs 3.0%, 30.4% vs 8.5%; $p < 0.001$). Our findings support the need for ED-based efforts to screen and intervene for family and peer violence and other contributory factors (including personal, family and peer alcohol, drug and weapons access) when youth present with intentional injuries, which can be critical to preventing future violence.

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youth violence; adolescence; family violence; emergency department

Introduction

Violence is a global public health problem and a leading cause of mortality and morbidity during adolescence (Centers for Disease Control & Prevention, 2021; Centers for Disease Control & Prevention National Center for Injury Prevention & Control, 2020). Worldwide, an estimated 200,000 homicides occur among youth 10–29 years of age each year, making it the fourth leading cause of death for this age group (World Health Organization, 2020). Adolescent youth with medically-attended injuries due to violence are at risk for future negative health outcomes including repeated violence and homicide (Carter et al., 2015; Cheng et al., 2003; Cunningham et al., 2015). Generally, physical violence perpetrated by a member of their peer group is most common, although adolescents are vulnerable to all forms of violence (Shiva Kumar et al., 2017). Other examples of interpersonal violence, i.e. violence between individuals, are family violence, which may include circumstances of child maltreatment or physical fighting, and intimate partner violence, which involves a former or current dating/intimate partner.

Early adolescence is a time of dramatic increase in problem behavior and is an opportune time to intervene to prevent escalation in later life (Dishion & Patterson, 2006; Lacourse et al., 2002). This stage may be early enough to positively impact educational outcomes and coincides with transition to middle and high school. Despite this, Emergency Department (ED) violence prevention interventions are often targeted to older/late adolescent age groups (Carter et al., 2016; Cunningham et al., 2013). ED-based studies of violence on this early adolescent youth population often focus on peer-assault related injuries (Cunningham et al., 2015; Carter et al., 2015; Cheng et al., 2003; Cheng et al., 2006; Jones et al., 2021; Ryan et al., 2021; Kironji et al., 2019) although the prevalence and circumstances of other violence related injuries resulting in ED evaluation are not as well delineated.

To fill this gap, we sought to describe the patient characteristics, characteristics of the injury event and characteristics of the ED visit for all violence-related injuries incurred by 10-15-year-old adolescents in an urban U.S. pediatric ED population to develop targeted preventive strategies. Secondly, given that the pandemic has altered the epidemiology of ED visits and there is evidence that violence-related injuries have increased and/or are of higher

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severity (Hartnett et al., 2020; Kovler et al., 2021; Swedo et al., 2020), we also sought to compare these events prior to and during the pandemic to understand its impact. We will also specifically explore the involvement of alcohol and illegal drugs in these events as increased use has been reported during the pandemic (Hartnett et al., 2020; Kovler et al., 2021) and is associated with an increased risk of violence in adolescents (Hohl et al., 2017).

Materials and methods

This study is a retrospective cohort study conducted at an urban academic pediatric ED in Baltimore, Maryland. This ED is a level 1 trauma center with an estimated annual census of 35,000 patients. The patient population at this ED center is 60% Black/African American, 21% White/Caucasian, and 10% identify Hispanic/Latinx. Approximately 60% of the patient population is enrolled in a public medical insurance plan. The overall study period was January 1, 2019 to December 31, 2020. In Maryland, a stay-at-home order was issued on March 30, 2020; the pre-pandemic period was thus defined as January 1, 2019-March 29, 2020 and the pandemic period was March 30, 2020 -December 31, 2020.

A query of the electronic health record (EHR) identified all pediatric ED visits for youth 10-15 years of age during the study period. A brief EHR review was performed (including a review of chief complaint and final diagnosis) to identify visits potentially relating to injury and to exclude visits for other medical complaints. A more extensive EHR review was then done by two abstractors to confirm that the patient was presenting for evaluation of an injury and to determine whether the mechanism was intentional/interpersonal, intentional/self-inflicted or unintentional. For cases in which there was uncertainty in classification of intentionality, the research team met and discussed until consensus was achieved. To further assess coding, a random sample of 10% of the charts that were not discussed was reviewed by a senior investigator (LMR) to assess discordance and there was 100% agreement with classification. Additional demographic and clinical data were abstracted, including patient characteristics (sociodemographic data), characteristics of the injury event (other party involved, injury scene, involvement of alcohol, drugs and weapons) and characteristics of the ED visit (transport to ED, time/day of visit, presence of social work consultation and disposition). Data were entered in Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, Washington) and analyzed using SPSS Statistics V.26.0. Descriptive statistics were used to summarize the clinical characteristics of the ED visits for injuries due to intentional/interpersonal violence and t tests, chi square testing and Fisher's exact test were used to compare pre-pandemic visits to pandemic visits. The hospital institutional review board approved this study (IRB00246826).

Results

A total of 2780 youth 10-15 years of age were evaluated in the pediatric ED for injury complaints during the study period. Of these, 819 (29.5% of the pediatric ED visits for injury) had intentional/interpersonal injuries and were included in the final analysis.

Table 1 summarizes the characteristics of the study population. Overall, the majority of patients were male (53.1%), Black/African-American (84.1%), and were enrolled in a public insurance plan (75.0%). Few identified as Hispanic/Latinx (6.2%). In comparing pre-pandemic vs pandemic circumstances, patients were significantly more likely to report having no insurance (16.3% vs 10.6%, $p = 0.04$). During the pandemic, intentional injuries comprised a lower proportion of overall injury visits (25.9% vs 30.7%, $p = 0.02$).

Table 2 summarizes the characteristics of the injury event. The majority of injuries resulted from altercations with a family member (54.7%); almost half of family cases (43.7%) involved the parent. Altercations with an unrelated peer or an unknown individual accounted for 19.2% and 12.2% of events, respectively. Injury events most commonly occurred at home (53.9%) and occasionally occurred at school (14.0%).

There were differences in the factors associated with the injury event comparing pre-pandemic to pandemic circumstances. Overall alcohol, illegal drugs and weapons were involved in 6.7%, 4.9% and 13.6% of altercations, respectively. The involvement of alcohol, drugs and weapons was significantly more likely during the pandemic in comparison to pre-pandemic, with weapons being reported in 30.4% of events during the pandemic compared to 8.7% pre-pandemic ($p = .001$). In addition, the proportion of injuries from altercations with an unknown individual or an unrelated but known adult increased significantly during the pandemic. Altercations with school staff and unrelated peers decreased significantly (Table 2).

Table 3 summarizes characteristics of the ED visit. Many youths were transported to the hospital by police (48.1%); while 33.0% arrived by private vehicle/walk-in and 16.8% arrived by ambulance. There were also differences in the ED visit comparing pre-pandemic to pandemic circumstances. Youth were more likely to be transported to the pediatric ED by ambulance (24.5% vs 14.6%) during the pandemic. Patients were also more likely to seek care in the ED in the later part of the evening or overnight during the pandemic. The majority of patients was discharged from the ED (95.6%) whereas 4.3% were admitted (including hospital admission, hospitalized observation and/or operating room).

Discussion

Overall, we found that nearly 1/3 of injury visits in the pediatric ED for youth 10-15 years of age reflect intentional/violence-related injuries. Although peer-violence related injuries comprised a substantial proportion of the sample, the majority of these injuries occurred as a result of family violence, which may include circumstances of child maltreatment or physical fighting. Given the high volume of violence related injuries and that family and peer violence accounted for nearly 75% of these injuries in this age group,

Table 1. Patient characteristics of youth 10-15 years of age with pediatric emergency department visits for interpersonal violence with injuries.

	Overall study population	Pre-pandemic	Pandemic	p value
	n = 819	n = 635	n = 184	
Proportion of overall injury visits in PED	819/2780 (29.5%)	635/2071* (30.7%)	184/709* (25.9%)	0.02
Age in years				
10	98 (12.0%)	79 (12.4%)	19 (10.3%)	0.46
11	116 (14.2%)	94 (14.8%)	22 (12.0%)	
12	127 (15.5%)	101 (15.9%)	26 (14.1%)	
13	136 (16.6%)	97 (15.3%)	39 (21.2%)	
14	177 (21.6%)	137 (21.6%)	40 (21.7%)	
15	165 (20.1%)	127 (20.0%)	38 (20.7%)	
Mean age in years	12.8 + 1.7	12.8 + 1.7	12.9 + 1.6	0.27
Gender				
Male	435 (53.1%)	343 (54.0%)	92 (50.0%)	0.34
Female	384 (46.9%)	292 (46.0%)	92 (50.0%)	
Race				
Black or African American	689 (84.1%)	530 (83.5%)	159 (86.4%)	0.52
White or Caucasian	65 (7.9%)	51 (8.0%)	14 (7.6%)	
Other	65 (7.9%)	54 (8.5%)	11 (6.0%)	
Ethnicity				
Hispanic or Latino	51 (6.2%)	41 (6.5%)	10 (5.4%)	0.27
Not Hispanic or Latino	760 (92.8%)	586 (92.3%)	174 (94.6%)	
Health Insurance				
Public	614 (75.0%)	478 (75.3%)	136 (73.9%)	0.04
Private	96 (11.7%)	78 (12.3%)	18 (9.8%)	
None	97 (11.8%)	67 (10.6%)*	30 (16.3%)*	

*Indicates statistically significant difference.

Table 2. Characteristic of the injury event for youth 10-15 years of age with pediatric emergency department visits for interpersonal violence with injuries.

	Overall study population	Pre-pandemic	Pandemic	p value
	n = 819	n = 635	n = 184	
Other party involved				
Family member	448 (54.7%)	347 (54.6%)	101 (54.9%)	<0.001
Intimate partner	5 (0.6%)	0 (0%)*	5 (2.7%)*	
Police	15 (1.8%)	10 (1.6%)	5 (2.7%)	
Teacher/school staff	27 (3.3%)	27 (4.3%)*	0 (0%)*	
Party unknown to youth	100 (12.2%)	68 (10.7%)*	32 (17.4%)*	
Unrelated but known adult(s)	67 (8.2%)	44 (6.9%)*	23 (12.5%)*	
Unrelated but known peer(s)/minor	157 (19.2%)	139 (21.9%)*	18 (9.8%)*	
Family member involved				
Parent	358 (43.7%)	285 (44.9%)	73 (39.7%)	
Sibling	43 (5.3%)	31 (4.9%)	12 (6.5%)	0.50
Grandparent	20 (2.4%)	15 (2.4%)	5 (2.7%)	
Aunt/Uncle	28 (3.4%)	21 (3.3%)	7 (3.8%)	
Cousin	9 (1.1%)	5 (0.8%)	4 (2.2%)	
Scene of injury event				
Home	442 (53.9%)	326 (51.3%)*	116 (63.0%)*	<0.001
Park/playground	15 (1.8%)	15 (2.4%)*	0 (0%)*	
School	115 (14.0%)	115 (18.1%)*	0 (0%)*	
Street/sidewalk	78 (9.5%)	50 (7.9%)*	28 (15.2%)*	
Other	43 (5.3%)	24 (3.8%)*	19 (10.3%)*	
Unknown	119 (14.5%)	98 (15.4%)	21 (11.4%)	
Involvement of alcohol				
No	764 (93.2%)	603 (95.0%)*	161 (87.5%)*	0.001
Yes	55 (6.7%)	32 (5.0%)*	23 (12.5%)*	
Patient	4	3	1	0.63
Other party	51	29	22	
Involvement of illegal drugs				
No	779 (95.1%)	616 (97.0%)*	163 (88.6%)*	<0.001
Yes	40 (4.9%)	19 (3.0%)*	21 (11.4%)*	
Patient	15	8	7	0.56
Other party	25	11	14	
Involvement of weapons				
No	708 (86.4%)	580 (91.3%)*	128 (69.6%)*	<0.001
Yes	111 (13.6%)	55 (8.7%)*	56 (30.4%)*	
Firearm	33	12	21	<0.001
Knife	34	26*	8*	
Other	44	17	27	

*Indicates statistically significant difference.

Table 3. Characteristic of the Emergency Department visit for youth 10–15 years of age with injuries from interpersonal violence.

	Overall study population	Pre-pandemic	Pandemic	p value
	n = 819	n = 635	n = 184	
Transport to Hospital				
EMS (Ambulance/Air)	138 (16.8%)	93 (14.6%)*	45 (24.5%)*	0.03
Interfacility transport	15 (1.8%)	13 (2.0%)	2 (1.1%)	
Non-EMS (car or walk in)	270 (33.0%)	217 (34.2%)	53 (28.8%)	
Police	394 (48.1%)	310 (48.8%)	84 (45.7%)	
ED arrival time				
12AM-6AM	94 (11.5%)	63 (9.9%)*	31(16.8%)*	0.001
6AM-12PM	103 (12.6%)	84 (13.2%)	19 (10.3%)	
12PM-6PM	330 (40.3%)	275 (43.3%)*	55 (29.9%)*	
6PM-12AM	292 (35.7%)	213 (33.5%)*	79 (42.9%)*	
Day of ED visit				
M-F	659 (80.5%)	519 (81.7%)	140 (76.1%)	0.09
Sat-Sun	160 (19.5%)	116 (18.3%)	44 (23.9%)	
Was a Social Work consult obtained				
No				
Yes	254 (31.0%)	203 (32.0%)	51 (27.7%)	0.27
	565 (69.0%)	432 (68.0%)	133 (72.3%)	
ED disposition				
Admit including OR	35 (4.3%)	23 (3.6%)	12 (6.5%)	0.04
Discharge	783 (95.6%)	612 (96.4%)*	171 (92.9%)*	
Expired	1 (0.1%)	0 (0%)	1 (0.5%)	

*Indicates statistically significant difference.

EDs planning the implementation of best practices for violence reduction and prevention should consider adopting resources and supports prioritizing both family and peer related violence.

Studies of violence prevention interventions for adolescent youth often focus on peer-assault related injuries, which commonly occur at school (Cunningham et al., 2015; Carter et al., 2015; Cheng et al., 2003; Cheng et al., 2006; Jones et al., 2021; Ryan et al., 2021; Kironji et al., 2019). However, our data suggest that the home is a prevalent and possibly under recognized setting for adolescents to sustain violence related injuries as this was the most common location of such events in our study population. This is particularly relevant during the pandemic, as stay-at-home orders and disruptions in school and work routines resulted in adolescents spending more time at home. These patterns are also concerning because exposure to family violence increases an individual's risk for perpetrating violence in their own future relationships (Cohen et al., 2018; Ehrensaft & Cohen, 2012; Ingram et al., 2020; Tucker et al., 2013). Given this, intervening when youth present to the ED can be critical to preventing future violence. Adolescents experiencing violence are more likely to be seen in the ED than in other settings (Wilson & Klein, 2000) which further supports that the ED is a key setting in which to identify at risk youth and initiate outreach. Furthermore, given the limited contact with school officials during the pandemic and at other times, identification of youth being victimized by family or interpersonal violence through the ED takes on even more salience.

We observed several differences in pre-pandemic and pandemic circumstances of these events.

Perhaps most alarming was the increased involvement of alcohol, illegal drugs and weapons, as well as a trend towards an increase in the admission rate, which suggests higher acuity of these injuries. Increased use of alcohol and illegal drugs during the pandemic and associated negative physical health and mental health consequences have been described (Pollard et al., 2020; McKnight-Eily et al., 2021); our data suggest similar negative associations with medically-attended violence injuries in adolescents. As we transition to post pandemic life, it will be important to provide supports to address these harmful consequences of the pandemic. Additionally, increases in weapon-involved intentional injuries during the pandemic have been described in adult populations (Abdallah et al., 2021; Yeates et al., 2021). These findings highlight the importance of community-based intervention and primary prevention efforts, including health communication strategies focused on firearm harm reduction strategies. Furthermore, targeted outreach and engagement of vulnerable groups via ED-based screening and intervention efforts after violent events have occurred seem to be vital components of pandemic-related public health response.

Lastly, we were surprised that injured patients were more likely to be transported to the ED by police or private means (car or walk-in) rather than ambulance, although the majority of injuries were minor given the low hospital admission rate. Given the high proportion of family violence in our study population, it is possible that this trend reflects police intervention at the injury scene for violence-related events that then prompted ED evaluation for involved adolescents.

Although this study is limited to a single institution and an urban setting, which limits generalizability, a major strength includes the descriptive patient and event characteristics which presents a more complete measure of intentional/violence-related injuries to early adolescent youth. Additional limitations include the retrospective study design and the potential for inaccurate or missing information present in the medical records that could also contribute to errors in chart abstraction during chart review.

Knowledge of these circumstances can be applied to best inform the development of preventive strategies targeted to the areas of highest need in EDs to support early adolescents and their families. The implications of these results

suggest that innovative approaches will be needed during the pandemic, including both ED-based and community-based outreach to identify and support at-risk adolescents (Ragavan et al., 2020).

Overall, nearly one-third of ED-attended injury visits for youth 10-15 years of age in our study population reflect intentional/violence-related injuries and the majority of these injuries are sustained at home. Peer-related violence accounted for nearly 20% of the injuries. The involvement of alcohol, drugs and weapons were significantly more likely to be involved during the pandemic in comparison to pre-pandemic. Our findings support the need for ED-based efforts to screen and intervene for family and peer violence and other factors which may be contributory (including personal, family and peer alcohol, drug and weapons access) when youth present to the ED with intentional injuries which can be critical to preventing future violence.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

Contributors' statement page

Drs. Ryan and Jones conceptualized and designed the study, designed the data collection instruments, coordinated and supervised data collection, carried out the initial analyses, interpreted the data, drafted the initial manuscript, and reviewed and revised the manuscript.
Ms. Miller and Ms. Walter designed the data collection instruments, analyzed and interpreted the data, and reviewed and revised the manuscript.
Dr. Irvin analyzed and interpreted the data, critically reviewed the manuscript for important intellectual content and revised the manuscript.

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