Jellyfish Envenomation Events in Selected Coastal Provinces of Thailand 1998-2008

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Introduction

Anecdotal evidence suggests jellyfish envenomation occurs commonly in coastal Thailand. Envenomation injuries are not currently included in national disease surveillance, so quantitative data are limited. One severe jellyfish envenomation and three lethal envenomation events reported to the MOPH within the past six years have raised concern about the scope of jellyfish envenomation events in Thailand.

Jellyfish usually contain venom within a coiled hollow thread-like structure called nematocysts on their tentacles. Discharge of venom typically causes local irritation or burning, but is not very dangerous to humans. The venom from a few species can cause severe burning and scarring and is potentially lethal to humans. Jellyfish envenomation has caused at least 100 documented fatalities worldwide[1]; northeastern Australia is the epi-center of lethal envenomation. Members of the Cubozoa class, known as box jellyfish, are thought to be responsible for the majority of lethal envenomation.

In 2002, two fatalities following jellyfish envenomation occurred in Koh Phangan, Surat Thani Province, Thailand. In January 2008, a four-year-old boy was severely injured after jellyfish envenomation in Koh Chang, Trat Province. In April 2008, an eleven-year-old girl died from a jellyfish envenomation in Koh Lanta, Krabi Province.

Teams from the Bureau of Epidemiology conducted investigations in three coastal provinces in 2003[2] and in two additional provinces in 2008. Results from the investigations were presented at conferences[3]. In this work, we present results from medical records review of jellyfish envenomation events for five year periods in five provinces. Areas included in this review included coastal regions of both the Gulf of Thailand and the Andaman Sea.

Methods

Thailand has 23 coastal provinces; tourist areas can be divided into three regions: the eastern coast, the southern coast along the Gulf of Thailand and the southern coast along the Andaman Sea. Total coastal length is 2,815 kilometers.

We used data from five provinces in Thailand with histories of jellyfish envenomation events. We conducted a descriptive study in coastal health facilities in Trat Province: Trat provincial hospital, Bangkok-Trat hospital, Lam Ngob community hospital, Koh Chang community hospital, Ban Klong Phrao health center; and in Krabi Province: Krabi provincial hospital, Ao Luk community hospital, Koh Lanta community hospital and Sala Dan health center. We reviewed both outpatient and inpatient medical records, both from log books and electronic databases, dependent on availability. Medical records from 1 Jan 2003 through 31 Dec 2007 were reviewed from Trat Province. Medical records from 1 Jan 2003 through 30 Jun 2008 were reviewed from Krabi Province.

We identified cases of jellyfish envenomation in two ways. We included cases with ICD-10 diagnostic codes X26 (contact with venomous marine animals and plants) and T63.6 (toxic effect of contact with other marine animals). We also searched for jellyfish envenomation cases in hand written patient registration logbooks for emergency room visits and hospital admissions where logbooks were available.

We included in our analysis 1998-2002 hospital data from Hua Hin District (Prachuap Khiri Khan Province), Cha-um District (Phetchburi Province), and Koh Samui District and Koh Pha-ngan District (Surat Thani Province) collected by researchers from Thailand's Bureau of Epidemiology in 2003[2]. These sites and the ones from our study are shown in figure 1.

The study team used chief complaint data from hospital log books and ICD-9 and ICD-10 codes to identify cases of jellyfish envenomation.

We collected data from each record including age, sex, nationality, address, dates of injury, injured parts of body, symptoms and signs, date and type of treatment. Injuries were divided into three categories: lethal, severe (admitted patients) and mild (outpatients).

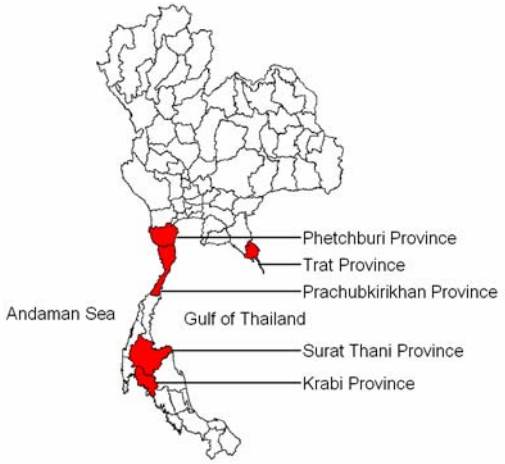

Figure 1. Data collection sites

We interviewed local fishermen who fishing in the Andaman Sea about occurrence of jellyfish envenomation among local people and jellyfish species they had observed in local waters. In the first three investigations, we collected specimens submitted by local fishermen or netted by snorkelers swimming close to the envenomation sites. In the Koh Lanta investigation, we collected jellyfish specimens two to four kilometers from the coast using a shrimp net submerged for 15-20 minutes in the sea at depths of three to four meters.

We used descriptive statistics to summarize information on envenomation events including demographic information on cases, envenomation rates, injury characteristics, and treatments administered. Denominators in our envenomation rate calculations were obtained from the Tourism Authority of Thailand and hospital admission data.

Results

From medical record reviews, we identified 587 cases of jellyfish envenomation. Cases ranged in age from 4 to 75 years, the median age was 26. In terms of anatomic site of envenomation, leg is the most common part while face is at the least (Figure 2).

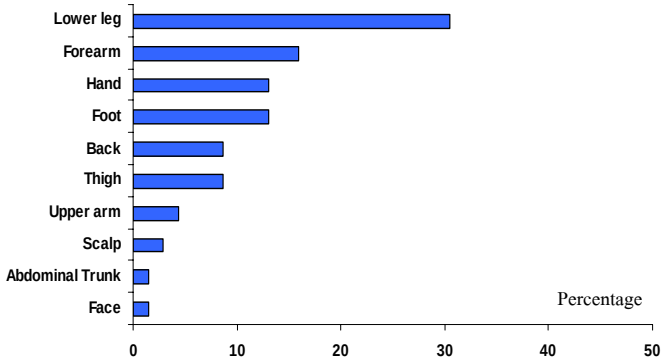

Figure 2. Anatomic sites exposed jellyfish envenomation in Thailand, 1998-2008

Burning sensation and pain were common symptoms and some of cases develop symptoms not relate to sting area such as chest discomfort, abdominal pain and nausea (Figure 3).

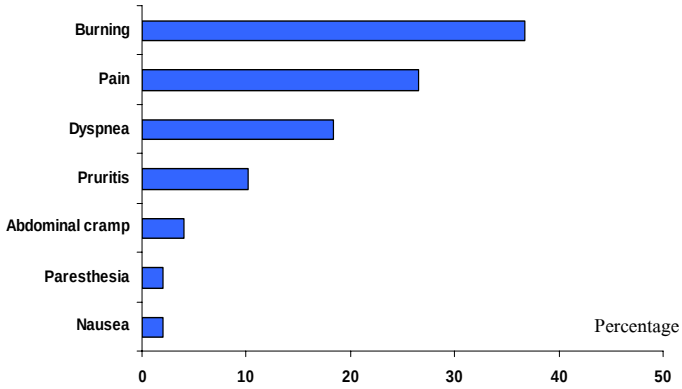

Figure 3. Symptoms of jellyfish envenomation cases in Thailand, 1998-2002

Patients usually present sign of erythematous rash, followed by burn wound and swelling (Figure 4).

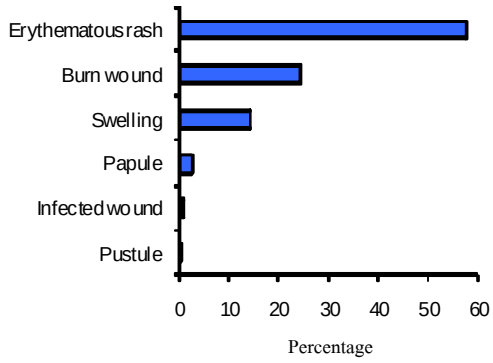

Figure 4. Percentage of signs of jellyfish envenomation cases in Thailand, 1998-2002

Rates of severe and lethal envenomation are presented per 1 million tourists and per 1,000 hospital admissions are shown in table 1. Since envenomation from box jellyfish can be fatal but proper first aid can effectively safe life, we present the first aid treatment in table 2.

Table 1. Characteristics of cases in jellyfish envenomation

Envenomation Attack Rate	Trat	Krabi
Tourist (per 1 million tourists)	0.5	1.5
Hospitalized cases (per 1,000 hospitalized cases)	0.1	0.1

In Surat Thani in 2003, the team collected 2 venomous jellyfish specimens which were identified as *Cubozoan* jellyfish of the *Carybdeid* family. In Koh Lanta, the team collected 12 venomous jellyfish specimens which were preliminarily classified into two species: *Cubozoan, Chyrasanum*.

Table 2. Types of treatment in jellyfish envenomation

Number	Type of Treatment
1	If cardiorespiratory compromise, immediate anti-venom where available.
2	Flood the area with 2-5% acetic acid (household vinegar) to keep undischarged nematocysts from firing. This does not relieve pain, but prevents discharge of additional venom.
3	Irrigate exposed eyes with copious amounts of room temperature tap water for at least 15 minutes.
4	Pluck off any vinegar–soaked tentacles with a stick or other tool.
5	If the victim has shortness of breath, weakness, muscle cramps, palpitations or any other generalized symptoms, take them to an emergency room.

Figures 5 and 6 show jellyfish collected in these investigations. Four local fishermen were interviewed; the anecdotal evidence showed existing of venomous jellyfish in local water. One fisherman experienced Cubozoan jellyfish envenomation. Since venomous jellyfish population by seasonality in Thai water had never been studied, further survey is needed.

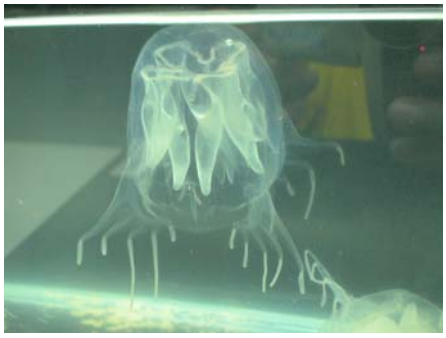

Figure 5. Jellyfish collected from Lanta island, Krabi Province

Figure 6. Jellyfish collected in an investigation near Samui island, Surat Thani Province in 2003

Discussion

Though there are fewer serious envenomation events in Thailand than in Australia, Thailand faces a more challenging control problem. As demonstrated by our data, envenomation events happen across broad expanses of Thailand's coast whereas Australia's high risk area is limited to the northeast. Australia's greater economic resources have also allowed scientists to collect data on jellyfish population dynamics and more thoroughly explore and document envenomation events.

The public health challenge for Thailand requires consideration of multiple factors: rarity of severe envenomation injury, uncertainty about changes in the burden of envenomation injury, limited utility of treatment options, and the importance of Thailand's tourism industry.

In our study, prevalence of jellyfish envenomation was likely underestimated as some jellyfish envenomation cases were misclassified and medical records were occasionally missing. Also affecting prevalence estimates is the reality that many mild cases of jellyfish envenomation do not present at a health facility for treatment. Most Thai cases who were local fishermen or lived near the coast did not visit health facilities after being stung, choosing instead to self-administer first-aid or use traditional medicine. Even taking this underestimation of prevalence into account, it is clear that rates of envenomation are low which has implications for the amount of resources devoted to this problem.

If jellyfish populations continue to grow and possibly expand into territory in which they have not historically been found, there may be an increase in the risk of envenomation. Thailand is also receiving greater numbers of tourists every year which may also result in increasing risk.

Prevention is a key in controlling jellyfish envenomation; treatment of severe cases may not be possible given the speed at which death occurs. The average time from envenomation to death in our study was about 10 minutes; most cases will not be able to reach health facilities in time. In addition, although antivenin is available for certain species of jellyfish, the cost of keeping it stocked in all coastal health facilities is prohibitive.

In recent years, tourism in Thailand has generated approximately seven billion U.S. dollars per year, a figure that represents roughly six percent of the country's GDP (Tourism Statistics Thailand 1998-2007). Intense public health campaigns about the risk of envenomation must be tempered with appreciation of the overall very low risk of serious injury from jellyfish and the importance of the tourist industry.

Data in the earlier study were collected in a slightly different way than our more recent investigation due to the availability of various data sources including electronic databases and hard copies of medical records. This limits our ability to look at trends and compare rates across time.

Public Health Action and Recommendations

Most cases of jellyfish envenomation develop mild symptoms and can be treated as outpatients or with only first-aid. Vinegar disrupts discharge of venom through denaturing nematocyst proteins on jellyfish tentacles and should be made available at beaches, in boats and in coastal accommodations. The most commonly injured body parts were lower extremities, followed by the arms and hands; these areas should be protected by clothing while in the water. Australia requires the use of protective "stinger suits" in high risk areas though expense makes this an unlikely intervention in Thailand and suitable alternatives should be encouraged.

The high season for tourists, both Thai and foreign, in the Gulf of Thailand is from October to May and in the Andaman Sea, November to May. Especially during these times, prevention methods such as posted warning signs in high risk areas and protective nets to reduce interactions between venomous jellies and swimmers should be used.

Health officers who work in coastal areas should be trained to recognize and manage jellyfish envenomation cases. However, we emphasize prevention as a more effective intervention than treatment.

We recommend that jellyfish envenomation be included in Thailand's non-communicable disease surveillance and advocate routine surveying of fishermen and other populations unlikely to seek medical care. The collection of these data will provide information on the burden of envenomation which in turn will facilitate an appreciation of potential changes in envenomation patterns. Continued collaboration with marine scientists is strongly recommended to identify venomous jellyfish species and monitor their populations.

Some evidence suggests that jellyfish numbers are increasing worldwide, perhaps due to global warming and overfishing (National Science Foundation News 2008). Jellyfish envenomation events have led to beach closures in Hawaii and Spain and posting of warning signs in Borneo and elsewhere. Protective "stinger suits" and anti-jellyfish nets surrounding swimming areas are used to reduce risk of envenomation in Australia.

Suggested Citation

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