Animal and human bite injuries in Victoria, 1998–2004

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ABSTRACT

Objective: To describe the epidemiology of mammal (human and non-human) bite injuries in Victoria.

Participants, design and setting: Retrospective case series of injuries recorded in the Victorian Emergency Minimum Dataset (VEMD) (1998–2004) and deaths recorded in the National Coroners Information System (1 July 2000 – 1 June 2006).

Main outcome measures: Frequency, nature and outcome of injury as a function of mammal, victim demographics and season.

Results: Of 12 982 bite injuries identified in the VEMD, dogs, humans, and cats were implicated in 79.6%, 8.7%, and 7.2% of cases, respectively. Dog bite injuries were commonly sustained to the hands/wrists (31.3%) and face/head (25.4%); cat bites to the hands/wrists (67.6%) and arms (16.0%); and human bites to the hands/wrists (37.1%), arms (20.5%) and face/head (20.4%). Males comprised 73.7% and 56.3% of human and dog bite victims, respectively, while females comprised 64.1% of cat bite victims. A third of dog bite victims (33.4%) were children aged 14 years or less. Most human bite victims (79.8%) were adults aged 20–49 years, inclusive. More injuries were sustained on weekends and during the summer, 55.4% of injuries occurred in the home, and 11.6% of patients required hospital admission. Dog bites resulted in three deaths.

Conclusions: Mammal bite injuries are common and often require inpatient care. Patterns of bite injuries relate to the type of mammal involved. These epidemiological data will inform prevention initiatives to decrease the incidence of mammal bites.

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Mammal bite injuries include puncture wounds, lacerations, avulsions and crush injuries,[1] and may result in infection,[1-4] disease transmission,[2,3,5,6] disfigurement,[7] serious injury or death.[1,7] The nature and severity of bite injuries vary with the type of animal involved[7-10] as well as with the characteristics of the victim, such as age and height.[7,8,10,11] The different types of wounds[8,12] and likelihood and nature of any infection[3,8] resulting from the various mammal species have a significant effect on patient management. Additionally, the injuries caused by dog and cat bites can result in considerable expense because of the need for long-term intravenous antibiotics, surgery and other medical treatments.[1] Finally, such injuries represent a preventable public health burden that may be reduced by public education about responsible pet ownership, and regulations regarding animal control.[13]

Our study explored the epidemiology of mammal (human and non-human) bite injuries in Victoria, examining the frequency, nature and outcomes of bites, including those from native Australian mammals. The findings will help to inform future research and ongoing injury prevention initiatives.

METHODS

We studied a retrospective case series of patients who sustained mammal bite injuries in Victoria between 1998 and 2004, inclusive. Victoria has a population of about 5 million people with a median age of 36.8 years.[14] Its geography and land use vary widely and it supports a diversity of domestic, introduced and native mammal species.

Data source

Injury and death data were obtained from the Victorian Emergency Minimum Dataset (VEMD) (1998–2004) and the National Coroners Information System (NCIS) (1 July 2000 – 1 June 2006), respectively. The VEMD injury data collection is administered by the Victorian Injury Surveillance Unit at Monash University Accident Research Centre. All Victorian public hospital emergency departments (EDs) running a 24-hour department now submit data.[15]

The study period commenced after the rollout of VEMD to most Victorian EDs. Data for the entire and partial study period were available from 26 and 11 of the 37 participating EDs, respectively. At each participating ED, staff enter demographic and injury/illness data for all patients into an electronic database. The subset of VEMD data relating to injured patients is then transmitted to the Victorian Injury Surveillance Unit. VEMD data were available in summary format and ethics committee authorisation was not required.

Database search

The NCIS database was interrogated using the search term "bite". Non-mammal bite cases were then excluded manually. The VEMD database was searched for patients with the *external injury code* of "dog related" or "other animal related" and for whom the *nature of main injury code* was "bite (non-venomous)" or "bite (not otherwise specified)". Additionally, we selected patients for whom the *description of injury event* contained any of "animal, creature, mammal, marsupial, zoo, wild, feral, stray, native, bite (and 11 synonyms)" and 62 animal names (available from the authors).

The search results were filtered manually. Patients were excluded if they had bite injuries from non-mammals, non-bite animal-related injuries or non-animal, non-bite injuries. All remaining patients were matched against three criteria:

1. *Nature of main injury* coded as either "bite (non-venomous)" or "bite (not otherwise specified)".
2. *External injury* coded as "horse related", "dog related", "other animal related"; or, for human bites, "struck by or collision with person".
3. *Description of injury event* included bite and/or animal related words.

Patients who met at least two of these three criteria were included in the final dataset. Patients who met only one of the criteria were individually checked and included only if it could be determined that the injury resulted from a mammal bite.

Data analysis

The study was a census of most of the patients entered into the VEMD database. Accordingly, no formal sample size calculations were undertaken. Data analysis was descriptive.

RESULTS

During the study period, 1 544 094 patients received treatment at the participating EDs, with 12 982 (0.8%) presenting with mammal bite injuries. Dogs, humans and cats inflicted almost all the bites (95.6%) (Box 1). A wide

1 Mammal species, number of cases and percentage of overall bite injuries, Victoria, 1998–2004

Mammal	No. of cases	Percentage (95% CI)
Dog	10 339	79.6% (78.9%–80.3%)
Human	1 134	8.7% (8.3%–9.2%)
Cat	937	7.2% (6.8%–7.7%)
Horse	127	1.0% (0.8%–1.2%)
Rat	109	0.8% (0.7%–1.0%)
Possum	101	0.8% (0.6%–1.0%)
Rabbit	69	0.5% (0.4%–0.7%)
Mouse	38	0.3% (0.2%–0.4%)
Ferret	33	0.3% (0.2%–0.4%)
Guinea pig	19	0.1% (0.1%–0.2%)
Monkey	11	0.1% (0.0–0.2%)
Pig	11	0.1% (0.0–0.2%)
Bat	9	0.1% (0.0–0.1%)
Cow/bull	7	0.1% (0.0–0.1%)
Fox	7	0.1% (0.0–0.1%)
Koala	7	0.1% (0.0–0.1%)
Other*	24	0.2% (0.1%–0.3%)
Total	12 982	100.0%

* Bites from a dingo (6), donkey (4), sheep (4); and one bite each from a wallaby, kangaroo, wombat, quoll, camel, glider, goat, mongoose, raccoon and squirrel. ◆

range of other mammals were involved including native, domestic, pet and exotic species. Native Australian animals caused 128 injuries (1.0%).

The median age (interquartile range) of the patients was 27 (11–42) years. Younger patients predominated, with the toddler age group (1–4 years) comprising 1528 patients (11.8%). As shown in Box 2, bites from dogs and "other" mammals (all other mammals except dogs, cats and humans) were most common among children, but there was a downwards trend in these bites among those over 30 years of age. In contrast, human and cat bites peaked in people in early and mid adulthood.

Males accounted for 7236 patients (55.7%), and more males than females were bitten by dogs (56.3%) and humans (73.7%) (Box 3). On the other hand, more females were bitten by cats (64.1%) and "other" mammals (55.6%).

Overall, hand and wrist injuries were the most common (Box 4). Dog bite injuries most commonly involved the hands/wrists, face/head or legs. Human bite injuries were most common on the hands/wrists, arms or face/head. In contrast, cat and "other" mammal bite injuries were relatively uncommon on the face and head.

Overall, 7198 patients (55.4%) were at home when bitten. A further 1381 (10.7%) were on public roads and 749 (5.8%) were at places of sport/recreation. Most human bites (44.5%) occurred on public roads and in places of sport/recreation and trades/services. Bite injuries were most common on Saturdays and Sundays (42.2% of bites) and during the warmer months (November–March).

Overall, 1504 patients (11.6%) were admitted to a hospital or observation unit. These included 12.0%, 10.1%, 10.4% and 8.6% of patients sustaining dog, human, cat, and "other" mammal bites, respectively. Two patients died after sustaining dog bites. The NCIS recorded an additional death also resulting from a dog bite injury. All three victims were male and included a toddler, a middle aged man and an elderly man.

DISCUSSION

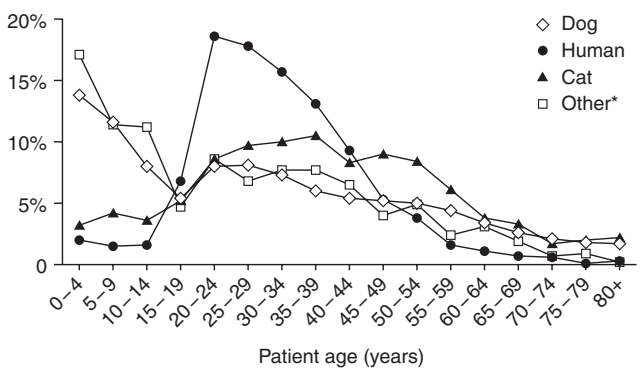
The proportion of mammal bite injuries among ED presentations (0.8%) is consistent with the findings of other reports.[2,7,8] However, differing inclusion criteria and indigenous mammal species make comparisons with other reports difficult.[9,10,13,14,16-20] In our study, dogs were responsible for almost 80% of all injuries. Similar proportions have been reported elsewhere, although these vary between 50% and 90%.[2,3,8-10,21] We found human bite injuries were more common than those from cats, consistent with findings in some reports,[2,21,22] but not in others.[6,8]

Clear patterns exist between patient age and each important mammal species. The large numbers of young children with dog bite injuries have been well documented.[3,12,13,16,17,23] Children are particularly vulnerable to dog attacks, due to their size and the proximity of their face to the dog's mouth, and attacks are frequently associated with interaction with the dog (possibly provocative) before the attack.[11,17] Very young children were also often bitten by mammals other than dogs, cats and humans. Horses and rats were commonly implicated in bite injuries in children aged under 10 years. However, the "other" mammals group was heterogeneous and should be examined further before firm conclusions are drawn. Finally, large numbers of human bite injuries among young adults have also been reported elsewhere[4] and may be associated with the social interactions of this age group.

Others have also reported that males are more often victims of dog bites[2,9,11,13,18] and females of cat bites.[2,3,9]

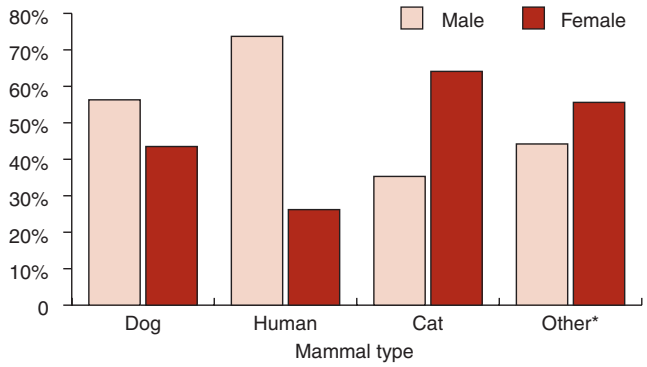
The admissions and deaths reported in our study indicate the severity of many bite injuries. The varying patterns of injury site for each mammal group are consistent with other

2 Main mammal species causing bite injuries in Victoria, 1998–2004, by patient age



* For a complete list of mammals involved in bites, see Box 1. ◆

3 Patient sex by main mammal species causing bite injuries in Victoria, 1998–2004



* For a complete list of mammals involved in bites, see Box 1. ◆

4 Body regions injured and main mammal species responsible, Victoria 1998–2004. Data are number (%) of bite injuries

	Dogs	Humans	Cats	Other mammals*	All mammals (%; 95% CI)
Face/head	2 630 (25.4%)	231 (20.4%)	27 (2.9%)	43 (7.5%)	2 931 (22.6%; 21.9%–23.3%)
Trunk	239 (2.3%)	51 (4.5%)	4 (0.4%)	15 (2.6%)	309 (2.4%; 2.1%–2.7%)
Arms	1 345 (13.0%)	232 (20.5%)	150 (16.0%)	57 (10.0%)	1 784 (13.7%; 13.2%–14.4%)
Hands/wrists	3 241 (31.3%)	421 (37.1%)	633 (67.6%)	394 (68.9%)	4 689 (36.1%; 35.3%–37.0%)
Legs	1 858 (18.0%)	31 (2.7%)	43 (4.6%)	19 (3.3%)	1 951 (15.0%; 14.4%–15.7%)
Feet/ankles	318 (3.1%)	7 (0.6%)	26 (2.8%)	14 (2.4%)	365 (2.8%; 2.5%–3.1%)
Multiple injuries	286 (2.8%)	60 (5.3%)	22 (2.3%)	5 (0.9%)	373 (2.9%; 2.6%–3.2%)
Missing/other body regions	422 (4.1%)	101 (8.9%)	32 (3.4%)	25 (4.4%)	580 (4.5%; 4.1%–4.8%)
Total	10 339 (100.0%)	1134 (100.0%)	937 (100.0%)	572 (100.0%)	12 982 (100.0%)

* For a complete list of mammals involved in bites, see Box 1. ◆

reports.[6,8,9,11] The common upper-limb injuries may have resulted from direct handling, or from attempts to separate fighting animals or aid injured ones.[1]

The home was clearly the most common location for bites to occur, and this is consistent with other reports.[1] However, additional data, especially "time of exposure", are required to further explore location patterns.

Our study has important limitations. The data are likely to underestimate injury incidence,[2,8] as they do not account for bites not requiring medical attention, and those treated by general practitioners and other doctors, and at private or non-VEMD EDs. Furthermore, there may be an inherent selection bias in that bites from some animals (eg, dogs) may be more severe and more likely to require ED management. The VEMD is a relatively reliable and valid dataset,[24] although there are identification and coding errors as well as missing data.

Mammal bite injuries represent a considerable public health burden, and ongoing prevention strategies are indicated. These should include public educational programs,[25] the separation of young children from dogs, avoidance of high-risk dogs by parents, neutering and regulatory reinforcement (ie, restriction of ownership and breeding of high-risk dog breeds), and appropriate restraint of animals in public places.[17] Research into bite injury rates (injuries per person-hour of contact) would better clarify the risk of injury for each species and is recommended.

COMPETING INTERESTS

None identified.

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