Injuries from arthropod, reptile and marine bites and stings in South Trinidad

Konings M *MD*[1], Maharajh HD *MD*[2], Gopeesingh S *MD FRCS* [3]

[1] Department of adult psychiatry, Mental Health Care / GGZ Oost-Brabant, location Helmond, the Netherlands.
[2] Psychiatry Unit, Dept of Clinical Medical Sciences, Champ Fleurs, Mt. Hope Trinidad.
[3] Consultant, Accident and Emergency Department, General Hospital, San Fernando.

Corresponding author: Monique Konings konings164@zonnet.nl

Abstract

Injuries caused by arthropods, reptiles and marine organisms are a major cause of morbidity and a burden to the health care providers in developing countries. Epidemiological data in published studies are sparse and this is the first study with previously unpublished data on this important public health issue from an under-reported region. This study was a hospital based study that investigated the rates, time of the year, age, gender, ethnicity and outcome of patients with bites and stings in rural regions of Southern Trinidad. Injury data were retrospectively collected from the Accident and Emergency Service of the San Fernando General Hospital. Data were used from computerized data files of two most recent calendar years that were available, which were 2003 and 2004. These demographical data were analyzed using SPSS and the Chi-square test determined levels of significance. A total of 1,289 cases of relevant bites and stings were reported during these two years, giving an incidence rate of 12.9/10,000 population. Scorpion and bee stings together were responsible for the majority of venomous bite and sting presentations and were significantly over-represented amongst males, when compared with females and with all other categories of bites and stings (X2=11.3, p=0.01). Most victims were 18 to 34 years old and there was a peak incidence of bites and stings during April to June, corresponding with the start of the raining season. The majority of patients were treated and discharged in good health. Snake bites and scorpion stings were generally admitted to the wards. One death was reported for a non specified insect bite and two cases of long term disability were also mentioned. These injuries are prevalent in the emergency service in Southern Trinidad and justify an urgent need for the implementation of a public health policy of education, information and prevention. Bites and stings from arthropods, reptiles and marine organisms are a major public health problem that contribute significantly to morbidity and health care costs.

Key words : arthropod, reptile, marine, bites, stings, Trinidad, public health.

Introduction

The Republic of Trinidad and Tobago is the most southerly of all Caribbean islands with Trinidad being the largest of the twin islands. Trinidad is located 11 kilometres from the Venezuelan coast, 10-11 degrees north of the equator. It has a total population of approximately 1.3 million with 40% of the population being of East Indian descent, 40% of African descent, 18% mixed and 2% belonging to other ethnic groups. The southern region is located in the agricultural belt. It is less urbanized with a population of about 500,000 people, mostly of Indian origin (Indian 60%, African 30% and mixed and others 10%). This region comprises approximately 40% of the country's population. The main city is San Fernando which has a population of approximately 100,000 people. The General Hospital in San Fernando serves the population of the Southern part of the country. About 20% of the inhabitants of Trinidad and Tobago are 0-14 years old, the majority (71%) are 15-64 years and 9% are over 65 years. The sex ratio is 1.07 for male:female in 2006 (CSO 2006).

Bites from venomous and poisonous animals are a significant cause of global morbidity and mortality (White 2000). The effect of a bite or sting depends on the species of the causal organism, the kind of bite, the toxicity of the venom injected, the amount of venom injected, the location of the wound and the victim's age and health. These bites and stings can result in neurological, renal, dermatological, cardiovascular and even psychological symptoms. Injuries of this nature can be painful and are usually accompanied by local swelling and inflammation (Harris and Goonetilleke 2004) and general symptoms from the alimentary tract such as vomiting and abdominal pain. They may result in respiratory paralysis, which is not uncommon (Bawaskar and Bawaskar 2004). Venom can also cause changes in blood cells, preventing blood from clothing and resulting in internal bleeding. So symptoms can vary from minor injury and irritation, allergic reactions, and in exceptional cases, chronic pancreatitis and even death (Clark et al 2005, Ellis and Day 2005, Reisman 2005, George Angus et al 1995). Bites have been shown to be a major public health problem, not only because of morbidity but also show higher incidence of hospitalizations and an increased cost of care (Benson et al 2006, Hoff et al 2005).

There have been few epidemiological or descriptive studies of animal bites in the Caribbean region and surrounding areas and most of the studies found describe cases. Medical complications due to scorpion stings have been studied both in Trinidad and Columbia. Over a one year period in two regions in Columbia, 129 Cases of scorpion stings were admitted (incidence rate of about 0.45/10,000) with a range of symptoms from vomiting to pancreatitis (Otero et al 2004). Of these cases, 76% showed mild envenoming and 21% and 4% showed moderate and severe envenoming respectively. The two latter groups were mainly children. In Trinidad, a typical

case involving a 13 yo girl is described. Following envenoming by a scorpion, she developed a disclosed unabated pancreatitis (George-Angus et al 1995). In 3 Brazilian hospitals in one region, 72 cases of scorpion stings were seen in one year with most victims being male with a mean age of 33.6 ± 18.3 years. No incidence rates were mentioned in this study and also no specific details about the demographics of the country were described (Pardal et al 2003). Studies on mosquito seasonal prevalence in Trinidad by Chadee (1994) indicated a high prevalence during wet season of 72%. In 1997 an article was published on dermatological irritation caused by the stings of jelly fish. Eight cases were described but incidence rates were not mentioned (Jefferies and Rushby 1997). In Brasil, 5 cases of dermatitis caused by jelly fish were reported in 2001 (Haddad et al 2001).

Clearly, literature on bites and stings from arthropods, reptiles and marine organisms in the Caribbean and its regions is sparse and this study is the first to investigate epidemiological factors in the southern rural region of Trinidad. Incidence rates, seasonality, gender, ethnicity, age distribution, types of bites and outcome were measured and outcomes were compared with the known literature.

Materials and Methods

Information was collected from the Injury Surveillance registry of the Accident and Emergency Department (A&ED) of the San Fernando General Hospital. All patients attending the service are first registered by medical personnel with reference to demographic data and presenting complaints. They are then streamlined to see a physician for examination, diagnosis, treatment options and outcome. This information is subsequently entered and stored into the A&ED computer data system. Information was available for the period 2003 to 2004 and demographic data of gender, age, date of arrival, diagnosis and outcome were assessed. During the two-year period from 2003 to 2004, 1289 patients were registered and included in this study.

The protocol for the management of animal bites at this hospital is well established so all patients registered for treatment for “small animal bites” and entered into the system were selected for this study. Patients bitten by mosquitoes were excluded due to a special protocol for dengue fever. Those injured or attacked by large domesticated animals such as dogs, pigs or horses or large wild animals, were excluded. Small animals were defined as invertebrates of less than six inches in length and marine organisms and reptiles (snakes) not longer than four feet. No distinction was made between bites and stings except where the perpetrator was known. More detailed data were not available for this study and numbers of large animal injuries were not known, so this study focused on small animal bites.

All data were entered and analyzed by the use of SPSS (Statistical Package for the Social Sciences, Version 11.0). The Chi-square test was used to determine if the tested populations were significantly different from the expected distribution for gender and different animal bites.

Results

From 2003 to 2004, 1289 patients sought treatment for animal bites at the A&ED of the General Hospital. The mean age of this group of patients was 30.7±18 (SD), and the median was 28.5 years, range 0-88 (Fig 1). More than half of the patient population (55%) was male (n=703) and 45% was female (n=586). Patient ethnicity comprised of Indian descent (823), Afro-Caribbean descent (278), mixed origin (46), and 142 had missing ethnicity data. Figure 2 shows the number of admissions by month.

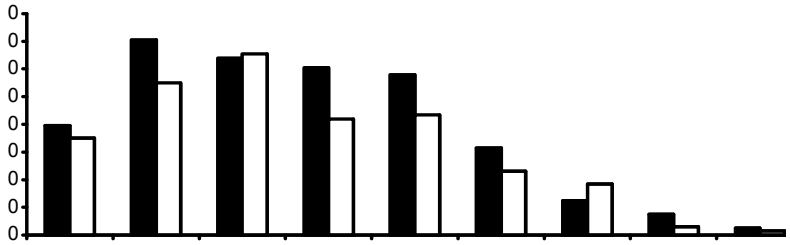

Figure 1: Age distribution in small animal injuries in 2003-2004 (male ■, female □).

Stings by scorpions (n=580) accounted for 44.9% of the patients seen, followed by stings by centipedes (n=230, 17.9%), stings by bees and wasps (n=222, 17.2%) and non-specified bites of insects (n=147, 11.4%). There were 86 snake bites that accounted for 6.7% of all bites, 10 reported cases of spider bites (0.8 %), 11 cases of marine organism bites and stings (0.9 %) and 3 reported cases of bites by ants (0.2 %) (Table 1).

Men were more often registered in this study. When both years were analyzed, it was found that being bitten or stung by a small animal, especially bees, was more associated with males than females (X^2=11.3, p=0.01). Separate data on both years showed also this gender difference for scorpion bites in 2003 and bee and centipede stings in 2004. When the data were combined, only bees showed statistical significance.

Separate data on admissions to a ward in 2003 and 2004 showed that there were 90 admissions to a ward in 2003 (12.2 % of total patients in that year) and 96 patients in 2004 (17.5 % of the total patients). In this data set, there was an increase of almost 50 % for patients who were admitted to wards in 2004 than in 2003.

Table 1: Emergency admissions due to bites and stings with Chi-square results for gender. Also, general ward admissions in 2003 and 2004 by organism responsible for the bite or sting.

Organism	Emergency admissions		Gender Chi-square emergency admissions		Left without being seen		Discharged well		Ward admissions		Died	
	2003 (%)	2004 (%)	2003	2004	2003	2004	2003	2004	2003	2004	2003 (%)	2004 (%)
Ant	2 (0.3)	1 (0.2)	--	--	0	0	1	0	1	0	0	0
Bee	120 (16.2)	102 (18.6)	3.33	8.82*	8	4	100	73	12	25	0	0
Centipede	137 (18.5)	93 (16.9)	3.22	4.74#	1	4	121	84	14	3	0	0
Marine organism	6 (0.8)	5 (0.9)	--	--	0	0	6	4	0	1	0	0
Unknown arthropod	83 (11.2)	64 (11.7)	0.01	0.06	3	2	66	49	12	12	1	0
Scorpion	336 (45.4)	244 (44.5)	4.30#	0.15	19	12	278	186	38	40	0	0
Snake	49 (6.6)	37 (6.7)	0.18	0.33	1	1	37	20	11	15	0	0
Spider	7 (1.0)	3 (0.5)	1.29	--	0	1	5	2	2	0	0	0
Totals	740 (100)	549 (100)			32	24	614	418	90	96	0	0

Statistical significance *p=<0.01; # p =< 0.05.

In the majority of cases, the outcome of animal bites was an asymptomatic discharge from the A&ED. Patients who sustained snake bites, stings by bees and wasps, unspecified or unknown bites and spider bites were admitted to the medical wards if symptomatic and/or for observation. About one third of the ant bites (total number only 3) and snake wounds (total admitted 26) were admitted to wards. There was one death reported in 2003, caused by an insect bite or sting that was not further specified. The patient was a 21-year old man of African-Trinidadian descent. Two people were mentioned to be "discharged with disability", but the nature of the disability was not specified. One of them was an African-Trinidadian female of 29 years who was stung by a centipede and the other was a 37-year old male of Indian-Trinidadian descent patient who was stung by a scorpion.

When the total patient group was divided into a group of adults (>18 yo) and children/adolescents (=<18 yo), no significant difference was found in discharge rates and most patients went home in good health (Table 2).

Table 2: Discharges and admissions of adults (>18 yo) and children (=<18 yo).

	No. left without being seen (%)	No. discharged well (%)	No. ward admissions (%)	No. others (%)	Total
Adults	60 (5.5)	766 (69.7)	268 (24.4)	5 (0.5)	1099
Children	6 (3.7)	123 (75.5)	34 (20.9)	0	163
No Age					27

The only noticeable difference was in admission rates, where 123 children (75.5 %) were discharged well and 34 children (20.9 %) were admitted to a ward. Six children left without being seen (3.7 %). Of the adults, 766 (69.7 %) were discharged well and 268 (24.4 %) were admitted to a ward. The rest left without being seen and there was one death reported (0.2 %).

Clear seasonality of bites and stings was observed from 2003 to 2004 and the wetter months of June and July were when patients were admitted more frequently (Fig 2).

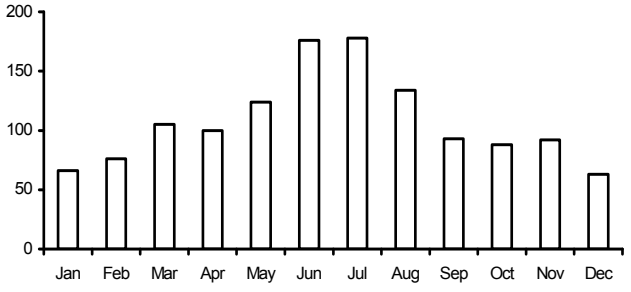

Figure 2: Number of small animal bites and stings by month during the period of 2003 – 2004.

When the animal bites in 2003 and 2004 were analyzed separately, it showed 740 cases of animal bites and stings in 2003. It comprised of 45.4 % (n= 336) scorpion stings, followed by 18.5 % (n= 137) centipedes stings; 16.2 % (n= 120) was due to attacks by bees or wasps, and in 83 cases (11.2 %) no specific insects were reported. Snakes accounted for 6.6 % (n= 49) of the bites and 1.0 % (n= 7) of the animal injuries was caused by spiders. There were two reports of bites by ants (0.3 %) and 6 reports of injuries by fish (0.8 %).

In 2004 549 cases of small animal injuries were reported. Scorpion stings were the most prevalent with 244 cases (44.5 % of the total cases). Stings by bees or wasps were second with 102 cases (18.6 %). Centipede stings accounted for 16.9 % (n= 93) of the cases, unspecified insects 11.7 % (n= 64). Snake bites were less common with only 6.7 % (n= 37) involved while 0.9 % (n= 5) reported bites and/ or stings by fish. There were 3 reported cases of spider bites (0.5 %) and one case of a bite of an ant (0.2 %) (Table 1).

Discussion

This study describes some epidemiological factors of animal bites during a period of two years at the Accident and Emergency Department of the General Hospital in South Trinidad. There were few significant differences in the pattern of small animal bites over the two years under study and variations in the numbers of patients seeking treatment for both years were largely not significant. In both 2003 and 2004, 45.4% and 44.3% sought treatment for scorpion stings, followed by centipedes 18.5% and 17.1%, bees and wasps 16.2% and 18.6% and unspecified insects 11.2% and 11.7% respectively. This can be explained by the fact that the southern region of Trinidad is mostly agricultural and each year there is a routine of land preparation, planting and harvesting. Monthly variations can be explained by varying rainfall patterns and seasonality.

A higher number of men visited the A&ED for animal bites than females which is typically explained by a male predominance of agricultural workers in the more heavily forested vegetations inhabited by scorpions, bees and snakes. In this study a two year cumulative incidence of 6.9/10,000 and 6.1/10,000 respectively was found for males and females.

The Accident and Emergency Department of the San Fernando General Hospital is a well staffed and highly organized service with a triage system of five emergencies categories adopted from the Canadian system. Animal bites with the complications of allergic reactions, bronchospasms and death are scheduled in category one which means immediate emergency care with no waiting time. The outcome of animal bites resulted in a healthy non-symptomatic discharge from the department. Admission to the medical ward for observation was routine for symptomatic patients and in some cases of scorpion, unspecified bites, bees and snake bites. The latter needed anti-snake venom if the patient was able to identify that they were bitten by the deadly snakes of the mappipi or coral species. The coral snakes (Micrurus and Micruroides) are two genera of about 65 snake species, found in tropical South America, which are venomous and are related to Old World Cobras. As pointed out by Warrell (1993) snake bites in the tropical world can be very dangerous.

An interesting finding was that twice as many patients were admitted to the medical wards in 2004 (25.6%) compared to 2003 (13.7%). This almost overall doubling of admissions in 2004 of snakes 22.4% to 41.7%, bees and wasps 10.3% t0 24.5% , scorpions 11.3% to 16.6% and unspecified from 14.5% to 19.4% is difficult to explain, but was possibly due to the addition of a second consultant to the A&ED in 2004. Notwithstanding, disability and death were rare with the enviable record of one death in two years of a person bitten by an unknown arthropod. It should be noted that many patients sought treatment for bites without knowledge of what bit or stung them which made management more difficult.

Seasonality was a major confounding variable in animal bites. The incidence of animal bites showed an increase during the beginning of the wet season in both years. There are two seasons in Trinidad, the wet season extending from June to December and the dry season from January to June. The preparation of land for planting precedes the onset of the rainy season. The differences in months over the period studied can be explained by an earlier wet season in 2004. The association between higher incidence of insects and the wet seasons has been reported in Trinidad (Chadee 1994).

A limitation of this study in its ability to report comprehensive bites and stings was that information was utilized from the Injury Surveillance database of the General Hospital's emergency service. It must be assumed that a minority of victims of small animal bites and stings actually visited the emergency ward and a majority sought treatment based on their experience and perception of danger and poisoning. A substantial percentage of the population use their own homemade remedies or seek assistance from private practitioners. Others with previous experiences of bites simply ignore their injuries. Another limitation was the inability to relate the time of bite to the time of treatment. This will has an effect on outcome, since early intervention will have a better prognosis.

There is a high incidence of arthropod, reptile and marine bites and stings in the Southern region of Trinidad. This study has shown that these wounds were associated with a high cost of emergency care, institutionalization with investigations and in some cases treatment with anti-toxin. Snake bites and non-specific arthropod bites

were associated with a high frequency of admission to the medical wards. ‘Animal bite’ in Trinidad and other Caribbean islands is thus a public health issue of some concern. While treatment facilities are adequate, little emphasis is placed on preventative measures. A collaborative effort of the Government's Ministry of Agriculture and the Ministry of Health is needed with the aim of providing safety guidelines to farmers and market gardeners. All children including those with asthma and allergies are an at risk group and should be educated on the recognition of poisonous animals, the effects of bites and information on seeking help. This ought to be a mandatory component of the school curriculum. Parks and recreation grounds ought to be properly maintained since these are often sources of biting vermin. Education of those who work and live in rural agricultural and farming sectors will decrease the risks of animal bites. A comprehensive preventative program will not only serve to provide a better quality of life for the nation but will also significantly reduce the costly burden of health care.

References

Bawaskar HS, Bawaskar PH (2004). Envenoming by the common krait (Bungarus caeruleus) and Asian cobra (Naja naja): clinical manifestations and their management in a rural setting. Wilderness Environ Med. 15: 257-266.

Benson LS, Edwards SL, Schiff AP, Williams CS, Visotsky JL (2006). Dog and cat bites to the hand: treatment and cost assessment. J Hand Surg. 31: 468-473.

Chadee DD (1994) Seasonal abundance, biting cycle, and parity of the mosquito Anopheles homunculus in Trinidad, West Indies. J Am Mosq Control Assoc. 10: 522-526.

Clark S, Long AA, Gaeta TJ, Camargo Ca Jr (2005) Multicenter study of emergency department visits for insect sting allergies. J Allergy Clin Immunol. 116: 643-649.

CSO (2006) Central Statistical Office, http://www.cso.gov.tt/ accessed Aug 2006.

Ellis AK and Day JH (2005) Clinical reactivity to insect stings. Curr Opin Allergy Clin Immunol. 5: 349-354.

George-Angus LD, Salzman S, Fritz K, Ramirez J, Yaman M, Gintautas J (1995) Chronic relapsing pancreatitis from a scorpion sting in Trinidad. Ann Trop Paediatr. 15:285-289.

Harris JB, Goonetilleke A (2004) Animal poisons and the nervous system : what the neurologist needs to know. Journal of Neurology Neurosurgery and Psychiatry 75 Suppl 3: iii40-6

Haddad v Jr. Cardoso JL. Silveira FL (2001) Seabather's eruption: report of five cases in southeast region of Brazil. Rev Inst Med Trop Sao Paulo. 43: 171-172.

Hoff GL. Cai J. Kendrick R. Archer R (2005) Emergency department visits and hospitalizations resulting from dog bites, Kansas City, MO, 1998-2002. Mo Med. 102: 565-568.

Jeffreries NJ. Rushby N (1997) Caribbean itch: eight cases and one who didn't (Exercise Blue Calypso Diamond). Journal of the Royal Army Corps. 143: 163-164.

Mitchell JF, Lowe J, Wood RA, Vellinga M (2006). Extreme events due to human-induced climate change. Philos Transact A Math Phys Eng Sci. 364: 2117-2133.

Otero R, Navio E, Cespedes FA et al. (2004) Scorpion envenoming in two regions of Colombia: clinical, epidemiological and therapeutic aspects. Trans R Soc Trop Med Hyg. 98: 742-750.

Reisman RE (2005) Unusual reactions to insect stings. Curr Opin Allergy Clin Immunol. 5: 355-358.

Warell DA (1993) Venomous bites and stings in the tropical world. Med J Aust. 159: 773-779.

White J (2000) Bites and stings from venomous animals: a global overview. Ther Drug Monit. 22: 65-68.