Incidence of Dog Bite Injuries Treated in Emergency Departments

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Context.—Dog bites that result in injuries occur frequently, but how frequently dog bite injuries necessitate medical attention at a hospital or hospital admission is unknown.

Objective.—To describe the incidence and characteristics of dog bite injuries treated in US emergency departments (EDs).

Design.—Emergency department survey from the National Center for Health Statistics National Hospital Ambulatory Medical Care Survey for 1992 to 1994.

Patients.—National probability sample of patients visiting EDs.

Main Outcome Measure.—Incidence of dog bites treated in EDs, defined as a cause of injury recorded as the E-code E906.0.

Results.—The 3-year annualized, adjusted, and weighted estimate of new dog bite–related injury visits to US EDs was 333,697, a rate of 12.9 per 10,000 persons (95% confidence interval [CI], 10.5-15.4). This represents approximately 914 new dog bite injuries requiring ED visits per day. The median age of patients bitten was 15 years, with children, especially boys aged 5 to 9 years, having the highest incidence rate (60.7 per 10,000 persons for boys aged 5 to 9 years). Children seen in EDs were more likely than older persons to be bitten on the face, neck, and head (73% vs 30%). We estimated that for each US dog bite fatality there are about 670 hospitalizations and 16,000 ED visits.

Conclusions.—Dog bite injuries are an important source of injury in the US population, especially among children. Improved surveillance and prevention of dog bite–related injuries, particularly among children, are needed.

THE CLOSE ASSOCIATION between humans and domesticated dogs began at least 12,000 years ago.1 Since then, people have been intimately involved in domesticating the wild dog into hunter, guard, and companion. However, the domesticated dog retains many of its wild instincts, including behaviors that all too often lead to human attacks. This risk has always been present. Only now, however, are we beginning to gain a full understanding of the impact of dog bites on populations.2

Estimates of dog bite injuries have been reported from data derived from household surveys, hospital-based studies, school-based surveys, local animal shelter monitoring, police reports, and newspaper articles.2,4 Because of lack of a national reporting system and variation of local reporting procedures, accurate national incidence rates for dog bite–related emergency department (ED) visits and hospitalizations have not been well quantified. The reported incidence of ED-treated dog bite injuries in the United States ranges from 0.3% to 1.1% of all ED visits.5,9,10

With regard to overall morbidity, the annual number of total bites that occur in the US population has been estimated to range from 500,000 to 4.5 million.5,11 It has been estimated that almost half of all children have been bitten by a dog at some point in their lives.5 Among children, more than 50% of documented bites have been to the head, face, or neck.4,11,14 Unfortunately, most of the studies that provided this descriptive information were limited because of small sample size and lack of consistent definitions, or they were not representative of the general population.

Recent work by Sacks et al2 has improved the precision of national estimates for dog bite–related mortality and for dog bites receiving any medical attention. For the 10-year period, 1979 through 1988, an annual average of about 15 fatal dog attacks was documented in the United States, with extrapolated estimates suggesting that as many as 20 per year may have actually occurred.11 Based on a random household survey, the Injury Control and Risk Survey conducted by the Centers for Disease Control and Prevention, it was estimated that about 800,000 bites occur annually that require medical attention.2 However, this estimate was not able to break down the proportion of patients seen in hospitals owing to the small size of the sample. The only nationwide study from any country that examined both major morbidity and mortality from dog bite injuries was conducted in New Zealand.13 This study predicted an incidence of hospitalization due to dog bites in the year 2000 of 9.6 per 100,000 persons, twice the incidence for 1979.15
The purpose of the present study is to estimate the incidence and characteristics of dog bite injuries treated in US EDs using a 3-year population-based stratified random sample of US ED visits. This study also fills the gaps in our understanding of the patterns of medical care for dog bite victims. With such an understanding, the broad medical and public health impact of dog bite–related injuries can be better appreciated and targeted for preventive efforts.

Methods

Data Source.—Data were obtained from the ED component of the 1992-1994 National Hospital Ambulatory Medical Care Survey (NHAMCS), a population-based stratified sample of US ED visits. This survey, conducted annually since 1992, is directed by the Centers for Disease Control and Prevention National Center for Health Statistics. The combined 1992-1994 data set represented estimates applying to approximately 274 million ED visits (about 91 million visits per year). The NHAMCS is a national probability sample of non-institutional general and short-stay hospitals (excludes federal, Veterans Affairs, and military hospitals). It uses a 4-stage probability sample that covers geographic primary sampling units, hospitals within primary sampling units, EDs within hospitals, and patients within EDs. Data collection takes place during a randomly assigned 4-week data period for each of the sampled hospitals. The US Bureau of the Census regional staff oversees the data collection process, while actual data collection is the responsibility of hospital staff. A separate data collection form is filled out at or close to the time of visit for each sampled patient. A full report of the methods used in this survey is available from the National Center for Health Statistics (NCHS).

After the forms are completed, they are sent to NCHS where International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) coding takes place by experienced nosologists. A maximum of 3 E-codes are assigned to each case. The nosologists work from the data collection form, not the original medical record. For 1992-1994, a total of 91,955 patient forms were collected.

Definition and Case Selection.—A dog bite injury was defined as any ED visit with an ICD-9-CM E-code of E996.0 ("dog bite") in the primary, secondary, or tertiary E-code field. More than 99% of the cases were identified from the primary E-code field. To obtain incidence estimates (i.e., new cases) records from the 1992 data set were excluded if they were not marked as “injury, first visit” in the data set to prevent counting follow-up visits. This excluded 17.9% of the dog bite–related injuries from the 1992 data. The 1993 and 1994 data collection instruments did not contain information on whether the visit was a first visit for injury or follow-up visit. Therefore, the sample weights from each of these latter 2 years were reduced by 17.9% based on the percentage of follow-up visits found in 1992. All 3 years were then combined and averaged to produce mean annual national estimates. The NCHS suggests the minimum reliable estimate for this combined data set is 30,000 visits (Catherine W. Burt, EdD, Ambulatory Care Statistics Branch, NCHS, oral communication, August 30, 1996). Place of injury (home, work, school, street, etc) was only collected in 1993 and 1994. An addition was made to the NHAMCS data set by imputing an Injury Severity Score from the primary and secondary diagnosis fields. The Injury Severity Score ranks injury severity mainly in terms of threat to life. In this study the Injury Severity Score was derived by automated translation of the ICD-9-CM diagnoses using Tricode software (Tri-Analytics Inc, Bel Air, Md).

Data Analysis.—Data were obtained from NCHS on floppy diskettes in ASCII format and combined for analysis on a desktop computer using SPS software (SPSS Inc, Chicago, Ill). Rates were computed by dividing incidence estimates by the appropriate population estimate. The 1993 total US population estimates were used as enumerated by the NCHS. The results are presented using weighted values to produce annual national estimates. Approximate relative standard errors in percentages used for calculating 95% confidence intervals (CIs) for reported aggregate estimates and rates are based on a model suggested by NCHS (Catherine W. Burt, EdD, Ambulatory Care Statistics Branch, NCHS, oral communication, August 30, 1996).

Results

The annualized weighted estimate of the incidence of new dog bite–related injuries seen in US EDs was 333,687 (95% CI, 269,950-397,424) for a rate of 12.9 (95% CI, 10.5-15.4) per 10,000 persons. These injuries comprised about 0.4% of all ED visits during the study period. (Numbers and rates for race, sex, age, geographic region, and day of month are available from the authors on request).

Ages of victims of dog bite–related injuries ranged from younger than 1 year to 91 years (median age, 15 years). Incidence was significantly higher among children aged 0 to 9 years, especially among boys. The 5- to 9-year-old male age group had the highest rate, 60.7 ED visits per 10,000 persons (95% CI, 34.8-86.6). The estimated 575,800 dog bite–related visits for boys aged 5 to 9 years represent 3.6% of all injury-related ED visits in this age and sex group.

Among the cases in which body part area could be determined (about two thirds of the cases), the face, neck, and head (combined) were the leading body part sites affected (25%), followed by the upper limbs and lower limbs. Among children aged 0 to 9 years, 73% of the injuries with attributed injury site were to the face, head, and neck, while all other ages had only 30% of the injuries occur to the face, head, and neck. There was a nonsignificant trend toward a seasonal distribution of the incidence of dog bite injuries, with the highest rates being observed during the summer months. Although the highest number of cases was seen in the southern region of the United States (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia), the population-adjusted rates were similar by geographic region and not significantly different from one another.

Over half the dog bite injuries (58.0%) were reported to have occurred at a home. Dog bite–related ED visits were more likely to occur on the weekends. Dog bite injuries were triaged in the ED as urgent-emergent in 46.1% of the visits and nonurgent for the remainder. Ninety-six percent of patients making dog bite–related ED visits were treated and released from the ED; the remainder were admitted to the hospital or transferred to another facility. Among the 94% of the cases assigned a calculated ISS score, 99% were of low severity (Injury Severity Score, 1).

Comment

This study extends previous work in dog bite epidemiology by adding more precise quantitative information about ED visits and incidence. It fills the remaining gap in our understanding of where people go for medical treatment of dog bites, thereby more clearly defining their burden on the medical care system. Using the (rounded) NCHS survey data reported here of 334,000 dog bite–related ED visits with a 4% hospitalization rate, Centers for Disease Control and Prevention household survey estimates of 757,000 medically treated and 3,73 million nonmedically treated dog bites, it appears that about 20 deaths per year, 110 it appears that, for each US dog bite fatality, there are about 670 hospitalizations, 16,000 ED visits, 21,000 other medical
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<th>Activity</th>
<th>Estimated Annual No. of Emergency Department Visits</th>
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<tr>
<td>Baseball/softball</td>
<td>404,364</td>
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<tr>
<td>Dog bites</td>
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<tr>
<td>Playground</td>
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<td>All-terrain vehicles, mopeds, etc</td>
<td>125,136</td>
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<td>Volleyball</td>
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<td>Inline skating</td>
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<td>Horseback riding</td>
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<td>Baby walkers</td>
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<td>Skateboards</td>
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References

1. Davis SIM, Valla FE. Evidence for domestication of the dog 12,000 years ago in the Natufian of Israel. Nature. 1978;276:608-610.