Trauma among Hispanic Children: A Population-Based Study in a Regionalized System of Trauma Care

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ABSTRACT

We studied 1164 injured Hispanic and 2560 injured non-Hispanic White children newborn through 14 years triaged to the San Diego County Regionalized Trauma System from 1985 through 1990. Incidence rates did not differ by ethnic group. Hispanic children were more likely to be struck as pedestrians (odds ratio [OR] = 1.5) and less likely to be injured in falls (OR = 0.7) than non-Hispanic White children. For motor vehicle and pedal cycle injuries, Hispanic children were more likely not to have been restrained by seatbelts (OR = 4.0) or car seats (OR = 3.7). (*Am J Public Health.* 1995;85:1005–1008)

Introduction

Injuries in children are a leading cause of childhood mortality[1–6] and morbidity.[6,7] The importance of pediatric trauma as a major public health problem in ethnically diverse populations has only recently been recognized because children in these groups are disproportionately affected.[8,9]

Although the Hispanic population is the largest and most rapidly increasing minority group in the United States, little is known about trauma in this ethnic group.[9] To our knowledge, only one population-based study of trauma in Hispanic children has been reported, but only included data on mortality.[10] To target effective injury prevention programs, current comprehensive data on traumatic injury in Hispanic children are needed.

The objective of this study was to compare traumatic injury characteristics in Hispanic children with those in non-Hispanic White children, a group with a large antecedent body of data. We report here the first population-based study of trauma in Hispanic children conducted in a regionalized trauma care system.

Methods

Study Population

The study population included 1164 injured Hispanic children and 2560 injured non-Hispanic White children newborn through 14 years triaged to the San Diego County Regionalized Trauma System from January 1, 1985, through December 31, 1990. The San Diego County Regionalized Trauma System is a population-based geographically defined trauma system consisting of six designated trauma centers. In the San Diego County Regionalized Trauma System, emergency medical services protocol directs that all injured patients are transported to the closest designated trauma center. No patients are transported to hospitals that are not trauma centers. Patients brought to a nontrauma center by other than the emergency medical services are "re-triaged" to a trauma center if it is determined they are seriously injured or have sustained a mechanism of injury capable of producing serious injury. Only children who have been determined to be dead at the scene are not transported to the nearest trauma center. Data from the San Diego County Regionalized Trauma System are entered into a computerized database (TREG), which includes all triaged patients whether they were treated in the trauma unit or the emergency department of trauma center hospitals. Injury characteristics, including age, sex, mechanism of injury,[11] outcome, length of stay, admission Glasgow Coma Scale score,[12] injury severity score,[13] trauma score,[14] and use of protective devices were obtained from the TREG database. All children included in the study were San Diego County residents.

Children were classified as Hispanic based on one of three criteria: the child's surname, parental identification of the child's ethnic background, or Spanish as the primary language of the child or parent. These criteria used by the TREG database for Hispanic ethnic status are in accordance with methods used by the State of California's Population Projection Division.[15]

Rate Calculations and Analysis

Age-adjusted incidence rates by ethnic status were calculated as annual estimates based on data from 1988 through 1990.[16] Ethnic-, sex-, and age-specific denominators were obtained from the 1990 census for the County of San Diego.

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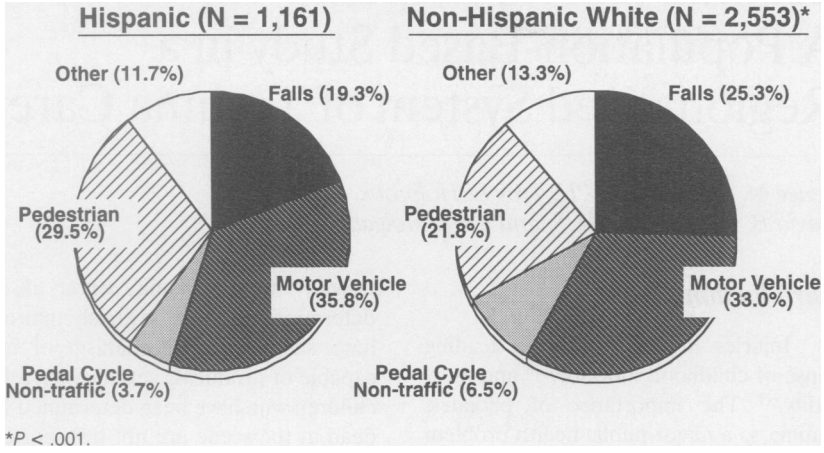

FIGURE 1—The distribution of the mechanism of injury in Hispanic and non-Hispanic White pediatric trauma patients, San Diego County regionalized trauma system, 1985 through 1990.

TABLE 1—Odds Ratios for the Association of Injury Characteristics and Outcome with Hispanic vs Non-Hispanic White Ethnic Status, San Diego County Regionalized Trauma System, 1985 through 1990

Injury Characteristic[a]	Hispanic (n = 1164),[b] %	Non-Hispanic White (n = 2560),[b] %	Odds Ratio	95% Confidence Interval
Trauma score				
≤12	13	10	1.3	1.0, 1.6
13+	87	90		
Injury severity score				
Severe (≥16)	21	19	1.1	0.9, 1.3
Moderate (<16)	80	81		
Glasgow Coma Scale[c]				
Mild (13–15)	84	85	. . .	. . .
Moderate (9–12)	12	12	1.0	0.8, 1.3
Severe (≤8)	16	15	1.1	0.9, 1.4
Type of trauma				
Blunt	96	97	0.7	0.5, 1.0
Penetrating	4	3		
Mortality				
Dead	4	3	1.1	0.7, 1.5
Alive	96	97		
Intensive care unit, days				
3 or more	7	5	1.4	1.1, 1.9
Less than 3	93	95		
Length of stay, days[d]				
4 or more	31	26	1.3	1.1, 1.5
Less than 4	69	74		

[a]The bottom category within each injury characteristic is the referent group.
[b]Totals may vary due to missing data.
[c]Mild is the referent group for comparison with the severe and moderate groups.
[d]Numbers of observations for this variable are 709 for Hispanics and 1555 for Non-Hispanic Whites.

Hispanic children were compared with non-Hispanic White children in a proportional design.[17] Odds ratios (ORs), 95% confidence intervals (CIs), and the corresponding chi-square statistics were computed for the association of injury-related factors with Hispanic vs non-Hispanic White ethnic status, based on the proportional design.[17] Logistic regression was used to estimate the independent association of selected factors controlling for age, sex, and injury severity.[18]

Results

Incidence Rates

Age- and sex-specific incidence rates were not significantly different in Hispanic compared with non-Hispanic White children. During the study period 1988 through 1990, 19 Hispanic children and 15 non-Hispanic White children were dead at the scene. Age-adjusted rates, including scene deaths, were also not significantly different (Hispanic: 18/100 000; non-Hispanic White: 19/100 000 population).

Injury Characteristics

With respect to mechanism of injury (Figure 1), Hispanic children were significantly more likely to be struck as pedestrians (OR = 1.5, 95% CI = 1.3, 1.8, $P < .001$) and less likely to be injured in falls (OR = 0.7; 95% CI = 0.6, 0.8; $P < .001$) and pedal cycle accidents in a nontraffic situation (OR = 0.6; 95% CI = 0.4, 0.8; $P = .001$). These patterns were similar for all age groups.

There were no differences in injury severity score, Glasgow coma scale, or mortality rate by ethnic status (Table 1). Hispanic children were more likely to have a lower admission trauma score (<12) than non-Hispanic White children (OR = 1.3; 95% CI = 1.0, 1.6; $P = .03$). Hispanic children were significantly more likely to stay in the intensive care unit 3 or more days (OR = 1.4; 95% CI = 1.1, 1.9; $P = .02$) and to have total lengths of stay of 4 or more days (OR = 1.3; 95% CI = 1.1, 1.5; $P = .02$) than non-Hispanic White children; these differences remained statistically significant after adjusting for age, sex, and injury severity.

Use of Protective Devices

With respect to motor vehicle injuries (Table 2), Hispanic children were 4.0 times more likely not to have worn seatbelts ($P < .01$) and 3.7 times more likely not to have been restrained in a car seat ($P < .001$) than non-Hispanic White children. For motorcycle, pedal cycle, and bicycle injuries, Hispanic children were 2.9 times more likely not to have worn helmets.

Discussion

We report here the first population-based study of traumatic injury in children of Hispanic ethnic status conducted in a regionalized system of trauma care. The San Diego County Regionalized Trauma System was explicitly designed to be a geographically defined population-based trauma system. All seriously injured children are transported by emergency medical services to a trauma center based on the geographic location of the injury, with retriage to the system if they are brought to a nontrauma center. Based on our detailed description of the system, we do not know of any major sources of bias in our study design or patient population that could have influenced our findings. We acknowledge that children with very minor injuries (such as fractured fingers) and children with immediately fatal injuries who are dead at the scene (such as massive head trauma) are excluded from the San Diego County Regionalized Trauma System. Although the characteristics of these groups may differ from those of the study population, we believe that the majority of significant childhood injuries that are associated with activity limitation will be observed within the trauma care system, and it can be argued that the most important impact on trauma morbidity and health care resources will come from injuries that require triage to trauma systems.

It is difficult to evaluate the differences in injury mechanism observed between our study and others because no previous studies have been conducted in regionalized trauma care systems that encompass both nonfatal and fatal injuries.[10,19]

Our findings indicate that Hispanic children had significantly longer lengths of stay in the hospital and the intensive care unit than non-Hispanic White children, even after adjusting for injury severity. These differences may reflect certain aspects of acculturation.[20,21] Although we do not have direct evidence for acculturation differences in our data, we postulate that such differences could function to influence the length of time spent in hospital care facilities.

The finding with the most direct public health impact was the significantly higher rates of nonuse of protective devices in injured Hispanic children compared with injured non-Hispanic White children. The most prevalent mechanism of injury in children for both ethnic groups was motor vehicle accidents, an observation supported by numerous studies of childhood injury.[10,19,22,23] Although rates of nonuse of protective devices were high in both injured Hispanic and non-Hispanic White children, to our knowledge no previous population-based studies have been able to demonstrate that injured Hispanic children were significantly more likely than injured non-Hispanic White children to be unrestrained in motor vehicle accidents and not to have worn helmets in motorcycle or bicycle accidents. It is important to note that these rates were based only on the nonuse of protective devices in injured children; rates based on all children involved in motor vehicle accidents may be substantially different.

Although no adjustments were made in the analysis for multiple comparisons, the majority of probability values cited were small enough that we do not believe this influenced our findings.

The results of this study have important implications for injury prevention among ethnically diverse populations, as shown by the differences in mechanism of injury and in the rates of nonuse of protective devices. Clearly, much remains to be learned about traumatic injury patterns in Hispanic children. Our findings lend support to the idea that prevention programs targeted at these areas in Hispanic children could substantially decrease mortality and morbidity in this population. □

TABLE 2—Odds Ratios for the Association of Nonuse of Protective Devices with Hispanic vs Non-Hispanic White Ethnic Status, San Diego County Regionalized Trauma System, 1985 through 1990

Cause of Injury[a]	Hispanic, %	Non-Hispanic White, %	Odds Ratio	95% Confidence Interval
Motor vehicle injuries	(n = 314)	(n = 478)		
Seatbelts				
Not worn	90	69	4.0	2.6, 6.0
Worn	10	31		
Carseats				
Not used	99	95	3.7	1.3, 11.0
Used	1	5		
Motorcycle, pedal cycle, and bicycle injuries	(n = 56)	(n = 166)		
Helmet				
Not worn	93	82	2.9	1.0, 8.5
Worn	7	18		

[a]The bottom category within each type of protective device is the referent group.

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Characteristics of Repeat Trauma Patients, San Diego County

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ABSTRACT

Data on 22 312 admissions to the San Diego County Trauma System were used to identify 185 trauma patients admitted repeatedly to trauma units. These patients were compared with the entire group of nonrepeating trauma patients admitted during the 80-month period of the study. In comparison with nonrepeaters, the repeaters were younger, were more often men, were more often Black, and were much more frequently victims of assault. Forty-eight percent of the repeaters were injured by the same general mechanism on both admissions. (*Am J Public Health.* 1995;85:1008–1010)

Introduction

Although there are many approaches to preventing traumatic injury,[1–6] one essential step is the characterization of patients who repeatedly sustain major trauma. We examined the San Diego County Regional Trauma System registry and retrospectively compared repeat and nonrepeat trauma patients admitted to the system's hospitals during an 80-month period.

Methods

The San Diego County Regional Trauma System includes one level 1 trauma center, four level 2 centers, and one pediatric center (as defined by the American College of Surgeons).[7,8] Cases that meet criteria for major trauma are included in the registry.[7–9]

A list of 22 312 admissions entered in the registry between September 1, 1984, and April 19, 1991, was reviewed for patients having more than one admission to the adult trauma centers. Admissions listing the same first and last name, ethnicity, and date of birth were presumed to involve the same patient. This matching process identified 185 repeat patients. Of these 185 repeat patients, 6 had an additional third admission; data from these third admissions were not used in most of our calculations. One hundred sixteen patients were entered in the database without names; since we could not verify whether these patients were admitted once or more than once, they were excluded.

The two values for each repeating patient were averaged to compare quantitative attributes of repeat patients with those of the rest of the trauma population. These values were compared with the values for the nonrepeaters by means of t tests or rank sum tests. For testing proportions, the standard error of the usual z test for the difference of proportions took account of the correlation between the two visits of repeat patients by the delta method.[10] The first and second admissions of repeat patients were compared via paired t tests (for means), McNemar tests (for proportions), or the method of Fleiss[11] (for nominal agreement).

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