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Sociodemographic determinants of non-accidental traumatic injuries in children

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ABSTRACT

Background: Traumatic injuries account for 18% of child abuse cases and 1680 children die from abuse annually. We set out to determine the impact of sociodemographic characteristics on resource utilization and outcomes in nonaccidental trauma (NAT).
Methods: We used the Kid's Inpatient Database to identify children with two main subgroups of child abuse diagnoses: NAT and other forms of child abuse. Income was represented by quartiles. Statistical analysis included descriptive statistics and regression analyses.
Results: We identified 5617 children requiring hospital admission due to NAT. Medicaid insurance payer status was associated with higher rates of traumatic injuries than private insurance. Black race, male sex, and high-income-quartile were independent factors associated with increased cost. We identified an increased risk of mortality in younger children and those with self-pay/uninsured status.
Conclusion: NAT represents a prevalent cause of childhood mortality. This study identifies sociodemographic factors associated with increased occurrence, higher resource utilization, and increased mortality in NAT.

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Introduction

According to The Federal Child Abuse Prevention and Treatment Act, child abuse is defined as "any act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation; or an act or failure to act, which presents an imminent risk of serious harm."[1] The Administration for Children and Families and Centers for Disease Control and Prevention (CDC) estimate that maltreatment and abuse victims approximate to 700,000 children with approximately 1680 children dying from their injuries and neglect.[2]

Certain risk factors may increase the likelihood of victimization, and understanding these risk factors will help professionals recognize abuse and intervene appropriately.[3] Sex has been recognized has an important determinant of child maltreatment.

According to the World Health Organization, boys are the victims of beatings and physical punishment more often than girls whereas girls have a higher risk of being victimized by sex, coercion into prostitution, infanticide, and neglect.[4] Certain age groups are at higher risk of abuse; for example, in 2012, the rates of victimization for girls and boys were 9.5 and 8.7 per 1000 children, respectively, with those younger than 1 with the highest rate of all groups.[5]

Although race is not considered a risk factor, in 2015, the child abuse rate was higher among Blacks compared to other racial groups.[6] Interestingly, after controlling for other variables, including socioeconomic status, the National Incidence Studies of Child Abuse and Neglect found no correlation between race and the incidence of child abuse.[7,8] Thus, socioeconomic status is a recognized risk factor which contributes to child abuse. Socioeconomic status and child maltreatment are related, as research indicates that children with household income less than $15,000 are 22 times more likely to experience child maltreatment than those with $30,000 or more of annual income.

Children who experience maltreatment often have severe consequences, including traumatic injuries and cognitive deficits that

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can influence development and be carried into adulthood.[9—11] Cognitive deficits can lead to a decreased capacity to recognize risk and respond appropriately. Moreover, abused children are at higher risk of alcohol and drug abuse.[6] In addition, child maltreatment has a significant economic impact. Hospital treatment cost of child maltreatment-related injuries was approximately $98.7 million in 2005, with an estimated lifetime economic burden of $585 billion.[12,13] We focused our study in children who are victims of maltreatment and suffer traumatic injuries (non-accidental trauma [NAT]). We set out to analyze the sociodemographic factors that may influence the likelihood of mortality and their impact on treatment cost.

Methods

Study design

We conducted a retrospective study of pediatric patients with non-accidental trauma using the Healthcare Cost and Utilization Project's (HCUP) Kids Inpatient Database (KID) for the years 2006, 2009, and 2012.[14] The KID is released every three years and is the United States' largest all-payer pediatric inpatient care database collected by the Agency for Healthcare Research and Quality.[15] By using discharge weights, the KID allows for national estimates and contains socioeconomic variables such as median zip code income, hospital charges, and payer status. Deidentified data were used for this study and it was exempt from Institutional Review Board approval by the University of Texas Medical Branch.

Study population

All pediatric discharges (age ≤18 years), were identified in a multi-step process using diagnosis codes representing non-accidental trauma. We included children with diagnosis codes of maltreatment/abuse (ICD-9-CM codes 995.50—995.59, E9670-E9679) and used diagnosis codes of accidental injury (ICD-9-CM codes 800.00—904.9, 910.00—959.9) to identify the cases of non-accidental trauma. Patients admitted since in-hospital birth and patients who were transferred from other hospitals were excluded.

Patient characteristics

Patient characteristics included sex, age, race, primary payer, and median household income. Race was categorized as White, Black, Hispanic and other (Asian or Pacific Islander, Native American, or other), as collected by the KID based on self-report. Primary payer was categorized as Medicaid, private, self-pay (self-pay or uninsured) and other (no charges or other sources). Median household income for patient ZIP code was reported in quartiles (Q1-lowest income quartile, Q4-highest income quartile).

Hospital characteristics

Hospital characteristics included geographic location (North East, South, Midwest or West), hospital teaching status (teaching or non-teaching), ownership (government or private), and bed size (small, medium or large).

Outcome variables

Following outcome variables were considered: in-hospital mortality and total costs. The KID reports hospital charges and using the HCUP Cost-to-Charge Ratio, all charges were converted to determine total cost. All costs were converted to 2012 US dollars using the consumer price index.[16]

Statistical analysis

All the statistical analyses accounted for survey design. Categorical and continuous outcomes were compared to patient characteristics using chi-square and t-tests. In-hospital mortality was summarized using proportions; length of stay (LOS) and total charges were presented using mean and standard error. Multivariable logistic regression analysis was used to evaluate the association of patient and hospital characteristics with in-hospital mortality. Multivariable linear regression was used to determine the association of patient and hospital characteristics with LOS and hospital costs. During our multivariable analyses, we did not consider any hierarchy in our data set. All statistical analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, North Carolina) with all testing as 2-sided at a level of significance (α) set at 0.05.

Results

We identified 8918 cases of child maltreatment equivalent to 13,509 weighted pediatric discharges. Non-accidental trauma accounted for 41% of the cases recognized as child maltreatment that required hospitalization (3686 cases, 5617 weighted discharges). Table 1 shows the sociodemographic characteristics and the comparison of non-accidental trauma and other types of child maltreatment without traumatic injuries.

Male cases of NAT (58%) were higher than cases of child maltreatment without evidence of traumatic injury. The racial distribution is similar in both groups (NAT compared to child maltreatment without traumatic injury). However, the age distribution differed between NAT and other types of child maltreatment. Younger patients (≤2 years) were more likely to be admitted to the hospital due to NAT than older children. Similarly, a higher proportion of pediatric patients with Medicaid were hospitalized due to NAT compared to other types of maltreatment without traumatic injury.

The mean treatment cost was $15,665 (SE, $548) per patient discharge. The mortality rate of pediatric patients requiring admission to the hospital due to non-accidental trauma was 17% (615 out of 3686 children). Determinant factors of these outcomes were analyzed.

Sociodemographic determinants of mortality

Table 2 reports multivariable logistic regression results for in-hospital mortality. Among patient characteristics, age and insurance status were associated with in-hospital mortality. Children younger than 7 years of age who sustain non-accidental trauma were more likely to die during the index hospital admission than older children (≥7 years). Self-pay and uninsured patients had higher mortality odds than privately insured patients. Sex, race, and household income were not found to have a significant association with mortality in our analysis.

Sociodemographic determinants of treatment cost

Table 3 reports the adjusted multiple linear regression analyses for treatment cost. Female patients had a decreased cost compared to male patients. Black patients had significantly increased treatment cost when compared to Whites. Patients with insurance status self-pay and "other" and those within the lowest quartile of household income were found to have significantly lower treatment cost when compared to patients with private insurance.