

Toxic jellyfish situation in Thailand

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Abstract This study aimed to describe the toxic jellyfish situation in Thailand. With ad hoc surveillance set up along Thai coastlines, a prospective study was conducted in four provinces to investigate new cases of toxic jellyfish envenomation. Hospitals and health centers were selected for a medical record review to assess morbidity and mortality. The results showed that at least 38 cases of toxic jellyfish were detected by the ad hoc surveillance. There were 381 cases of morbidity and mortality, their median age was 28 years, and 52% of them were foreigners. There was one case of death. The three most common areas of injury were the leg/knee/thigh (40%), arm/forearm/elbow (35%), and ankle/foot (13%). Three of the most common clinical signs were erythema (64%), rash (31%), and edema (26%). Common symptoms included pain (58%), burning sensation (45%), itching (15%), chest tightness (13%), and abdominal pain (10%). The box jellyfish is a health problem in Thailand. **Chiang Mai Medical Journal 2012;51(4):93-102.**

Keywords: Toxic jellyfish, envenomation, sign

Introduction

Among toxic jellyfish, the box jellyfish is known as the most venomous marine animal in the world. It belongs to the Class cubozoa of jellyfish. There are two main groups of box jellyfish; multi-tentacle (Order Chirodopidae) and single-tentacle (Order Carypdeidae). *Chironex fleckeri* is the most lethal jellyfish in the multi-tentacle group. In severe cases, victims receive extensive skin lesions and develop cardiopulmonary failure. They usually feel a severe burning pain while swimming in shallow waters before unconsciousness leads to cyanosis and eventually death within minutes if no appropri-

ate first aid treatment is applied, such as cardiopulmonary resuscitation and vinegar wash [1, 2]. The clinical symptoms from the single-tentacle box-jellyfish are less severe, but some fatal cases have been reported. This group of jellyfish causes an Irukandji-like syndrome, which has bizarre systematic symptoms. It usually causes difficulty in diagnosis, due to a delay of about five to forty minutes after contact with the jellyfish. Symptoms of typical Irukandji syndrome comprise severe low back pain, generalized muscle cramps, vomiting, profuse sweating, anxiety, and difficulty in breathing. Some species cause severe hypertension [3, 4].

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There have been more than 100 cases of fatal envenomation reported worldwide. The majority of them were caused by box jellyfish. Occurrences were common in northern Australia, with others reported from tropical areas such as the Philippines, Borneo, Japan, and Malaysia [2, 5, 6].

No laboratory in Thailand can identify the toxins of box jellyfish species. The first suspected box jellyfish envenomation in the country was reported to the Ministry of Public Health (MOPH) in 2002, when two foreign tourists died on Pha-Ngan Island, Surat Thani province. The investigation of the two fatal cases found clinical manifestations compatible with multi-tentacle box jellyfish envenomation. At that time, no government officials had ever heard of box jellyfish killing humans in Thailand. There was strong belief that the deaths were caused by hypersensitivity of Caucasian people to local jellyfish toxin. In March 2008, a Swedish girl died at a beach on Lanta Island, Krabi province. Her diagnosis was anaphylactic shock from jellyfish contact and she had extensive tentacle marks all over her legs [7]. This event activated a wider response from the MOPH and marine biological team. However, one of the major responses from local government personnel and tourist operators was the question of whether toxic jellyfish is really a problem in Thailand. Furthermore, all of the fatalities were of foreign not Thai tourists, or local people. This study aimed to describe the toxic jellyfish situation in Thailand.

Methods

The researchers invited biologists, toxicologists, physicians, epidemiologists, lecturers, and health personnel from governmental and non-governmental organizations in coastal areas to collaborate regarding their toxic jellyfish experiences and set up a network in a meeting hosted by the MOPH. An ad hoc surveillance was established in 23 provinces along the coast of the Andaman Sea and Gulf of Siam. A prospective study was conducted for suspected toxic jellyfish cases during 2009 and 2010 in four southern provinces, where suspected toxic box jellyfish or fatal jellyfish deaths had been reported in the past five years. The meetings and training for private and government health services, hotels, resorts, tour agencies, tourist organizations, emer-

gency rescue organizations, local communities, and local governments were organized in each province. A toxic jellyfish case was defined as an individual with a history of exposure to jellyfish and development of any one of the following signs and symptoms: burning sensation, body ache, tentacle mark, erythematous rash, blister, superficial ulceration or necrosis, and local soft tissue edema and angioedema. Hospitals and health centers that were located near beaches in four provinces (Phuket, Krabi, Surat Thani and Satun) were selected for collecting information on the morbidity and mortality from toxic jellyfish. Medical records of patients with a diagnosis of ICD-10 code X26 (contact with venomous marine animals and plants) and code T63.6 (toxic effect of contact with other marine animals) from January 2003 to February 2009 were retrieved. Records that had a history of exposure to jellyfish were included. To increase coverage, suspected toxic jellyfish cases not coded as X26 or T63.6 were searched from emergency and out-patient registrations using the case definition mentioned above. The extracted information included demographic data, incidence, onset, clinical manifestation, and treatment.

Finally, the researchers interviewed people along both coasts regarding their own experiences of injury or witness to toxic jellyfish stings. These people included fishermen, sea gypsies, tourist long tail boat drivers, and tourist business owners. They identified the types of jellyfish by using picture charts.

Results

1. Ad Hoc Surveillance Network

The Ad Hoc Surveillance network for the prospective study detected at least 38 toxic jellyfish cases from January 2009 to March 2010. The male to female sex ratio was 2:1 (25 males and 13 females). The median age was 34.5 years (inter-quartile range 22-42 years). These cases occurred all year round on an average of two to three cases per month. Cases were reported mainly from two hospitals; a district hospital in Surat Thani province and a private hospital in Phuket province.

2. Morbidity and mortality

Demographic data

Thirty three health services from Surat Thani (15), Krabi (7), Phuket (6), and Satun (5) participated in the study. They comprised 26 hospitals, 5 clinics, and 2 health centers, accounting for 381 cases from 2003 to 2009. The number

of cases by province was 91 in Surat Thani, 119 in Krabi, 140 in Phuket, and 31 in Satun. The male to female sex ratio was 1.18:1 (207:174). The median age was 28 years (range = 1 to 78). There were 199 foreigners (52%) and 182 Thais (48%).

Time

The number of toxic jellyfish cases increased from 2006 to 2009 on both coasts (Figure 1). The number of cases on the Gulf of Siam coast increased during high season (December and January) and August and September (Figure 2). The number of cases on the Andaman coast increased during high season (October to January) and April and July (Figure 2). The majority of cases with completed data on time of incident (Andaman 45.25% Gulf of Siam 72.88%) recorded injury at between 11:00 am and 6:00 pm on both coasts.

Health care

Of 354 cases with completed data on seeking health care, 84% and 16% were treated

at out-patient and in-patient departments, respectively. The number of visits among the out-patient cases ranged from one to eight times. The median length of stay for the in-patients was one day (range one to six days). The majority of the 354 cases received treatment within 24 hours (69%) after the jellyfish incident (Table 1). Three cases were referred and one died.

Injured areas of the body

Of 381 cases, the three most common areas of injury on the body were the leg/ knee/ thigh (40%), arm/forearm/elbow (35%), and ankle/foot (13%) (Figure 3).

Signs and symptoms

The 5 most common symptoms among the 381 toxic jellyfish cases were pain (58%), burning sensation (45%), itching (15%), chest tightness (13%), and abdominal pain (10%) (Figure 4). The 5 most common clinical signs were erythema (64%), rash (31%), edema (26%), burning wound (19%), and papules (18%) (Figure 5).

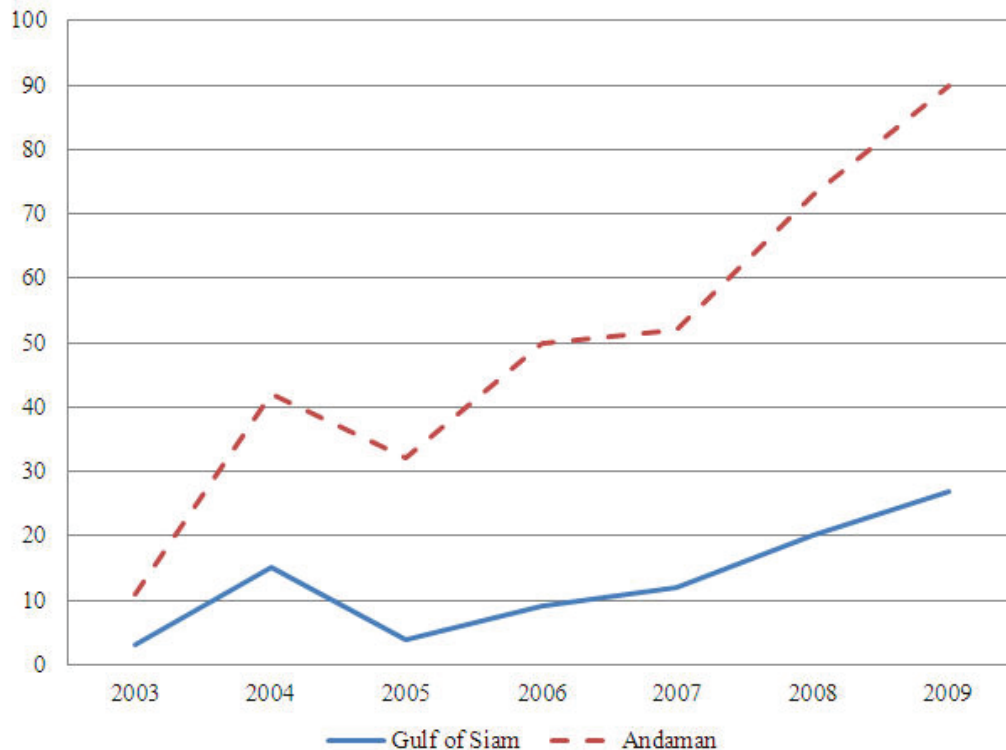


Figure 1. Toxic jellyfish cases occurring in the Gulf of Siam and Andaman coasts from 2003 to 2009 (n = 353).

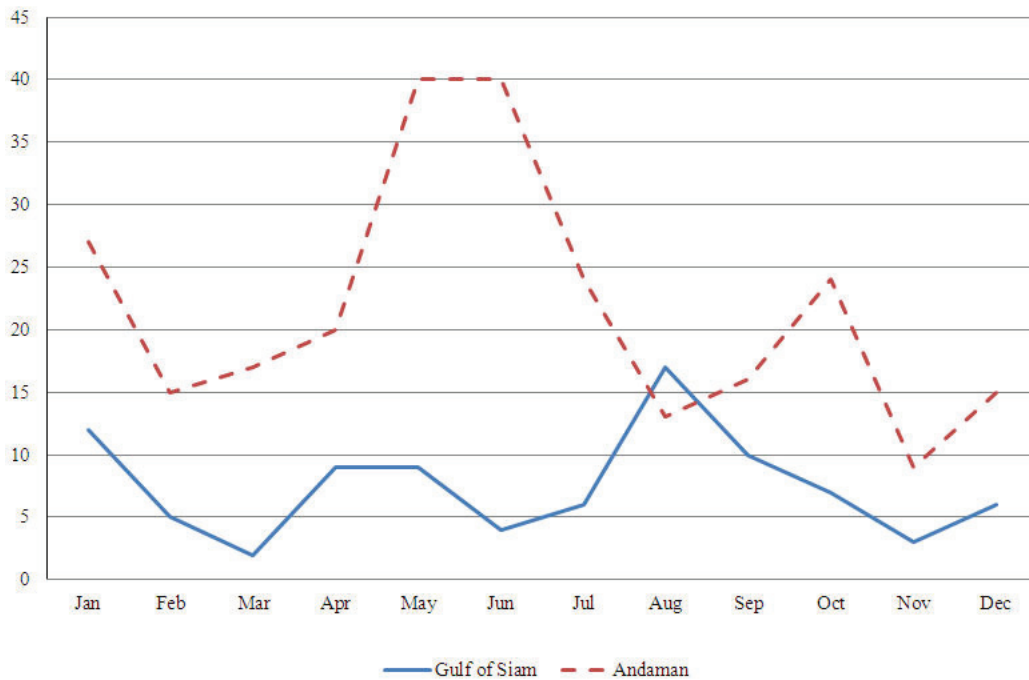


Figure 2. Toxic jellyfish cases occurring in the Gulf of Siam and Andaman Coasts by month from 2006 to 2009 (n = 263).

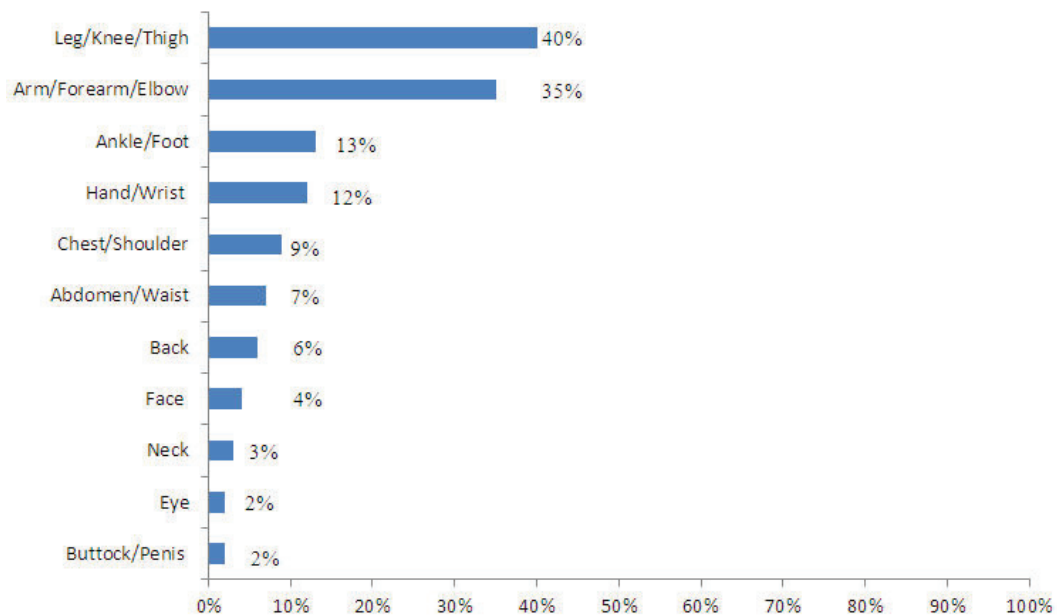


Figure 3. Injured areas on the body among toxic jellyfish cases from 2003 to 2009 (n = 381).

Table 1. Number of days seeking medical care after a jellyfish incident for out-patient cases of toxic jellyfish injury (n = 354)

| Number of days seeking medical care after a jellyfish incident | n (%) |
|--|-------------|
| 0 | 245 (69.2) |
| 1 | 50 (14.1) |
| 2 | 22 (6.2) |
| 3 | 14 (4.0) |
| 4 | 4 (1.1) |
| 5 | 1 (0.3) |
| 6 | 1 (0.3) |
| 7 | 3 (0.8) |
| 8 | 2 (0.6) |
| 10 | 2 (0.6) |
| 14 | 2 (0.6) |
| 16 | 1 (0.3) |
| 18 | 1 (0.3) |
| 21 | 2 (0.6) |
| 30 | 2 (0.6) |
| 90 | 1 (0.3) |
| 365 | 1 (0.3) |
| Total | 354 (100.0) |

Treatment

The majority of the 381 cases received antihistamines (93%), analgesic drugs (68%), steroids (62%), and antibiotics (22%). Only 6% of them received a vinegar wash. Other treatment included ammonia (9%), cold pack (4%), and hot pack (3%) applied on the wounds (Figure 6).

Diagnosis

Fifty three cases were diagnosed under the toxic jellyfish category as having toxic effects after contact with a marine animal/jellyfish (51 cases), suspected Irukandji syndrome (one case), and axonal neuropathy of the tibial and common peroneal nerve from the neurotoxin of a jellyfish (one case).

3. Interviews

Sixty people from four target populations were interviewed including: fishermen (45%),

sea gypsies (40%), tourist long tail boat drivers (10%), and tourist business owners (5%).

Fishermen

The majority of the fishermen (75%) had seen both single and multi tentacle box jellyfish on both coasts since they were young. The local names differed by place and group, but they described similar shapes and sizes of the box jellyfish. The biggest was about the size of a hand with tentacles approximately 2 meters long. Some of the fishermen said that the box jellyfish could be spotted after rains or storms. They floated with the current and at depths between the surface and bottom of the sea, and they could be found at any time around the clock. Most of the fishermen knew that the box jellyfish was a dangerous species and they avoided contact with its tentacles. Fatal cases had been reported in Satun province for around 10 to 20 years. These fishermen also had experienced fire jellyfish and non-toxic species. The majority of the fishermen who lived on this coast (93%) had experienced minor injury from toxic jellyfish. The signs and symptoms reported included chest tightness and difficulty in breathing (34%), and chest pain (18%). They indicated that box jellyfish were the cause, and the wound looked like deep thread marks, which were different to the papules and bands of erythema from fire jellyfish. Folk treatment included vinegar, beach morning glory, honey, lime, rain water, banana, brown sugar, squid ink, aloe vera, and analgesic balm.

Sea gypsies

The majority of the sea gypsies work in deep waters. Some of them reported that they did not really notice the types of jellyfish, so could not tell whether they had seen box jellyfish or not. Nevertheless, some of them had had direct experience of severe jellyfish envenomations, with symptoms and scars that resembled those that the fishermen had experienced from box jellyfish. However, the body surface exposed by the sea gypsies to the jellyfish was wider than that of the fishermen, and the symptoms including excruciating pain, chill (due to severe pain), pain radiating to the heart, and pain all over the

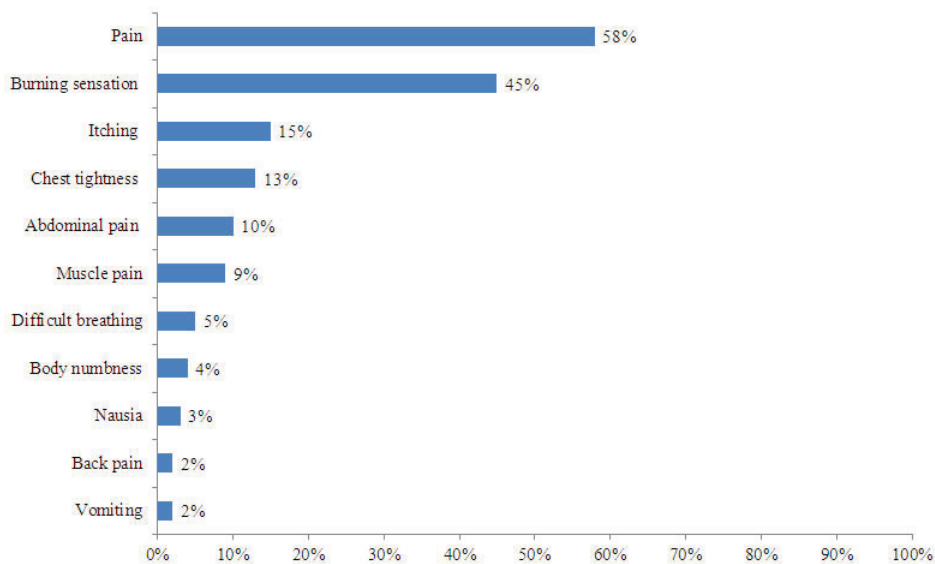


Figure 4. Symptoms among toxic jellyfish cases from 2003 to 2009 (n = 381).

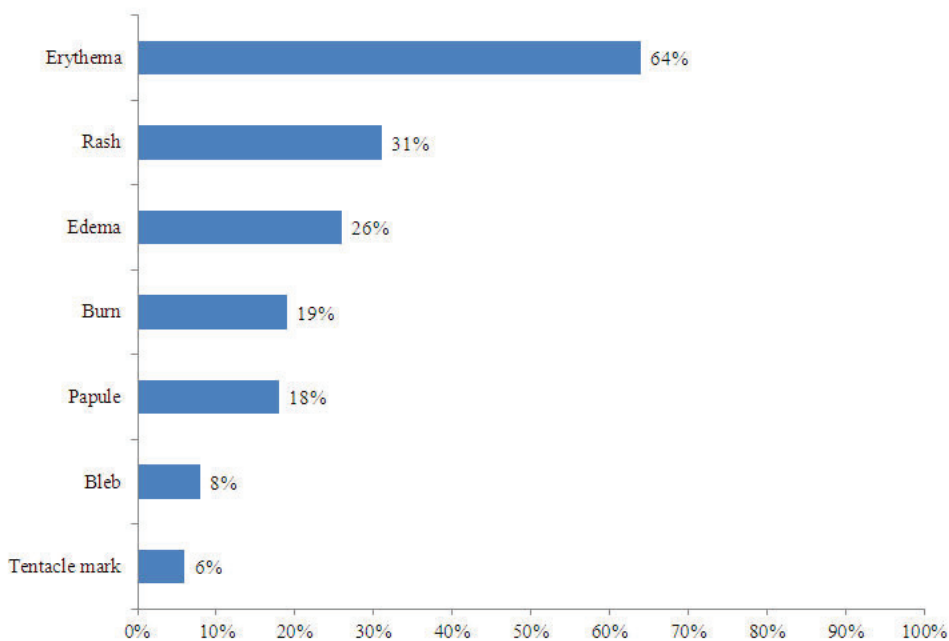


Figure 5. Signs among toxic jellyfish cases from 2003 to 2009 (n = 381).

body were more severe. The sea gypsies also showed a larger, wider area of scar tissue. Two fatal events around 60 years ago were described as caused by jellyfish in sea gypsy villages in Phuket province. Those people were found dead

in the sea bearing extensive tentacle marks. In later years, this group of people changed to wearing long sleeved shirts and pants for protection from jellyfish and other sea animals.

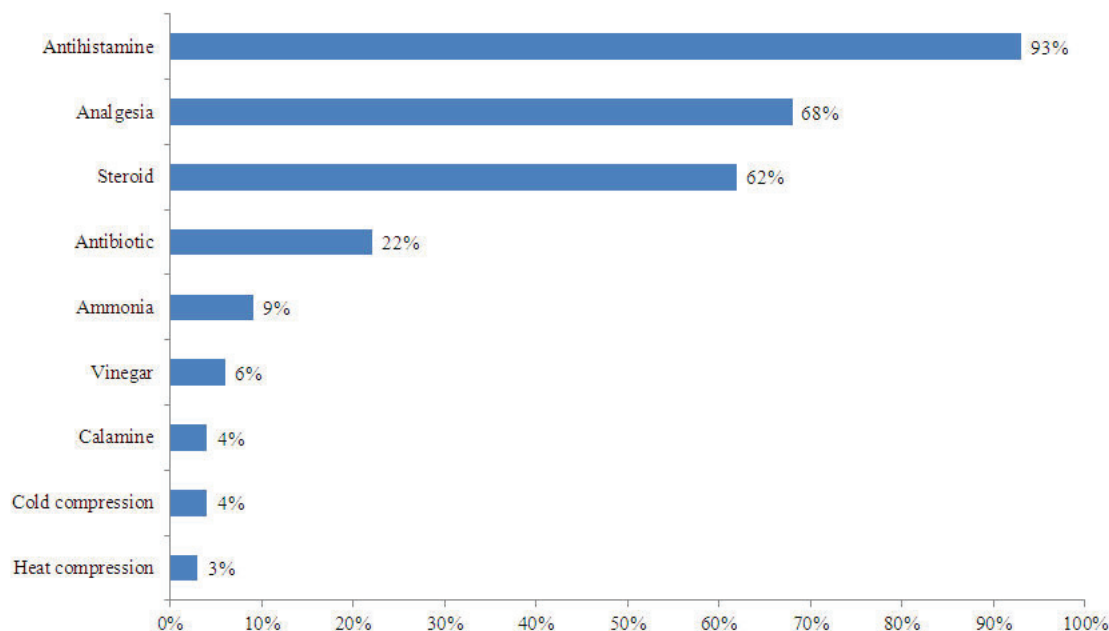


Figure 6. Treatment for toxic jellyfish cases from 2006 to 2009 (n = 381).

Tourist long tail boat drivers

The long tail boat drivers usually had vinegar available in their boats and they wore long sleeved shirts and long pants for protection. They had not experienced jellyfish stings or heard of fatal cases.

Tourist business owners

Some business owners had heard about the box jellyfish problem in Pha-Ngan Island, where two fatal cases occurred in 2002. They also referred to the severe case of a foreigner living on Tao Island in Surat Thani province near Pha-Ngan Island. The man on Tao Island was a diving instructor who had lived there for some years. After contact with tentacles of a jellyfish, he experienced severe chest pain, difficulty in breathing and an altered state of consciousness. He was hospitalized for three days and had high levels of creatinine. Experts from Australia later classified this case as having Irukandji-like syndrome [8].

Discussion

There is controversy as to whether toxic jellyfish causing death is really a problem in Thailand.

Some Thais believe that the problem lies in the hypersensitive skin of Caucasians because they had only heard of foreigners dying from jellyfish stings. The results of this study showed that the toxic jellyfish problem has existed in Thailand for many years. Although small in numbers, at least 53 cases have been diagnosed under the toxic jellyfish category, and two of them were diagnosed as suspected Irukandji syndrome and axonal neuropathy of the tibial and common peroneal nerve from the neurotoxin of jellyfish. Based on the findings of morbidity and mortality, the number of toxic jellyfish cases increased between 2006 and 2009 on both coasts. This might be a real trend or loss of medical records in earlier years. The number of cases that increased during high season might be due to more tourists, therefore, more exposure of people to toxic jellyfish. The majority of the cases were injured between 11:00 am and 6:00 pm because this period was for leisure time and swimming. Injury on the body was found commonly on the limbs. This might reflect the activities of the cases, depth of water, and jellyfish habitat. It is worth noting that some of the clinical manifestations were similar to

those inflicted by box jellyfish, which are chest tightness, difficulty in breathing, vomiting, muscle pain, back pain, and body numbness. This study could not confirm box jellyfish cases, but there were at least 53 cases diagnosed under the toxic jellyfish category. About 6% of these cases had tentacle marks that might be caused by box jellyfish. In addition, Thaikruea L et al and Fenner PJ reported fatal and near fatal box jellyfish cases in Thailand [7,9]. Thus, an effective surveillance system is needed. The results of this study show that only 6% of the victims received vinegar flushing as treatment, which is recommended first aid for reducing toxin firing. Most of the cases received antihistamines (93%), which did not help much. Steroids should not be used for a box jellyfish sting with massive wounding. There had been no standard treatment guideline available in Thailand, but now the Ministry of Public Health and related institutes have developed one. This study found fatal and severe cases of box jellyfish envenomation in Thailand reported by Thaikruea L et al, who also contributed valuable information for developing the guideline [7].

Box jellyfish is a complicated issue by its nature, since there are several species and the majority of them cause mild symptoms. Thus, impressions regarding box jellyfish are highly dependent on the past experience of local people. For most of them, this type of jellyfish causes minor symptoms compared to what they call "fire jelly". However, some of the fishermen and sea gypsies, who have had direct experience with species that cause severe symptoms, were deeply impressed with box jellyfish and believed that they could cause death. Furthermore, most of the fishermen had experienced box jellyfish while following their occupation, when they touched the tentacles of jellyfish caught in their fishnets. In those cases, it was unlikely that the fishermen received fatal envenomation. The results also suggested that fatalities happened among local Thai people in different places, but they could not be proven, since incidences occurred some decades ago when medical records were not well established. Picture evidence of box jelly-

fish was taken along the coasts of Thailand, such as the Chironex species taken off Samui Island (Figure 7).

The clinical manifestations in this study were similar to those in other reports [2, 4, 5]. Regarding the prospective study of the ad hoc surveillance network, only 38 toxic jellyfish cases were detected. Actual cases might be higher than those reported, due to under-reporting and missed diagnosis. Only two hospitals reported these cases in this study. Furthermore, at that time there were no official diagnostic guidelines for toxic jellyfish, particularly box jellyfish and Irukandji syndrome. During data collection, the researchers found that most of the health care personnel were unaware of deadly box jellyfish, although non-fatal and fatal cases of box jellyfish injury were occurring along the coast of Thailand [9].

The results showed that not only foreigners were affected by toxic jellyfish, but also Thais, who accounted for almost half of the reported cases. Therefore, in many cases the hypothesis of hypersensitivity of foreigners is less likely to be a reason for symptoms and outcomes.

There were some limitations in this study. The cases of toxic jellyfish might be underestimated from reviewing medical records that had the ICD10 code. Some health services had had data for only two to three years. There also might be misdiagnosis. However, this study searched every possible source including, emergency registration, out-patient registration, and news from the Diving Alert Network.

Despite different constraints, public awareness and health education should be carried out urgently. Intensive prevention measures are needed, including systems in place for early detection of abnormal increases in dangerous jellyfish near beaches; warning signs in high risk places and during peak season; first aid equipment, including vinegar; and trained personnel at specific beaches, with a stinger net at high risk beaches if possible [1]. Educating the medical profession is another key target for proper diagnosis and treatment. Developing an appropriate surveillance system that is suitable for target



Figure 7. Chironex species of box jellyfish taken off Samui Island (Image source: Mr. Sakanan Plathong. Faculty of Science, Prince of Songkla University, Hadyai Campus, Thailand).

groups in the context of toxic jellyfish is essential [10].

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There is no conflict of interest.

References

1. **Daubert G.** Cnidaria envenomation. California: Emergency Medicine, 2010. [Cited July 21, 2010] Available at <http://emedicine.medscape.com/article/769538-overview>.
2. **Tibballs J.** Australian venomous jellyfish, envenomation syndromes, toxins and therapy. *Toxicon* 2006;48:830-59.
3. **Fenner P, Hadok J.** Fatal envenomation by jellyfish causing irukandji syndrome. *Med J Aust* 2002;177:362-3.
4. **Winkel K, Tibballs J, Molenaar P, et al.** The cardiovascular actions of the venom from the irukandji (*Carukia barseni*) jellyfish: Effects in human, rat and guinea pig tissues in vitro, and in pig in vivo. *Clinical and Experimental Pharmacology and Physiology* 2005;32:777-88.
5. **Lippmann J, Fenner P, Winkel K, L. G.** Fatal and severe box jellyfish stings, including Irukandji stings, in Malaysia, 2000-2010. *J Travel Med* 2011;18:275-81.
6. **Williamson J, Fenner P, Burnett J, Rifkin J.** Venomous and poisonous marine animals. Sydney: University of New South Wales Press; 1996.
7. **Thaikruea L, Siriariyaporn P, Wutthanarungsanm R, Smithsuwan P.** Review of fatal and severe cases of box jellyfish envenomation in Thailand. *Asia Pac J Public Health* 2012 (online first).
8. **De Pender AMG, Winkel KD, Ligthelm RJ.** A Probable Case of Irukandji Syndrome in Thailand. *J Travel Med* 2006;13:240-43.
9. **Fenner PJ, Lippmann J, L-A. G.** Fatal and Nonfatal Severe Jellyfish Stings in Thai Waters. *J Trav Med* 2011;17:133-8.
10. **Kitreerawutiwong N, Kuruchittham V, Somrongthong R, Pongsupap Y.** Seven Attributes of Primary Care in Thailand. *Asia Pac J Public Health* 2010;22:289-98.

สถานการณ์แมงกะพรุนพิษในประเทศไทย

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บทคัดย่อ

วัตถุประสงค์ เพื่อศึกษาสถานการณ์แมงกะพรุนพิษในประเทศไทย โดยดำเนินการเฝ้าระวังเฉพาะกาลขึ้นตามชายฝั่งทะเลทั้งสองน่านน้ำ ติดตามสอบสวนผู้ป่วยรายใหม่ที่ได้รับพิษจากแมงกะพรุนพิษ และทบทวนเวชระเบียนจากโรงพยาบาลในพื้นที่ชายฝั่งทะเล เพื่อประเมินสถานการณ์การบาดเจ็บและเสียชีวิตจากแมงกะพรุนพิษ ผลการศึกษาพบว่าการเฝ้าระวังเฉพาะการค้นพบผู้ป่วยจากจากแมงกะพรุนพิษ 38 ราย สำหรับสถานการณ์การบาดเจ็บและเสียชีวิตนั้น พบ 381 ราย ดาย 1 ราย มีมัชฐานอายุ 28 ปี เป็นชาวต่างชาติร้อยละ 52 บริเวณที่บาดเจ็บซึ่งพบบ่อยสามอันดับแรกคือ ชายท่อนปลาย/เข้า/คันขา (ร้อยละ 40) แขน/ปลายแขน/ศอก (ร้อยละ 35) และข้อเท้า/เท้า (ร้อยละ 13) อาการแสดงที่พบบ่อยสามอันดับแรกคือ บวมแดง (ร้อยละ 64) ผื่นแดง (ร้อยละ 31) และบวม (ร้อยละ 26) อาการที่พบบ่อยคือ ปวดตามร่างกาย (ร้อยละ 58) ปวดแสบปวดร้อน (ร้อยละ 45) คัน (ร้อยละ 15) แน่นหน้าอก (ร้อยละ 13) และปวดท้อง (ร้อยละ 10) แมงกะพรุนพิษยังคงเป็นปัญหาในประเทศไทย เชียงใหม่เวชสาร 2555;51(4):93-102.

คำสำคัญ: แมงกะพรุนพิษ envenomation