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PAPER
PATHOLOGY AND BIOLOGY

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Child Abuse-Related Homicides in New Mexico: A 6-year Retrospective Review

ABSTRACT: We retrospectively reviewed autopsy records at a statewide medical examiner's office in order to identify and characterize deaths due to child abuse. In a 6-year period in New Mexico, the medical examiner investigated 45 deaths determined to be child abuse-related. Decedents were predominantly male (68.9%), Hispanic White (53.3%), and all were 5 years of age or younger, with a median age of 1 year. Head injuries were the most common cause of death (44.4%), followed by battered baby syndrome (15.6%). Relatives were involved as alleged perpetrators in 80% of the cases, with the father most often implicated (36.1% of cases), and 88.9% of child abuse injuries resulting in death occurred in the family's residence. Toxicology was positive in 26.7% of cases, but only two cases had substances of abuse present. Information on risk factors such as prematurity, parental age, and history of abuse was also collected.

KEYWORDS: forensic science, child abuse, homicide, toxicology, battered baby syndrome, domestic violence

Childhood and adolescent homicides often show a bimodal age distribution, and are most likely to occur during the first year of life and then during later adolescence (1–3). Over three-quarters of homicides involving very young children are viewed as fatal child abuse, with findings considered to have been intentionally incurred (4–6). Child abuse and neglect are defined by federal law PL 93–247(1978), now amended and codified as 42 USCS Section 5106 g (4), as "the physical and mental injury, sexual abuse, or exploitation, negligent treatment or maltreatment of a child under age 18 by a person who is responsible for the child's welfare under circumstances which indicate that the child's health or welfare is harmed or threatened" (7). A 2006 study found that over 900,000 children in the United States were survivors of child abuse and neglect (8), and that survivors suffer a wide variety of physical and mental illness throughout their lifetimes (9,10). Previous studies have shown that for children younger than 3 years of age, the perpetrator is usually a relative of the victim and male (1,11). Risk factors for child abuse include parental factors such as a young age, a low level of education, multiple children in the family, and late initiation of prenatal care, and child characteristics such as prematurity, low birth weight, male sex, and low Apgar scores (1). Frequent initial histories involve "falls" and "found unresponsive" (12).

Child abuse-related homicides make up a significant proportion of childhood forensic autopsies performed at the New Mexico Office of the Medical Investigator (OMI), which holds jurisdiction over deaths that occur in the entire state of New Mexico. We hereby present a retrospective epidemiologic review of child abuse-related homicides that occurred within a 6-year period (2001–2006), in order to explore patterns and characteristics of the demographics of child abuse victims as they apply to New Mexico, and to identify risk factors so that possible interventions and preventive strategies can be employed to mitigate future occurrences.

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Materials and Methods

Data Collection

The OMI is the centralized, statewide medical examiner's agency for the state of New Mexico, authorized by state statute to investigate any deaths that are sudden, violent, unexpected, or unattended by a physician (13). Information generated from medicolegal death investigations (about 5000 per year, or one-third of the deaths occurring in New Mexico each year) is entered into a web-based database, and includes demographic, circumstantial, toxicologic, and microbiologic data. A list of pediatric and youth homicide cases was developed from an Access query of the OMI database for January 1, 2001 through December 31, 2006, using in-house codes for manner of death (homicide) and an age limit of 18 years and younger. Case information, including age, gender, race/ethnicity, county of residence and county of pronouncement, causes of death and a brief description of circumstances, were downloaded electronically into an Excel spreadsheet. Homicidal cases that were not related to child abuse based on review of circumstances and causes of death were excluded, and cases that met the definition of child abuse and neglect (7) were reviewed for additional information.

Additional data were abstracted from review of electronic case files for each case, including the location of death, the alleged perpetrator, major autopsy findings and toxicology findings, survival interval, and putative risk factors (prematurity, developmental/medical concerns, domestic violence in the home, history of child abuse, parental alcohol use, and parental marital status).

Data Analysis

Data were cleaned in Microsoft Excel and analyzed with SAS software, version 9.1 (SAS Institute, Cary, NC). Chi-square or Fisher exact tests were used to analyze categorical variables, and continuous variables were analyzed with Wilcoxon rank sum tests. *p*-Values of 0.05 or less were considered statistically significant.

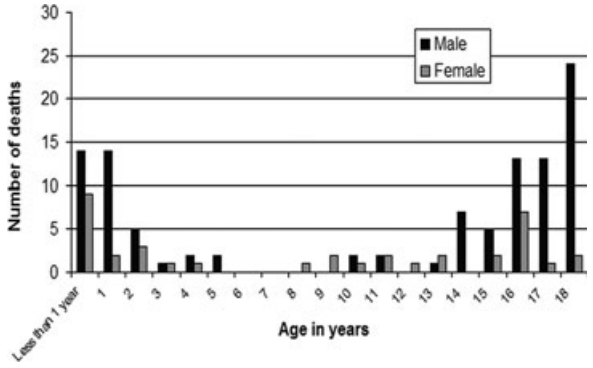

FIG. 1—*Age and gender distribution of homicidal victims ≤18 years of age in New Mexico, 2001–2006.*

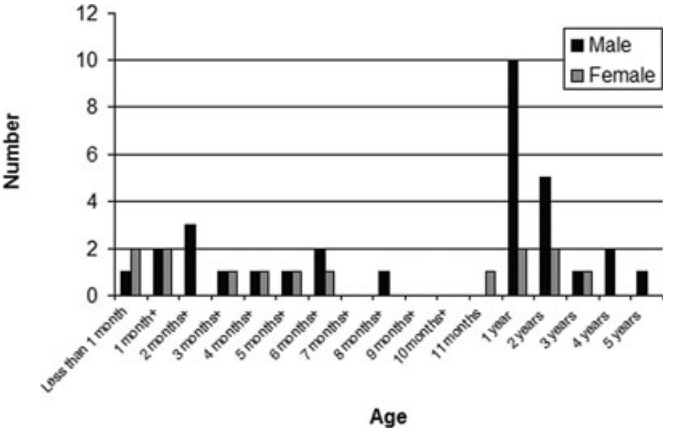

FIG. 2—*Age and gender distribution of fatal child abuse victims in New Mexico, 2001–2006.*

Results

Demographics

During this 6-year period, 142 homicides meeting our case definition were identified, with ages ranging from 1 day to 18 years (Fig. 1). This represents 0.5% of all forensic autopsies, and 6.5% of child autopsies for the same period. Forty-five cases were child abuse-related, as indicated by case history and autopsy findings. Ages ranged from 1 day to 5 years (mean age 1.14 years), with a male to female ratio of 2.2:1 (Table 1; Fig. 2). Victims of child abuse were significantly younger than victims of other types of homicides ($p < 0.001$). Seventy-three percent of child abuse-related homicides in our series involved children who were 1 year of age or younger. There was no significant difference in gender in victims of child abuse compared with victims of other types of homicides, as both were predominantly male. Fifty-three percent of victims were Hispanic Whites, followed by American Indians (22.2%), non-Hispanic Whites (15.6%), and Blacks (4.4%). Race/ethnicity was unknown in the remaining 4.4% of victims.

Causes of Death

Head injuries were the most frequent cause of death as listed in the death certificate (44.4%), followed by battered baby syndrome (15.6%) and multiple blunt force injuries (15.6%), abdominal injuries (8.9%), asphyxia (6.7%), shaken baby syndrome (2.2%), dehydration/malnutrition (2.2%), and others (one case of undetermined charring death). It is important to note that the actual percentage of victims who suffered from head injuries was higher than 44%, for autopsy findings associated with head injuries were present also in many cases labeled as battered baby syndrome, shaken baby syndrome, and multiple blunt force injuries (see below).

TABLE 1—*Demographic characteristics of New Mexico child abuse deaths, 2001–2006.*

Age	
Median	1 year
Range	1 day–5 years
Gender	
Male	31 (68.9%)
Female	14 (31%)
Race/ethnicity	
Non-Hispanic White	7 (15.6%)
Hispanic White	24 (53.3%)
Native American	10 (22.2%)
African American	2 (4.4%)
Unknown	2 (4.4%)

Physical and Toxicologic Findings

The majority of victims showed signs of head injuries (84.4%), including one or more of the following findings: skull fractures, subscalpular/subdural/subarachnoid hemorrhages, retinal and/or optic nerve sheath hemorrhages, and diffuse axonal injury. Fractures of ribs and/or long bones were seen in 40%, and abdominal injuries were seen in 8.9%. Bite marks were seen in 11.1% of cases, and these involved the cheek, torso, and extremities.

Toxicology was positive in 26.7% of victims, with almost half (13.3%) being antiepileptics (benzodiazepines, diphenylhydantoin, phenobarbital). Cocaine (and its metabolite) was detected in one victim, and ethanol was detected at a negligibly low concentration in one victim. A minor concentration of acetone was detected in one case. Lidocaine, pseudoephedrine, acetaminophen, and morphine were detected in the remaining victims, who all received medical attention, and thus were most likely related to resuscitative attempts or previous treatment for illnesses or injuries.

Survival Interval

We explored the survival intervals reported for victims who survived the initial injury (34/45, 75.6%), and found that it ranged from under an hour to two and a half years (Fig. 3). Most child

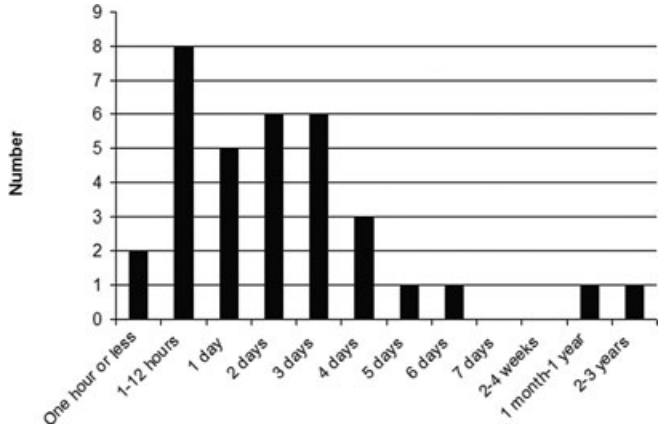

FIG. 3—*Distribution of survival interval for child abuse deaths, 2001–2006.*

abuse victims with a reported survival interval (32/34, 94.1%) did not survive more than 1 week after the fatal injury.

Location and Perpetrator

Eighty-nine percent of the injuries resulting in child abuse-related deaths were inflicted in the residence. The remaining victims died in the hospital (6.7%), in the babysitter's residence (2.2%), and in a boarding school (2.2%). Alleged perpetrator information was obtained from review of investigative reports and confessions, if available. Relatives were allegedly involved in 80% of cases, with the father being implicated most frequently in this group (36%), followed by one or both parents (30.6%), the mother (16.7%), the stepfather (8.3%), the stepmother (5.6%), and the aunt (2.8%). The remaining nonrelative cases with a known suspect allegedly involved the mother's boyfriend (11.1%), the foster parent(s) (4.4%), and the father's girlfriend (2.2%). The alleged perpetrator was unknown in 2.2% of cases.

Predisposing Factors

Premature births were reported in 8.9% of cases, with gestational ages ranging from 31 to 35 weeks. Full-term births were reported in 20% of cases, and the birth history was unknown in the remaining 71.1% of cases. In terms of developmental or medical concerns, recent vomiting was reported in 17.8% of cases, followed by long-term or recurring medical concerns (15.6%) such as airway and sinus diseases, seizure disorders, lactose intolerance/diarrhea, anemia, failure to gain weight (<10th percentile), and human immunodeficiency virus infection. Eleven percent of victims had undergone previous hospitalization for various procedures, such as management of fractures/head injuries, motor vehicle accidents, tracheostomy, hydrocephalus, hernia repair, and phototherapy for jaundice. Behavioral concerns such as bed-wetting were only observed in one case (2.2%). Healthy growth without pertinent developmental or medical concerns was reported in 6.7% of cases, and health information was unknown in the remaining 42.2% of cases.

Parental ages were reported in five cases, and ranged from 16 to 29 years. Marital/cohabitation status was reported in 60% of cases, divided between cohabitation (28.9%), separation (28.9%), and single (2.2%). In terms of employment, the mother was reported to have a job in 11.1% of the cases, and to still be in high school in 2.2% of the cases. A history of child abuse was reported in 8.9% of deaths, and domestic violence in the home was reported in 6.7% of investigated deaths. In one case, there were other children in foster care. Parental alcohol use was unknown in all cases.

Discussion

Our study showed that child abuse-related deaths in New Mexico during 2001–2006 occurred in children all 5 years of age or younger, with the majority being 1 year of age or younger. The racial/ethnic distribution of child abuse decedents differed from that of New Mexico, which reported a racial/ethnic distribution of 45.1% non-Hispanic White, 41.3% Hispanic White, 10% Native American, 2.3% African American, and 1.3% Asian for the midpoint time period of this study (14). Children who were Hispanic or American Indian were thus over-represented among the decedents in this study. The alleged perpetrator was usually a relative or major caretaker of the child. Head injuries were the most common cause of death, and most deaths occurred in the victim's residence. These findings are in congruence with previous epidemiological studies of this nature in other states (3,9).

We attempted to abstract information regarding putative risk factors predisposing to child abuse, including prematurity, developmental or medical concerns in the victims, and parental factors (age, marital status, employment status, history of domestic violence or child abuse in the home, and alcohol use) (1). Information on infant/child characteristics showed that almost one-fifth (17.8%) of victims showed a recent history of vomiting, and in 63% of these cases the cause of death was head injuries, suggesting perhaps that the two may be associated, with vomiting being the presenting symptom suggestive of underlying head injuries. Similar numbers of victims exhibited long-term or recurring medical concerns (with respiratory disease being the most frequent complaint) and/or previous hospitalizations. Thus, when present, these case histories should raise suspicions for child abuse. A history of premature birth was present only in a small percentage of our cases, although it is believed to be a pertinent risk factor (1). Information on parental risk factors such as domestic violence in the home, previous history of child abuse, alcohol use, marital status, employment status, and ages were largely unknown, highlighting the need for consistent collection of this type of information during scene investigations and interviews with family and witnesses.

A review of physical findings at autopsy showed an overwhelming majority of cranial trauma (84.4%), followed by fractures of ribs or long bones (40%) and abdominal injuries (8.9%). These findings re-emphasize the importance of performing a complete autopsy on all pediatric deaths, including a complete skeletal survey, examination of the eyes and optic nerves, and a detailed examination of the brain. Bite marks (11.1% of our cases) should be sought for at the autopsy as an additional clue to child abuse-related deaths. It is also important to note that although rare (8.9% of our cases), asphyxia and cases of neglect (dehydration/malnutrition) should be considered and appropriately investigated. Whereas asphyxia may not be associated with prominent physical findings at autopsy, loss of intra-abdominal and subcutaneous fat deposits and a weight well below the expected range for age should raise suspicions of neglect or maltreatment.

Toxicologic studies were performed in almost all of our victims, which showed positivity in over one-fourth of cases (26.7%). The majority consisted of anti-epileptics and/or resuscitative medications, with only a minor population who showed cocaine or ethanol in their blood. Although rare, drug poisoning can be used as a means of, or contribute to, child abuse-related homicides, and thus should be sought for in all pediatric deaths (15).

Pediatric deaths continue to pose a challenge to law enforcement officers, the forensic investigators, the medical examiners, the court system, and the families. Children under the age of 5 years are at risk for child abuse, and efforts should be made in order to identify patterns and risk factors in order to prevent future occurrences. Our study outlined some of the associated risk factors, including victim characteristics such as recent vomiting, recurring medical concerns, and previous hospitalizations. Information regarding parental risk factors, however, was largely unknown. It is therefore important for the medical personnel to work closely with law enforcement officers and forensic investigators in order to obtain more parental data and victim characteristics (such as data on prematurity), so that families at risk can be identified and approached in a timely manner with the aim to educate and help prevent future child abuse in these families (1,16). Home visitations by trained nurses during pregnancy and/or the first few years of life have been shown to reduce rates of state-verified cases of child abuse and neglect among children of unmarried adolescents of a low socioeconomic status (1), and parent training programs have been found to be effective in preventing the recurrence of physical abuse (16).

Starting in 2009, the American Academy of Pediatrics will offer board certification in the subspecialty of child abuse pediatrics (9), increasing the numbers of pediatricians focusing on diagnosing and preventing child abuse (17).

A New Mexico child fatality review committee was re-started in 2007, which takes part in establishing a national database for child fatalities. Four different panels of experts, including psychiatrists, pediatricians, and forensic pathologists, meet monthly to review cases and formulate recommendations for prevention measures for childhood deaths due to suicide, abuse and neglect, transportation, and sudden infant death syndrome (SIDS)/broader spectrum issues. In 2005, New Mexico joined the National Violent Death Reporting System (NVDRS), a surveillance network funded by the Centers for Disease Control and Prevention (CDC) that monitors trends in homicides, suicides, and unintentional firearm fatalities across 17 states (18). OMI works cooperatively with CDC and the New Mexico Department of Health to provide case information for both child fatality review and NVDRS surveillance, offering hope that information learned from case reviews, surveillance reporting, and retrospective studies such as this one will help prevent future deaths due to child abuse.

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