


Characteristics of Marine Envenomation Cases in Kepulauan Seribu District Hospital, Indonesia

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ABSTRACT

Backround Kepulauan Seribu district hospital frequently manage cases of marine envenomation. Recognizing characteristics of envenomation are needed to develop clinical guideline. **Method.** A cross sectional study during January to December 2016. Cases of marine envenomation in the Emergency Room of Kepulauan Seribu District Hospital were documented by structured medical records. Pictures of the affected body parts were also taken. **Results.** Sixteen cases of marine envenomation were documented. Most subjects (87,5%) were domestic tourists. The average age of the subjects were 21,12 years old. Pain is the most common chief complaint (81,3%). Most subjects seek medical treatment less than 2 hours after the incident (56,3%). Lionfish sting was the most common cause (50%) followed by jellyfish sting (25%), other causes were stingray, sea urchin, catfish, and sea snake. Diagnosis were mostly made by focused anamnesis for animal identification (62,5%) and examination of the wounds (25%). Puncture type wound was the most common pattern (68,75%). Initial management by hot water immersion were only done in 56,3% cases. **Conclusion.** Lionfish sting was the most common cause of the envenomation cases in Kepulauan Seribu region. Identification of the animals and the wound patterns were the most common diagnostic methods. Hot water immersion was found to be effective to relief the pain but its use in medical management was not extensively applied.

Keywords : Kepulauan Seribu, marine envenomation

ABSTRAK

Latar Belakang. Rumahsakit daerah Kepulauan Seribu sering mengelola kasus-kasus medis sengatan binatang laut.Diperlukan data karakteristik kasus-kasus sengatan sebagai dasar pengembangan panduan pelayanan medis. **Metode.** Studi *cross-sectional* dari Januari-Desember 2016. Kasus-kasus sengatan binatang laut yang datang ke Instalasi Gawat Darurat (IGD) Rumah Sakit Kepulauan Seribu dicatat dalam rekam medis terstruktur, bagian tubuh yang terkena sengatan juga difoto. **Hasil**,Terdapat 16 kasus sengatan binatang laut yang dicatat. Sebagian besar (87,5%) wisatawan domestik. Rerata usia pasien 21,12 tahun. Nyeri adalah keluhan utama terbanyak, 56,3% pasien mendatangi rumah sakit kurang dari 2 jam setelah sengatan. Ikan lepu adalah penyebab sengatan tersering (50%), diikuti sengatan ubur-ubur (25%), hewan penyebab lain adalah ikan pari, bulu babi, ikan sembilang, dan ular laut. Diagnosis berdasarkan informasi hewan yang teridentifikasi sebagai penyebab (62,5%) atau melalui pemeriksaan pola luka (25%). Luka tusukan adalah yang paling sering (68,75%). Pertolongan awal dengan rendaman air hangat hanya dilakukan pada 56,3% kasus. **Simpulan** : Ikan lepu adalah penyebab sengatan binatang tersering di daerah Kepulauan Seribu. Identifikasi hewan penyebab dan pola luka adalah metode penegakan diagnosis yang paling sering. Rendaman air hangat efektif mengatasi rasa nyeri namun belum lazim dilakukan. **Hadiki Habib, Johan Salim, Yogie Dwi Nugroho, Fitran Amansyah, Donny Alpha Edison, Ghamal Ahmad Pramana, Ma'mun, Salinah. Karakteristik Kasus Sengatan Binatang Laut di RS Kepulauan Seribu, Indonesia**

Kata kunci : Kepulauan Seribu, sengatan binatang laut

INTRODUCTION

Kepulauan Seribu District is one of Jakarta region, the capital city of Indonesia. The region is well known as marine tourism destination. There are about 20.000 people living in the eleven islands (total islands are 342), the total area of the mainland is 8.7 km^2.[1] Kepulauan Seribu primary care facilities and district hospital frequently manage cases of marine envenomation. Many first aid methods in this region were developed based on local wisdom. First aid treatment and advanced medical management for these cases have not developed properly.

To provide basic information on clinical conditions, marine species, and medical management of envenomation cases in Kepulauan Seribu District Hospital, we conduct a clinical research during 2016.

Methods

A cross-sectional descriptive study of suspected envenomation cases presenting to Kepulauan Seribu District Hospital was done from January to December 2016. Registry form was used to collect descriptive data of

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envenomation cases. Image of affected body parts were taken to provide information on acute clinical signs.

Result and Discussion

A total of 16 cases were identified during the study period, mostly local tourists ; patients were relatively young, the average age was 21.13 years (CI± 6.17) **(table 1)**. Lionfish (*Pterois sp.*, local name: *Ikan Lepu*) was the most common cause of envenomation, followed by Jellyfish (phylum: *Cnidaria*; local name : *Ubur-ubur*), Sea Urchin (class : *Echinoidea*; local name : *Bulu Babi*) Cat Fish (family: *Ariidae* ; local name : *Ikan Sembilang*), Stingray (class : *Chondrichthyes* ; local name *Ikan Pari*), and Sea Snake (Family: *Elapidae*, local name : *Ular Laut*) (**table 2**). The cause of envenomation were similar to some region such as Australia[2] or South East Asia.[3,4]

Table 1. Demography of marine envenomation patients

Demography	n	%
Sex		
Male	11	68.8
Female	5	31.3
Mean age (years)	21.13 (SD 6.17)	
Status of residency		
Local resident	2	12.5
Local tourist	14	87.5

Table 2. Cause of envenomation

Animals	n	%
Lionfish (*Pterois sp*)	8	50
Jellyfish (*Cnidaria*)	4	25
Sea Urchin(*Echinoidea*)	1	6.3
Catfish (*Ariidae*)	1	6.3
Stingray (*Chondrichthyes*)	1	6.3
Sea Snake(*Elapidae*)	1	6.3

Emergency conditions caused by contact from marine creatures can be divided into four types: bite, envenomation wound, poisoning after ingestion, and electrical sting.[3] Most envenomation cases happen in tropical region especially Indo-Pacific.[3]

There were neither inpatient management nor mortality in all of our cases. This suggests that lionfish (genus *Pterois*) or scorpionfish (genus *Scorpaenidae*) are the species living in the sea of Kepulauan Seribu. Other *Synanceia* genus called stonefish has the most lethal venom compared to lionfish or scorpionfish.[5,6]

Diagnosis was made by collecting information from the patients and/or laypersons who saw and able to identified the creatures, or by identifying the wound patterns and general symptoms after the accident. These two diagnosis methods of marine envenomation were recommended for healthcare officer.[3]

All patients reported moderate to severe pain in the injury site (**table 3**). Other local symptoms were swelling and redness around the wound. Two patients also experienced fever. Almost half of the cases (43.8%) came to the district hospital more than 12 hours after the accident. This happened because of the long distance from the accident site to the nearest hospital or the patient already received first aid treatment but experienced no significant symptoms improvement.

Table 3. Signs and Symptoms of Marine Envenomation

Variables	Results
Chief Complaint	
Pain	13 (81.2%)
Itching	3 (18.8%)
Severity of Pain	
Mild	3 (23%)
Moderate	6 (46.2%)
Severe	4 (30.8%)
Swelling	
Yes	8 (50%)
No	8 (50%)
Redness	
Yes	13 (81.3%)
No	3 (18.7%)
Systemic symptoms	
Yes	2 (12.5%)
No	14 (87.5%)
Onset from accident to hospital	
< 2 hours	9 (56.2%)
2-12 hours	0 (0%)
>12 hours	7 (43.8%)
Diagnosis methods	
Interview for animal identification	10 (62.5%)
Wound site identification	4 (25%)
Wound site and animal identification	2 (12.5%)
Wound type	
Puncture	11 (68.8%)
Laceration	1 (6.2%)
Skin redness	4 (25%)

Isbister from Australia reported 22 cases of fish sting, the most common complaints were severe pain (100%), redness (14%), swelling (33%), bleeding (24%), numbness (19%), and radiating pain (14%).[7]

Early presentation (less than 2 hours) of lionfish (*Pterois sp.)* sting was shown in **figure 1**. There was initial intense pain followed by swelling, redness, and cyanosis in the affected finger. First aid by hot water immersion was given before the patient was brought to Emergency Department (ED). It helps reduced pain severity from severe to moderate. No systemic effect occurred after the accident.

Figure 1. Lionfish sting on the second finger of the left hand.

A case of lionfish sting on the sole of the left foot is shown in **figure 2**. Patient was admitted early to the emergency room (less than 2 hours) and did not receive any first aid at the accident site. He suffered from severe pain and anxiety. Two puncture wounds with localized cyanosis were identified.

Figure 2. Lionfish sting on the foot

Lionfish has bulging spine on the dorsal fin, venom glands were attached on the base of the spine, any pressure to the spine could induce venom injection from the glands through small channel on the bulging spine. The sting can promote severe burning pain around the puncture site. The affected body part will look pale and cyanotic, followed by swelling and redness.[8] The venom can promote systemic effects such as fever and nausea. More severe but rare symptoms are muscle weakness, paralysis, seizure, cardiac arrhythmia, and shock.[5,8] Retrospective study by Grandolas in France from 2001-2005 reported 57 cases of stonefish envenomation,


the main reason of ED visit was intense pain (95%). Local signs included puncture wound (100%), swelling (74%), local inflammation (21%), bruising (23%), necrosis (19%), and cellulitis.[9]

Jellyfish *(Cnidaria)* was the second most frequent envenomation cause found in Kepulauan Seribu Hospital**. Figure 3** shows a late presentation (more than 12 hours) of jellyfish sting in the upper extremities. There were erythematous circular lesions, consisted of papules and macules, followed by burning and itching sensation. The patient received no first aid, at early presentation in the emergency room, the patient only suffered mild pain, but subsequently the symptoms got worse.

Figure 3. Jellyfish sting on the arms

Figure 4. Sea Urchin sting on the foot

Figure 5. Marine catfish sting on the 3rd finger of right hand

Jellyfish has venom-contained-cells called *nematocyst* on its tentacles. The venom can induce local irritation, pain, itching, and some fatal condition such as cardiac arrhythmia.[8] Although no fatal cases occured after jellyfish sting in Kepulauan Seribu, some species of jellyfish in tropical region have deadly sting such as box jellyfish (*Chironex fleckeri*) or *Carukia barnesi* in Australian ocean and can cause Irukandji syndrome.[10, 11]

Figure 4 shows a late presentation (more than 12 hours) case of sea urchin sting in the sole of the right foot. There were multiple puncture sites with skin necrosis around the wound followed by swelling and redness, the patient also experienced moderate pain and fever. No proper immediate first aid was given after the accident.

Sea urchin *(Echinoidea)* are docile animals whose sharp, fragile spines can penetrate into skin and soft tissue.[12]Acute penetrating injuries from sea urchin spines are common.[9] Some species secrete toxin consist of corticosteroid, serotonin, glycosides, cholinergic agents, and bradykinin-like substances which are found at the base of the spine.[13] Acute reactions include moderate to severe pain, numbness, muscle paralysis, and sometimes respiratory distress or hypotension. Even though it can resolve spontaneously within days, some chronic lesions could develop due to retained spine fragments in the skin and soft tissue, promoting persistent inflammation and granuloma formation.[13]

One case of marine catfish envenomation is shown in **figure 5**. The patient was admitted early after the accident (less than 2 hours). First aid management with hot water immersion was given to reduced intense pain. At the hospital, the distal part of the affected finger was inflamed, but only accompanied with mild pain. Proper first aid reduced the pain and prevented progression of the swelling.

Freshwater catfish and marine catfish can sting because they have sharp object on the dorsal and pectoral fins.[8] Two mechanism of envenomation are sting penetration followed by rupture of toxin gland surrounding the sting and production of toxins in the entire fish skin called crinotoxicity. Catfish venom contents haemolytic, dermonecrotic, odema-producing, and vasospastic factors.[14] Catfish envenomation can induce swelling, redness, and local pain. More severe symptoms are paresthesia, localized sweating, muscular fibrillation and weakness.[8, 15] Complication can occur such as abscess formation.[16]

Sting ray (*Chondrichthyes*) distribution is worldwide in tropical and subtropical waters. Humans usually come in contact with this fish in shallow water. It was estimated 1500 injuries in the United States due to stingrays, mostly minor.[12] Tail of stingray contains a barbed stinger attached to a venom gland. The tail can be embedded deep enough in the soft tissue of the victim and venom is injected into the wound. The venom has vasoconstrictive effect that leads to cyanosis and necrosis.[12] Most acute symptom is severe pain.[17] others are salivation, nausea, vomiting, diarrhea, muscle cramps, dyspnea, seizure, and cardiac arrhythmia.[12] Study from Clark in 2007 showed that 88% acute pain due to stingray sting can be diminished after administration of hot water immersion protocol, the study also proposed using prophylactic antibiotic due to high potential for bacterial contamination.[17] Compression dressing or bandage can be used to stop bleeding.[18]

Sea snakes *(Elapidae)* have similar shape compared to land snakes, except they have a flat tail for swimming. They have no gills so that they should periodically go to the surface for breathing.[19] Tropical and subtropical zone are the most common habitats of sea snakes.[19] Even though some sea snakes have lethal venom, only 10% of bites inject any venoms and fatality worldwide is about 3%.[18]

Table 4. Medical treatment of marine envenomation cases

Treatment	Cases
Hot water immersion	
Yes	9 (56.3%)
No	7 (43.8%)
Local Procedure	
Wound toilet	9 (56.2%)
Wound incision	3 (18.8%)
No intervention	4 (25%)
Local analgesia (lidocaine 2%)	
Yes	4 (25%)
No	12 (75%)


The bite is relatively painless. If the venom was injected, it could be followed by drowsiness, nausea and vomiting, weakness, visual disturbances, breathing problem or stiffness.[18] Our study reported one case of sea snake bites in the foot. The patient had moderate pain but without any disturbing sign and symptoms, suggested that the bite was 'dry'.

During marine envenomation, there are two principle managements, first is medical first aid immediately after the accident, and the second is medical stabilization and prevention of complication in healthcare facilities. First aid intervention should start from evacuation of the victim from the marine creature by getting them out the water and throw away any creatures that cling in the body part. Helper should not touch any part of marine creatures directly because some body part of the animals would still able to sting even though it is already dislodged from the main body. Any victims with critical condition should have appropriate basic life support and early referral to the healthcare facilities. First aid on the puncture or wound site includes hot water immersion or vinegar application and immobilization followed by bandaging to prevent bleeding and to reduce swelling.[18, 20]

Hot water immersion (HWI) is a common method to reduce pain after marine envenomation. Immersion procedure is done by using 42-45°C water, the affected body part is immersed for 30-90 minutes, if the patient can tolerate, water temperature can be increased to 50°C.[19] This method was previously performed to reduce pain after stonefish and its kind, but now has been used in any marine envenomation such as sea urchin and jellyfish sting as first aid treatment based on International Life Saving Federation, British Marine Life Study Society and Toxbase.[11, 19, 21] Venom from marine creature consist of various heat labile protein and enzyme.[23] Immersion of affected body part with warm water is effective to deactivate of the venom and reduce intense pain.[18] On daily basis, vinegar is more practical than hot water immersion, because it is easy to carry and do not need special container to maintain liquid temperature. Vinegar is effective to reduce pain and degrade toxin from marine creature especially jellyfish.[20,22]

In this report, only 56.3% cases had HWI as first aid. The rest had various method such as pressure bandage, vinegar spread on the affected body part, or turmeric application on the skin. Immobilization and compression bandage can be used for suspected venom injection after animal sting, it helps to reduce toxin spread via bloodstream, reduced pain and swelling.[18]

Advanced medical management depends on clinical conditions. All marine envenomation patient should undergo wound toilet or debridement if there is a suspected deep and dirty wound.[8, 18] Any parts of sting or spine that is left in the tissue should be evacuated properly. Oral antibiotic, antihistamine, or analgesic could be administered based on signs and symptoms.[3,8,18] Anti-tetanus vaccine was administered if the clinician suspected the risk of tetanus infection.[8, 18]

Grandcolas reported various methods for stonefish sting management after HWI such as lidocaine injection. Systemic analgesic was administered including morphine, anti-inflammatory drugs, ketamine, nitrous oxide, and local or regional anesthesia. 29% of patients received systemic antibiotics.[9]

We also recorded various advanced medical management for marine envenomation cases in Kepulauan Seribu District Hospital (**table 4**). Almost half cases had no HWI as first aid management. Decision to give medication is based on current clinical conditions. Some topical treatments after local procedure are steroid and antibiotics, followed by systemic drugs (antibiotics, anti-histamine, analgesic, and steroid). None received prophylaxis tetanus vaccine.

Conclusion

Lionfish sting was the most common envenomation case in the sea of Kepulauan Seribu. Identification of the animals and wound patterns were the most common methods to diagnosis. Hot water immersion was effective to relief the pain but its use in medical management was not extensively applied.

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