

Hospital Admissions for Abusive Head Trauma at Children's Hospitals During COVID-19

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Evidence that reports to child protective services¹ and emergency department visits² for maltreatment have decreased during the coronavirus disease 2019 (COVID-19) pandemic has led to concerns that children are being maltreated but not being brought to care. We hypothesized that in the case of potentially life-threatening abuse, such as abusive head trauma (AHT), it is more difficult for caregivers to forgo medical care. A standard approach to estimating the occurrence of AHT has been counting hospitalizations.³ Therefore, comparing AHT hospitalizations during the COVID-19 pandemic in 2020 with those in previous years would provide useful insight into how the pandemic is influencing this type of abuse.

METHODS

The Pediatric Health Information System (PHIS), a database of 51 children's hospitals in the United States, was used to identify hospitalizations for AHT from January 1, 2017, to September 30, 2020, in children <5 years of age. This study was limited to 49 hospitals with consistent contributions to the PHIS since 2017. Inclusion as hospitalizations for AHT required *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD-10-CM) codes for both confirmed child abuse and head

trauma (the Centers for Disease Control and Prevention's broad definition for AHT⁴; Supplemental Table 2). Hospitalizations associated with ICD-10-CM codes for suspected abuse, auto crashes, or falls were excluded (Supplemental Table 3). Patient characteristics and mean monthly AHT admissions in 2020 were compared with those in 2017–2019 by using the time period March 11 (the World Health Organization declaration of COVID-19 as a pandemic⁵ in 2020) to September 30 for each year to account for seasonality (Table 1). This study was considered exempt from review by the Institutional Review Board of the Yale School of Medicine.

Statistical comparison of patient characteristics was performed by using Wilcoxon rank and χ^2 tests. The mean monthly admissions during COVID-19 were compared across all years by using a Kruskal-Wallis test, followed by pairwise testing. Analyses were performed by using JMP, version 15.0.0 (SAS Institute, Inc, Cary, NC).

RESULTS

Of the 1 216 336 hospitalizations for children <5 years of age, 1317 (0.1%) were for AHT. Of these, 750 occurred between March 11 and September 30, 127 (16%) of which were in 2020. Compared to 2017–2019, children hospitalized



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Dr Maassel collected data, conducted the initial analyses, drafted the initial manuscript, and reviewed and revised the manuscript; Drs Asnes and Leventhal conceptualized and designed the study and critically reviewed the manuscript; Dr Solomon conceptualized and designed the study, coordinated and supervised data collection, and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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TABLE 1 Comparison of Patient Demographics and Admission Characteristics of AHT Hospitalizations Occurring From March 11 to September 30 Over 4 Years

Patient and Admission Characteristics	All Years (N = 750)	2017–2019 (n = 623)	2020 (n = 127)	P
Age, d, median (IQR)	137.5 (263.5)	132 (243)	148 (413)	.19
Length of stay, d, median (IQR)	6 (13)	7 (15)	5 (8)	.004
Sex, male, n (%)	483 (64.4)	401 (64.4)	82 (64.6)	.97
Age <1 y, n (%)	572 (76.3)	483 (77.5)	89 (70.1)	.08
Payer, government, n (%)	620 (82.7)	517 (83)	103 (81.1)	.61
Race, n (%)				.71
White	448 (59.7)	369 (59.2)	79 (62.2)	
Black	174 (23.2)	151 (24.2)	23 (18.1)	
Asian	7 (0.9)	5 (0.8)	2 (1.6)	
American Indian	5 (0.7)	4 (0.6)	1 (0.8)	
Pacific Islander	6 (0.8)	5 (0.8)	1 (0.8)	
Other	110 (14.7)	89 (14.3)	21 (16.5)	
ICU, n (%)	451 (60.1)	370 (59.4)	81 (63.8)	.36
Ventilator use, n (%)	316 (42.1)	266 (42.7)	50 (39.4)	.49
Subdural hemorrhage, n (%)	599 (79.9)	493 (79.1)	106 (83.5)	.26
Retinal hemorrhage, n (%)	418 (55.7)	344 (55.2)	74 (58.3)	.53
Mortality, n (%)	78 (10.4)	61 (9.8)	17 (13.4)	.24

IQR, interquartile range.

with AHT during 2020 had a shorter length of stay but were otherwise similar regarding the percentage of ICU stay, ventilator use, subdural hemorrhage, retinal hemorrhage, and mortality. There was a significant difference in mean monthly admissions when comparing all years together ($P = .003$). On pairwise comparisons, mean monthly admissions were lower in 2020 compared to 2019 ($P = .002$), 2018 ($P = .004$), and 2017 ($P = .007$; Fig 1). There were no statistical differences in monthly admissions among 2017 to 2019.

DISCUSSION

This study reveals a significant decrease in AHT admissions in children <5 years of age across 49 children's hospitals within the United States during the COVID-19 pandemic. The expectation was that child maltreatment would increase because of the emotional and economic stressors of the pandemic.⁶ In some early studies, researchers supported this expectation but were limited to single institutions with short study periods during the pandemic.^{7,8} In contrast, decreased child protective

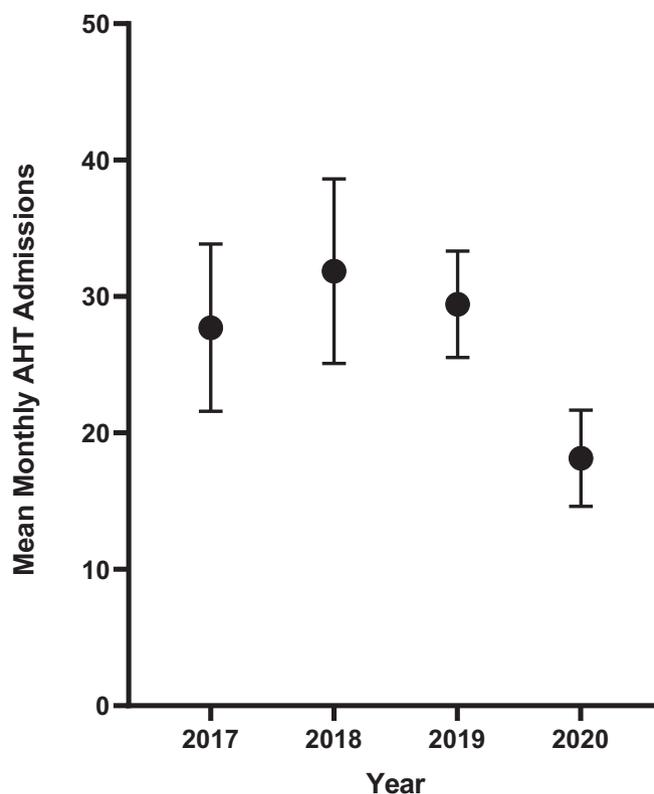


FIGURE 1

Comparison of mean monthly admissions for AHT between March 11 and September 30 over 4 years. Data are reported as means with 1 SD for monthly admissions for AHT. The mean monthly admissions for 2020 (19.1 ± 2.9) were lower than those for 2017 (29.1 ± 4.2), 2018 (33.5 ± 6.3), and 2019 (30.9 ± 2.3). The numbers for total AHT admissions were as follows: 194 in 2017, 223 in 2018, 206 in 2019, and 127 in 2020.

services reporting and national emergency department visits related

to child abuse have generated concern that maltreatment may be

occurring without subsequent evaluation.^{1,2} Mild cases of AHT may be able to forgo care; however, the overall severity of this type of abuse necessitates consideration of alternative hypotheses, given our findings. One possible explanation could be that with the marked increase in job losses for women⁹ and many adults working from home, young children were more likely than before the pandemic to be cared for by ≥ 2 caregivers, potentially reducing the likelihood of sole male caregivers, who are the most common perpetrators of AHT.¹⁰

The study's major limitation is its reliance on diagnostic coding, which may be erroneous. Additionally, admission criteria may have been more restricted during COVID-19; however, this effect may be minimal, given a similar percentage of ICU admissions, compared to previous years. Furthermore, PHIS data are available for patients discharged through September 30, 2020; therefore, a few admissions during COVID-19 may not have been counted, but this is unlikely to substantially affect our results. Given the severity of AHT, the observed decrease in hospitalizations likely represents a true decrease in the occurrence of AHT. As more data become available, continued

surveillance of AHT trends will clarify our findings.

ABBREVIATIONS

AHT: abusive head trauma
 ICD-10-CM: *International Classification of Diseases, 10th Revision, Clinical Modification*
 PHIS: Pediatric Health Information System

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