

A Case–Control Study of Severe Physical Abuse of Older Adults

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OBJECTIVES: To characterize the severity and outcome of traumatic injuries suffered by victims of elder abuse, describe the characteristics of the perpetrators, and identify risk factors associated with severe traumatic elder abuse.

DESIGN: Case–control study.

SETTING: Two Level I trauma units in the greater Chicago, Illinois, metropolitan area.

PARTICIPANTS: Forty-one cases of elder abuse resulting in severe traumatic injury were identified between 1999 and 2006. Controls were randomly selected from the list of elderly patients in the trauma registry (N = 123).

MEASUREMENTS: Elder abuse was defined according to the Illinois Elder Abuse and Neglect Act.

RESULTS: In this study, 85% of the perpetrators were family members or intimate partners. In the final multivariable logistic regression model, victims of severe traumatic elder abuse were more likely to be female, to have a neurological or mental disorder, and to abuse drugs or alcohol.

CONCLUSION: This is the first clinical case–control study detailing clinical outcomes and evaluating risk factors of persons suffering severe physical abuse. Of elderly trauma victims, those who are physically abused have more-severe injuries than their nonabused counterparts. More research is needed to better evaluate risk factors of physical abuse and effective interventions. *J Am Geriatr Soc* 59:417–422, 2011.

Key words: elder abuse; trauma; alcohol; dementia; Alzheimer's disease

In 2007, 17.4% of the U.S. population was aged 60 and older, and this is projected to grow as the baby boomers

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continue to age.^{1,2} As individuals age, their physical mobility and mental capacities often decline, increasing their susceptibility to abuse.

Researchers estimate that the prevalence of elder abuse in the United States ranges from 500,000 to 2.5 million individuals aged 60 and older.^{3–8} Based on national surveys, substantiated reports of elder abuse have been on the rise during the past 2 decades.^{3,5,6} Of the substantiated reports of abuse, the relationship of the perpetrator to the victim was most frequently adult child (32.6%) spouse or intimate partner (11.3%) and other family member (21.5%). An important risk factor associated with elder abuse is living with a primary caregiver but otherwise being socially isolated from other friends and family.^{4,9–13} In addition, the likelihood of violence by a caregiver appears to increase when the victim is violent or if the caregiver is the spouse or an intimate partner.¹⁰ Alcohol abuse by the perpetrator is also strongly associated with physical abuse.^{10,14–17}

Although there is a growing literature on the subject of elder abuse, information on victims suffering severe traumatic injuries as a result of elder abuse is limited. The vast majority of research on the subject of elder abuse has focused on quantifying the prevalence and incidence of abuse in general, as well as characterizing the three most common types of elder abuse: financial exploitation, neglect and psychological–emotional abuse. Although traumatic injuries resulting from elder abuse represent some of the most severe incidents of abuse, the literature continues to lack case series characterizing the injury and describing clinical outcomes of older adults suffering severe traumatic elder abuse, analytical studies describing severe traumatic elder abuse using comprehensive trauma registries to describe in detail the clinical presentation of the injury, and mortality of victims of elder abuse. Furthermore, the role of alcohol intoxication and preexisting medical conditions in the victim has not been well documented.

Outside of the immediate family, emergency department and trauma medical personnel may be the only ones to see an elderly person suffering from physical forms of abuse caused by neglect and assault. The trauma center presents an opportunity to identify and assist older individuals suffering specifically from severe physical abuse. Furthermore, the state of Illinois mandates that all patients treated in a Level I or II trauma unit be documented in a state trauma registry. This provides an organized foundation for

investigators to conduct research on issues related to older adults. In Illinois, 29% of patients treated in Level I and II trauma units are aged 60 and older.

This was a case–control study of victims of elder abuse treated in two Level I trauma centers in the greater Chicago, Illinois, metropolitan area between 1999 and 2006. The severity and outcome of traumatic injuries suffered by victims of elder abuse are characterized, the characteristics of the perpetrators are described, and risk factors associated with severe physical elder abuse are identified.

METHODS

Trauma Registry

Data on victims of elder abuse were gathered from two Level I trauma units in the greater Chicago metropolitan area: Advocate Lutheran General Hospital (ALGH) in Park Ridge and John H. Stroger Hospital in Chicago (Cook County Hospital; CCH). Every Level I and II trauma unit in the state of Illinois collects data on all injured individuals who are admitted to the trauma unit for 12 hours or longer. The trauma registry contains data on demographics (age, sex, race and ethnicity), cause of injury (ECODEs), place of injury (ECODE849), type of injury (NCODES), length of stay, toxicological examinations, and health outcomes (diagnoses, measures of injury severity, hospital procedures, mortality, disability status on discharge).

Severity of injury is measured using an injury severity score (ISS) ranging from 0 to 75 (death).¹⁸ ISSs of 16 or greater represent severe injuries. The in-hospital case fatality rate, which is the number of deaths occurring after admission to the trauma center divided by the total number of cases or controls, was calculated. The case fatality rate provides a proxy measure of severity of injury. In addition, patients were screened for alcohol and drug use at the time of admission to the trauma unit. All toxicology examinations are based on blood samples. Drug and alcohol abuse is determined through the medical history interview with the patient and family members. Alcohol abuse is also assessed using the CAGE questionnaire.¹⁹ The codes for cause, place, and type of injury are part of the standardized *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM). Trained data entry personnel at each respective hospital code the data according to predefined protocols.

The trauma registry includes patients of all ages. For this study, all case reports of persons aged 60 and older were extracted from the data sets of both hospitals, which resulted in a master list to identify cases and controls. Figure 1 provides a description of how cases and controls were selected.

Identifying Potential Cases

The trauma registry data sets from both hospitals were reviewed to identify potential cases of elder abuse (Figure 1). The following criteria were used to screen for potential cases of elder abuse: patients with a perpetrator E967 ECODE (ICD-9 code) designating domestic violence and physical abuse, patients with a 995 NCODE (ICD-9 code) designating adult physical abuse, and patients with ICD-9

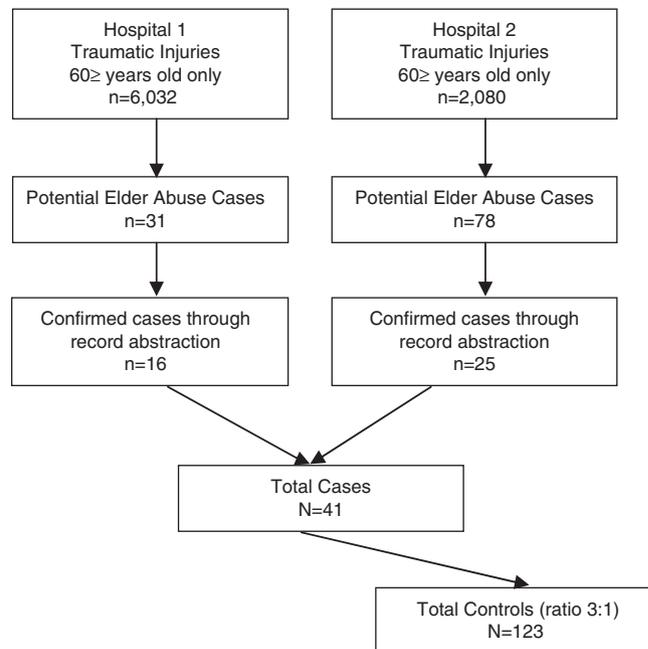


Figure 1. Case and control selection.

codes indicating an assault (ECODE: 960-969) at home (E849.0) or in a residential facility (E849.5).

Case Definition and Ascertainment

The next step after identifying potential cases was to abstract data directly from the medical records to confirm true cases of abuse. The case definition used for this study was a patient aged 60 and older treated at a Level I trauma center who has suffered a traumatic injury inflicted intentionally or through neglect by a caregiver or other person who stands in a trust relationship at home or in a residential facility. The Illinois Elder Abuse and Neglect Act defines “elderly” as persons aged 60 and older.

A trained epidemiologist (LSF) completed the record abstraction for the cases. A data entry form linked to the trauma registry database was used to abstract data from the medical records. All of the data from the trauma registry was validated for accuracy. Additional information gathered during the record abstraction phase included narratives on cause of injury from ambulance reports, nurse’s admission reports, operative reports, inpatient progress notes, medical discharge synopses, and social worker notes; court subpoenas; weight; height; personal information regarding marital status, children, and employment; and medical history. All final confirmed cases were identified using a spectrum of data regarding cause of injury, place of injury, type of injury, court documents, and detailed narratives. Two senior authors of this study (LSF, SA) reviewed the data of all potential cases, and the final interrater agreement was high ($\kappa = 85.4\%$; 95% confidence interval (CI) = 69.5–100%). If there was disagreement between the raters on individual cases, those cases were excluded from the analysis.

The Cook County Bureau of Health Services institutional review board approved this study on September 23, 2008.

Controls

Controls were randomly selected from the list of elderly patients in the trauma registry (Figure 1). Identified cases of elder abuse were removed from the control list before random sampling. Controls were selected using the random sampling procedure in SAS (PROC SURVEYSELECT, SAS Institute, Inc., Cary, NC). Three controls were randomly sampled for each case (3:1 ratio). The medical records for each control were also abstracted to validate the data in the registry and gather additional information not available in the trauma registry (see above). The researchers reviewed the data to validate that none of the controls suffered from elder abuse.

Statistical Analysis

SAS software was used for all statistical analyses (version 9.1). Frequencies of injuries, overall and distributions according to age, sex, marital status, employment status, and place of injury, were described. Type of injuries in terms of external cause of injury, body part affected, type of injury, and measures of severity of injury were also described for cases and controls. Appropriate parametric tests (Pearson chi-square) were used to evaluate bivariate relationships. For continuous variables, the Student *t*-test was used to assess crude statistical relationships. The Levene test was used to test for equivariance between samples.

A multivariable logistic regression model was used to evaluate the relationship between victims of abuse and factors associated with elder abuse. The likelihood ratio approach was used to determine the best fit for the final model. Similar to the stepwise model selection method in linear models, variables were added to the model if they significantly improved the model ($\alpha = 0.05$) and removed if they did not. The final multivariable logistic regression model included sex, neurological or mental disorder (including dementia, depression, schizophrenia, and anxiety disorder), and drug and alcohol abuse. The following covariates were also controlled for: age, hospital (ALGH, CCH), length of stay in the hospital (days), and ISS greater than 16 (designating severe injuries). A two-sided $P < .05$ was considered statistically significant.

RESULTS

Forty-one cases of elder abuse resulting in severe traumatic injury were identified between 1999 and 2006. Cases were more likely than controls to be female (58.5% vs 41.5%), single (39.0% vs 30.9%) and unemployed (97.6% vs 90.2%) (Table 1). Cases and controls were nearly identical in terms of age. The relationship of the perpetrator with the victim was as follows: spouse or partner, 31.7%; child, 31.7%; sibling, 4.9%; grandchild, 7.3%; nephew, niece, or other relative, 9.8%; friend or roommate, 14.6%. Assaultants were predominately male ($n = 25$; 61.0%). The mechanism of assault varied as follows: cutting and piercing instruments (e.g., knife), 24.4%; unarmed fight or brawl, 24.4%; use of household items, 24.4%; pushed or thrown, 12.2%; rape, 4.9%; hot water, 2.4%; and strangulation, 2.4%. For 4.9% of the cases, the mode of assault was unspecified. There were no cases of assault involving a firearm. Household items included a cane ($n = 2$), hammer ($n = 2$),

Table 1. Demographic Characteristics of Cases and Controls

Characteristic	Cases (n = 41)	Controls (n = 123)
Sex, n (%)		
Male	17 (41.5)	72 (58.5)
Female	24 (58.5)	51 (41.5)
Age, n (%)		
60–64	11 (26.8)	30 (24.4)
65–69	7 (17.1)	23 (18.7)
70–74	8 (19.5)	17 (13.8)
75–79	5 (12.2)	16 (13.0)
≥80	10 (24.4)	37 (30.1)
Age, mean ± standard deviation	73.3 ± 9.9	73.9 ± 10.0
Race or ethnicity, n (%)		
Black	25 (61.0)	50 (40.7)
Non-Hispanic white	15 (36.6)	65 (52.8)
Hispanic white	0 (0.0)	5 (4.1)
Other	1 (2.4)	3 (2.4)
Marital status, n (%)		
Single	16 (39.0)	38 (30.9)
Married	9 (22.0)	39 (31.7)
Divorced	3 (7.3)	8 (6.5)
Widowed	6 (14.6)	21 (17.1)
Unknown	7 (17.1)	17 (13.8)
Unemployed or retired, n (%)	40 (97.6)	111 (90.2)
Place of injury, n (%)		
Home	31 (75.6)	44 (35.8)
Residential institution	4 (9.8)	3 (2.4)
Street or highway	3 (7.3)	58 (47.2)
Industrial place	0 (0.0)	2 (1.6)
Public building	0 (0.0)	3 (2.4)
Other outdoor location	0 (0.0)	8 (6.5)
Unspecified	3 (7.3)	5 (4.1)

drinking glass ($n = 1$), iron fence/bar ($n = 1$), lamp ($n = 1$), pot ($n = 1$), sticks ($n = 1$), and a stool ($n = 1$).

For the cases, all causes of injury resulted from an assault. For the controls, the distribution of cause of injury was as follows: falls, 46.3%; motor vehicle crashes, 34.2%; assaults, 6.5%; fire, 2.4%; suicide attempt, 2.4%; and other, 8.1%. The assaults on controls did not involve a caregiver or other person who stood in a trust relationship but involved bar fights or other public brawls and criminal acts committed by strangers. The proportion of injuries occurring at home or residential institution was more than twice as high in the victims of elder abuse (Table 1).

Individuals suffering from elder abuse were more likely to have penetrating injuries (26.8%) than controls (5.7%; $P < .001$). The three most common types of injury that the victims of abuse had were open wounds (56.1%), internal injuries (24.4%), and fractures (22.0%). For controls, the three most common types of injury were fractures (54.5%), open wounds (22.3%), and internal injuries (13.0%). The victims of elder abuse were more likely to suffer injuries to the head (61.0%) and torso (31.7%) than controls (39.0% and 20.3%, respectively). Table 2 presents the distribution of the most frequent injury types according to body region.

Table 2. Most Frequent Types of Injuries and Body Locations in Cases and Controls

Body Region	n (%)	
	Cases (n = 41)	Controls (n = 123)
Fracture		
Head and neck	5 (12.2)	7 (5.7)
Spine and back	1 (2.4)	7 (5.7)
Torso	0 (0.0)	10 (8.1)
Upper extremities	2 (4.9)	12 (9.8)
Lower extremities	2 (4.9)	30 (24.4)
Open wound		
Head and neck	12 (29.3)	20 (16.3)
Torso	5 (12.2)	0 (0.0)
Upper extremities	2 (4.9)	6 (4.9)
Lower extremities	2 (4.9)	3 (2.4)
Unspecified	3 (7.3)	0 (0.0)
Internal injury		
Traumatic brain injury	9 (22.0)	15 (12.2)
Spinal cord	0 (0.0)	0 (0.0)
Chest	3 (7.3)	0 (0.0)
Abdomen	0 (0.0)	0 (0.0)
Pelvis and urogenital	0 (0.0)	0 (0.0)
System wide	0 (0.0)	1 (0.8)

Patients were counted more than once if they had multiple injuries to multiple body parts.

Cases' lengths of stay at the hospital were nearly 2 days as long on average as those of controls (Table 3). Cases were also substantially more likely to be sent to an intensive care unit (ICU; $P < .001$) and to be put on a ventilator ($P = .004$). The mean ISS and case fatality rate were higher for cases. Mean Glasgow Coma Scale score, respiratory rate, and systolic blood pressure at intake to the trauma units did not differ significantly between cases and controls (cases vs controls: Glasgow Coma Scale score, 13.5 vs 14.2; respiratory rate per minute, 20.1 vs 19.5; systolic blood pressure, 151.5 vs 158.7).

Elder abuse cases suffered disproportionately from preexisting medical conditions ($P = .002$), particularly heart disease, dementia and Alzheimer's disease, mental illness, and drug and alcohol abuse (Table 3). Mean body mass index, a measure of body weight, was nearly identical between cases (24.6 ± 6.2) and controls (25.4 ± 6.3), although there were more overweight controls (36.6%) than cases (19.5%). In addition, 29.3% of the cases tested positive for alcohol, compared with 13.0% of controls ($P = .01$), of which 24.4% of the cases and 4.9% of the controls had blood alcohol concentrations greater than 0.1% ($P < .001$). There were no significant differences in the number of patients testing positive for illicit drugs (cases, 7.3%; controls, 4.9%; $P = .55$).

Although cases had more-severe injuries than controls, the number discharged home as opposed to an acute care or long-term care nursing facility did not differ substantially between cases and controls (discharged home: cases, 53.7%; controls, 57.7%; discharged to a acute care or long-term care nursing facility: cases, 31.7%; controls,

Table 3. Hospital Treatment, Severity of Injury, and Preexisting Medical Conditions in Cases and Controls

Factor	Cases (n = 41)	Controls (n = 123)
Hospital treatment		
Length of stay, days, mean \pm SD	6.2 \pm 8.9	4.5 \pm 6.2
Sent to ICU, n (%)	14 (34.2)	14 (11.4)
Length of stay in ICU, days, mean \pm SD	2.7 \pm 6.2	0.8 \pm 3.5
Put on ventilator, n (%)	8 (19.5)	6 (4.9)
Length of time on ventilator, days, mean \pm SD	2.1 \pm 6.4	0.4 \pm 2.2
Had surgery, n (%)	14 (34.2)	42 (34.2)
Severity of injury		
In-hospital fatality, n (%)	4 (9.8)	5 (4.1)
Injury Severity Score		
Mean \pm SD	11.4 \pm 14.7	7.6 \pm 7.7
16–24, n (%)	5 (12.2)	9 (7.3)
≥ 25 , n (%)	4 (9.8)	7 (5.7)
Preexisting conditions, n (%)		
Hypertension and ischemic heart disease	18 (43.9)	35 (28.5)
Pulmonary disease	4 (9.8)	7 (5.7)
Liver or renal disease	2 (4.9)	3 (2.4)
Cancer	2 (4.9)	4 (3.3)
Diabetes mellitus	2 (4.9)	10 (8.1)
Dementia	3 (7.3)	4 (3.3)
Mental illness*	6 (14.6)	1 (0.8)
Drug or alcohol abuse	9 (22.0)	7 (5.7)
Other	9 (22.0)	8 (6.5)

* Four patients diagnosed with depression, two with schizophrenia, and one with anxiety disorder. The control patient was diagnosed with depression. ICU = intensive care unit; SD = standard deviation.

36.6%). Twenty victims of abuse, all of whom were discharged home, were returning to the same environment in which the abuse occurred. In the majority of these cases, the perpetrator had been arrested, but seven (17.1%) expressed the desire to return to the perpetrator of the abuse, as well as not press charges.

In the multivariable logistic regression model, controlling for injury severity, hospital, length of stay, and age, victims of severe traumatic elder abuse were more likely to be female (adjusted odds ratio (AOR) = 3.5, 95% confidence interval (CI) = 1.4–8.8; $P = .008$), have a neurological or mental disorder (AOR = 9.1, 95% CI = 2.5–33.6; $P < .001$), and report drug or alcohol abuse (AOR = 8.0, 95% CI = 2.3–28.0; $P = .001$). In addition, elder abuse cases were more likely to require treatment in an ICU than controls (AOR = 4.5, 95% CI = 1.4–14.6; $P = .01$). None of the covariates were significant in the final model.

DISCUSSION

This is the first clinical case-control study detailing clinical outcomes and evaluating risk factors of elderly persons suffering severe physical abuse. Victims of severe traumatic elder abuse were more likely to be female, have a neurological or mental disorder, and abuse drugs or alcohol. The victims of abuse were assaulted with a wide array of

weapons and predominately suffered injuries to the head and torso, suggesting an intent to kill—not injure. No firearms were used, although persons who die at the scene are less likely to be sent to a trauma unit, and firearms have a higher lethality.

Consistent with the elder abuse literature, the majority of victims of severe traumatic elder abuse were female, and the majority of perpetrators were male.^{6,7} Eighty-five percent of the perpetrators were family members or intimate partners, compared with 60% to 65% in the most recent national surveys.^{3,7,20} The current study includes only people who experienced severe physical abuse, whereas the national studies are based on reports from Adult Protective Services and involve primarily cases of neglect, financial exploitation, and psychoemotional abuse. It is likely that the perpetrators of physical abuse of older adults are more likely to be people who live with the victim, which would explain the differences in the relationship of the perpetrator between the current study and the national studies.

Past research has reported a relationship between elder abuse and dementia and depression,^{9,21–23} but past studies have primarily relied on self-reports by caregivers rather than case-based research.^{9,21,24,25} However, one case-control study²³ found that abused older adults were more likely to have depression and dementia. Like the current study, the AORs were high. The previous study included cases referred to their geriatric team but consisted primarily of neglect cases (82%).²³ Despite the difference in abuse samples, the findings from that study are similar to those reported in this study, particularly in terms of the magnitude of the association between abuse and neurological or mental disorders.

Alcohol abuse by the perpetrator also plays a substantial role and is strongly associated with physical abuse,^{10,14–17,26} although there is little information regarding alcohol abuse by the victim. In one cross-sectional study of people with psychiatric illness, there was a nonsignificant positive association with alcohol abuse in the victim,²⁶ although the sample size was small, which may have affected the statistical power of the analysis (sample of 20 victims; 3 experiencing physical abuse).²⁶ Based on the narratives in the current study, it appears that, in many cases, the victim and perpetrator both consumed alcohol before the assault. It would be interesting if a larger study could determine the role of substance abuse in the perpetrator alone and in the victim alone and whether the magnitude of the relationship is synergistic when the perpetrator and victim are both substance abusers.

LIMITATIONS

The small sample size resulted in low statistical power for this analysis. As a result, associations that were borderline significant ($P \leq .10$) may be confirmed as important factors of abuse in a larger sample size. Furthermore, the odds ratios reported in the final multivariable model are unstable, as shown by the large CIs, so the exact magnitude of the relationships are unclear.

Physicians and nurses are trained in conducting medical histories to document preexisting conditions and medication or drug use, identify signs and symptoms, and note any conditions or issues that may affect treatment. These

intake interviews and screens are conducted on all admitted patients uniformly. It is unlikely that intake screening would differ between cases and controls because, in most instances, the cases were not identified as abused until after the admission process or several days into the hospitalization. Nevertheless, it is possible that underreporting of pre-existing conditions and alcohol or drug use occurs in cases and controls.

The proportion of blacks was much higher in the case group than the control group. Nearly all of the victims treated at CCH were black (92%), whereas only a fraction at ALGH were black (12.5%). CCH serves a predominately black community, whereas ALGH serves a far more diverse population of multiple ethnic and cultural backgrounds. More than 85% of the abuse cases came from a community setting (home, residential facility). In contrast, nearly half of the controls were from motor vehicle crashes. Several large interstate highways intersect near CCH, and persons injured in motor vehicle crashes that occur on these roads or local roads are often brought to CCH. In addition, CCH is located near downtown Chicago, so persons injured while working downtown may be treated at CCH. For this reason, it may be that the preponderance of black victims of abuse in this sample reflects a referral bias and that the true incidence of abuse in blacks is similar to that reported in national studies.⁶

It is possible that patients that were afraid or reluctant to inform the medical staff of injuries caused by abuse were missed. More importantly, patients suffering from physical abuse that resulted in minor injuries and those suffering medical complications as a result of neglect (e.g. self-injury, medication error, malnutrition) would not be treated in a trauma unit. This study only addresses the apex of the injury severity pyramid. Work has already begun with hospitals to examine patients treated in emergency departments to identify those suffering from neglect and less-severe physical abuse.

CONCLUSIONS

Elderly victims of physical abuse suffer more-severe injuries than their nonabused counterparts. All of the important measures of injury severity—length of hospital stay, treatment in an ICU, assisted breathing, ISSs, in-hospital case fatality rates—were higher in the cases. These measures of severity are associated with long-term adverse outcomes.^{18,27} In addition, many of the victims returned to the environment in which the abuse occurred. There is a need for larger studies and comprehensive interventions that assess the long-term health and social and economic impact of physical abuse; evaluate protective services and effectiveness of placement in alternative living facilities in reducing risk of abuse; develop simple screening tools to assist medical professionals in identifying and reporting cases of abuse; and elucidate the relationship between abuse and specific individual characteristics, health conditions, personal habits, and medical outcomes.

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