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Penetrating trauma in children on the United States-Mexico border: Hispanic ethnicity is not a risk factor

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ABSTRACT

Introduction: The United States-Mexico border is perceived as dangerous by the media and current political leaders. Hispanic ethnicity, low socioeconomic status, male gender and adolescent age have previously been identified as risk factors for penetrating trauma (PT).

Methods: A retrospective review of PT was performed in a border region. Children 0–17 years old, admitted to the region's only level I trauma center between 2001 and 2016 were included. Standardized morbidity ratio was used to compare observed to expected morbidity.

Results: There were 417 PT admissions. 197 (47%) were non-accidental, 34 (8%) suicide attempts and 186 (45%) accidental. There were 12 homicides, 7 suicides and no accidental deaths. The region contains over 280,000 children, thus yielding a homicide rate of 0.26 per 100,000. The U.S. pediatric homicide rate was 2.6–4.0 over this period. Adolescents 13–17 years old accounted for 237 (57%) admissions, 152 (78%) of non-accidental admissions and 12 (63%) deaths. Most admissions (N = 321, 77%) and 15 of the deaths (79%) were males. Non-accidental injuries were more frequent in ZIP codes associated with low incomes. Hispanic patients accounted for 173 (88%) of non-accidental trauma. However, 40 (20%) non-accidental injuries occurred in Mexico and 157 (80%) injuries occurred in an 82% Hispanic region. Therefore, the standardized morbidity ratio for Hispanic ethnicity was 1.048 (CL 0.8–1.2, P = 0.6).

Conclusion: On the United States-Mexico border, the pediatric homicide rate was less than 1/10 the national average. Male adolescents are at risk for non-accidental PT. In a Hispanic majority population, Hispanic ethnicity was not a risk factor for PT. It is possible that economic disparity, rather than race/ethnicity, is a risk factor for PT.

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Introduction

Injury is the leading cause of death for children in the United States. Mechanism of injury is a significant predictor of mortality, with penetrating trauma resulting in an increased risk of death [1]. Recent studies suggest that the rate of pediatric penetrating trauma is increasing, and Hispanic children from families of low socioeconomic status (SES) are disproportionately affected [2,3]. Hispanic ethnicity and lack of insurance have been shown to be significant predictors of mortality in pediatric patients who suffered a penetrating trauma [4,5].

El Paso, Texas is perceived by many individuals, the media and political leaders as an unsafe location due to its location on the United States-Mexico border with Juarez, Mexico. On the contrary, El Paso consistently ranks as one of the safest cities in the U.S. [6]. The population is primarily of low SES and 82% of people identify as Hispanic [7]. The purpose of this study was to examine the trends and risk factors for pediatric penetrating trauma in a border city that is primarily Hispanic.

Methods

The study was approved by the Institutional Review Board at Texas Tech University Health Sciences Center, El Paso. A retrospective analysis was performed using the trauma database at the region's only American College of Surgeons verified Level I trauma center. This trauma center covers a wide geographical area and routinely receives patients from Texas, Mexico and New

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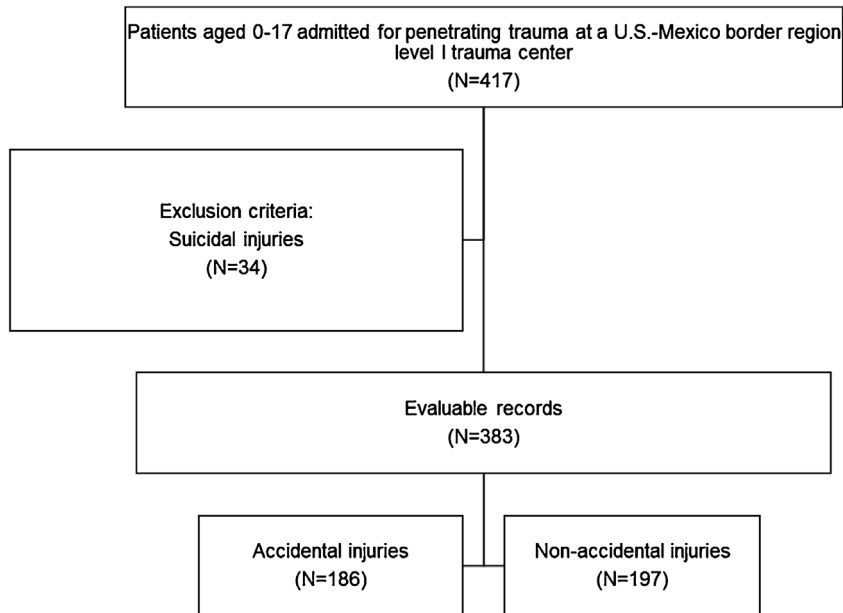


Fig. 1. Patient Flow Diagram.

Mexico. Data were requested from the trauma registry for all patients aged 0–17 years old admitted for penetrating trauma between 2001 and 2016. The variables analyzed in the study included: age, gender, race/ethnicity, patient ZIP code, injury location, ICD-9 or –10 codes, mechanism of injury, accidental or intentional injury, injury severity score (ISS), admitting Glasgow Coma Scale (GCS), length of stay (LOS), intensive care unit LOS, time on a ventilator and insurance status. SES was assessed indirectly via insurance status and by examining the median income of the child's home ZIP code through the U.S. Census [7,8].

Penetrating trauma was categorized as non-accidental (purposefully inflicted violence by another person), suicidal (self-inflicted violence) or accidental. Injuries were also categorized according to mechanism (knife wound, gunshot wound, encounters with broken glass, injury by machinery and household power tools, falls onto sharp objects, dog bites and other less common mechanisms). Adolescence was defined as 13–17 years of age.

Patient characteristics were summarized with N (%) for categorical variables and median (interquartile range) for continuous variables. A logistic regression model was used to identify factors associated with non-accidental penetrating trauma admissions, as compared to patients with accidental penetrating trauma (patients with suicidal injuries were excluded from this particular analysis). The patient flow diagram is shown in

Fig. 1. Since the incidence of penetrating trauma was much higher for adolescents, a secondary analysis was performed for different age groups (<13 years old, 13–17 years old). Standardized mortality ratio was used to compare the observed to expected likelihood of Hispanic involvement in non-accidental trauma with respect to the overall population. Statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC). $P < 0.05$ was considered statistically significant.

Results

Over the 16-year period of the study, 417 children were included in the database for penetrating trauma. Patient characteristics are shown in Table 1. Data is shown for all patients, and then for accidental and non-accidental trauma with suicidal injuries excluded. Most patients were males ($n = 321$, 77%) between the ages of 13–17 years ($n = 237$, 57%). 351 (84%) patients were

Hispanic, 51 (12%) were Caucasian, 7 (2%) were African American and 8 (2%) of another race/ethnicity. Injuries occurred primarily in El Paso ($n = 226$, 54%), New Mexico ($n = 113$, 27%) and Mexico ($n = 50$, 12%).

Trauma demographics

Fig. 2 illustrates the incidence of non-accidental, suicidal and accidental injuries according to age, gender and race/ethnicity. 76% of non-accidental traumas involved adolescents ($n = 150$). Similarly, 92% of suicidal injuries involved adolescents ($n = 31$). Accidental injuries were more evenly distributed according to age, but 5–12 year-olds comprised the largest proportion at 42% of the accidental traumas ($n = 79$). Older children were not only more likely to be involved in penetrating trauma, but also more likely to be more severely injured. Fig. 3 shows a trend of mean injury severity scores increasing as a function of age. Most penetrating trauma patients were male (Fig. 2b). Males comprised 81% of the non-accidental injury ($n = 160$), 71% of suicidal injury ($n = 24$) and 74% of accidental injuries ($n = 137$).

Hispanic race/ethnicity was not a risk factor for penetrating trauma (Fig. 2c). Hispanics comprised 88% of the non-accidental trauma ($n = 173$), 74% of suicidal injury ($n = 25$) and 82% of the accidental injury ($n = 153$). These numbers may appear high, but El Paso County is 82% Hispanic and 14% non-Hispanic white. Therefore, the observed morbidity from non-accidental trauma in Hispanic patients was 173 persons. The expected morbidity is 161 persons, as 82% of the population is Hispanic and a total of 197 persons were involved in a non-accidental trauma. Therefore, the standardized mortality ratio for Hispanic ethnicity was 1.048 (CL 0.8–1.2, $P = 0.6$). When considering that 40 (20%) of the non-accidental traumas occurred in Mexico, where almost all citizens are Hispanic, this statistic becomes even less significant for Hispanic ethnicity being a risk factor for penetrating trauma. In contrast, non-Hispanic whites make up only 16% of the population in El Paso, but comprised 21% of the suicidal trauma. However, this trend was not statistically significant, with a standardized mortality ratio of 1.3 (CL 0.8–1.9, $P = 0.2$).

Logistic regression for predictors of non-accidental penetrating trauma was performed and the results are shown in Table 2. The only statistically significant predictors of penetrating trauma were

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