

**Sea snakebite in Myanmar : epidemiology and treatment seeking behaviour**

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Although sea snake bite occurs among fishermen in Myanmar, the incidence has not been documented. In order to determine the incidence, case fatality and treatment seeking behaviour of the victims, a community based study was conducted in three fishing communities namely Letkokekone (LKK) (Yangon Division), Kyaikkami (KKM) (Mon State) and Daedaye-Pyarpone-Bogalay (DPB) (Ayeyawady Division). A house-to-house visit was conducted and the victims were asked structured questionnaires. The cumulative incidence of sea snake bite for 4 years (1999-2002) in LKK was 318/100000, in KKM was 75/100000 and for 5 years (1999-2003) in DPB was 118.9/100000. Case fatality rate ranged from 8.5 to 20.2%. The mean age of the victims was 35.64 years (age range 10 - 87 yr). Majority of them were fishermen, being bitten during day time on legs (LKK), hands (KKM) and on both hands and legs (DPB) while engaged in fishing activity. Majority sought treatment with local healers (LKK and KKM) and home remedy (DPB). Hospital treatment was sought in less than 10% of the cases and incidence based on hospital data was underestimated. None of them used prophylaxis against snakebite. Wound incision and local application or ingestion of herbs were widely practiced among the victims. Health education on the use of prophylaxis at work and correct first aid should be promoted. Practice on harmful unscientific wound treatment and local and home remedy should be discouraged.

**INTRODUCTION**

Sea snakebite is an important occupational hazard of fishermen. Accidental bite occurs while sorting fish at sea especially under insufficient light [1]. According to Reid [2] 80% of the accidental bites fail to envenom victims. Severe envenomed cases present with neuromuscular paralysis and renal failure secondary to myoglobinuria. Specific antivenom is not available in Myanmar. Traditional practice in fishing community is that only very sick victims are advised to seek hospital treatment. The incidence of sea snake bite based on hospital data is 0.4% [3]. There were few reports on sea snake bite cases in Myanmar [1,4,5]. Recent community-based study of snakebite in Myanmar [6] and other countries [7-9] suggested that incidence based on hospital data was underestimated. Community-based

study of sea snake bite in two townships [10] highlighted that because of variations in traditional belief and fishing technique between communities, incidence, case fatality rate and treatment seeking behaviour may vary. In order to verify the statement, epidemiological study of sea snakebite was further extended to fishing communities in Ayeyawady Division and findings were presented in this communication.

**MATERIALS AND METHODS**

Community-based study of incidence, case fatality rate and treatment seeking behaviour of sea snake bite victims was carried out in three fishing communities namely Letkokekone (LKK) (Yangon Division), Kyaikkami (KKM) (Mon State) and Daedaye – Pyarpon - Bogalay (DPB) (Ayeyawady Division) with the help of

basic health staffs of the respective township from January to May 2003 in LKK and KKM and February to May 2004 in DPB. A house to house visit was undertaken by assigned midwife. Set proforma including size of the household, age, sex of sea snake bite victims within last 4 years (LKK and KKM) and five years (DPB) was asked to the head of household and the victim was identified. Structured questionnaires designed to cover circumstances of the bite, fatality and treatment seeking behaviour, use of first aid and prophylaxis were asked to the victims or next of kin if the victim was dead. For children, guardians or parents were asked. Coded data were entered and analyzed using Epi info version (6.04d) software.

## RESULTS

### *Incidence/case fatality rate*

A total of 154981 populations residing in three study sites namely (LKK) (14777), (KKM) (61209) and Ayeyawady Division (DPB) (78995) with 26543 households were included in this study. The yearly incidence/case fatality rate of sea snake bite cases from three study sites were shown in Table 1.

The incidence (per 100,000) and case fatality rate (%) of sea snakebite victims (from 1999 to 2003) in three townships of Ayeyawady Division were: Daedaye 72.3 (9%), 64.4 (50%), 50.5 (12.5%), 129.9 (28.5%) and 97 (12.5%), Pyapon, 4.16 (0%), 32.6 (0%), 28 (28.5%), 11.7 (0%) and 3.84 (0%) and Bogalay 2.97 (0%), 5.7(50%), 5.59(50%) and 8.22% (0%) respectively. Total incidence and mean case fatality rate of three townships were: Daedaye 400.2/100000 (22.7%), Pyapon 76.8/100000 (10%) and Bogalay 21.9/100000 (25%).

A total number of sea snake bite victims were 187. The cumulative incidence of sea snake bite for 4 years in LKK is

318/100000, KKM for 4 years is (75.15/100000) and DPB for 5 years is (118.9/100000). The average case fatality rate is 11.2% (range 2% to 20.3%). Among three study sites, LKK has high incidence of the bite with decreasing trend of incidence. However, it fluctuates between years, ranging from 17.8 to 32.9/100000 in Ayeyawady Division. Daedaye (D) has high yearly incidence of the bite (400.2/100000) (range 50.5 -129.9/100000) and case fatality rate (22.7%) (range 9%-50%) among three townships of Ayeyawady Division.

Demographic characteristics of the victims are presented in Table 2. The mean age of the victims was 35.64 yr (range 10-87yr)(n=187) and 77.5% of the bite occurred in age group of 21-50 yrs. Majority (89.3%) of them were male and 89.4% (n=94) of the victims from DPB were bitten at day time (6am-5pm) and 70% (n=47) of KKM and 55.45% (n=46) of LKK after dark (6pm-5am). Bite occurs throughout the year with its peak in March/May (LKK) and December through February (KKM and DPB). History of sea snake bite within last 10 yrs was recalled in 15.5% (n=187) and jelly fish sting in 11.7%.

Table 1. Incidence and case fatality rate of sea snake bite cases in three study sites

Locality	Year	1999	2000	2001	2002	2003	Total
LKK	Population				14777		14777
	Incidence / 100000	158.1	77.5	69	27		318
	CFR	4 (18%)					8 (18%)
KKM	Population				61209		61209
	Incidence / 100000	27.7	11.9	15	22.8		75.15
	CFR				2 (14%)		2 (14%)
DPB	Population					78995	78995
	Incidence / 100000	17.8	24.2	22.4	32.9	25.3	118.9
	CFR	1 (8.3%)	4 (21%)	4 (22.2%)	7 (26.9%)	3 (15.7%)	19 (20.2%)

KKM = Kyaikkami, DPB = Daedaye-Pyarpon-Bogalay  
LKK = Letkokekone, CFR = Case fatality rate

### Circumstances of the bites

Majority 84.49% (n=187) were fisherman and 86.6% were bitten while engaged in fishing activities: setting up/drawing conical net (34.7%), stake net (19.25%), bag net (9%), casting net (8.5%), fish sorting (11.76%) and carrying fish baskets (3.2%). Bite at sea shore accounts for 13.4%: while walking/sitting on sand bank of LKK (3.7%) and in shallow sea water of DPB while doing washing up/working (9.6%) (Table 3).

### Site of bite

Majority of the victims are bitten on legs 81 % (n=47) in LKK, right more than left (21 and 17) and on hands 70% (n=46), left

Table 2. Demographic characteristics of the sea snake bite victims

Age	Mean 35.64yr	(Range 10-87yr)
	10-20yr	17 (9%)
	21-30yr	56 (29.9%)
	31-40yr	51 (27.3%)
	41-50yr	38 (20.3%)
	51-60yr	21 (11.2%)
	61-70yr	3 (1.6%)
	81-90yr (87)	1 (0.5%)
Sex	Male	167 (89.3%)
	Female	20 (11.7%)
	Male: female ratio	167:20 (2.6:1)
The bite	Throughout the year	
	Peak -March-May	LKK
	-Dec-Feb	KKM DPB
Time bite	Day (6am-5pm)	84 (89.4%) -DPB
	Night (6pm-5am)	32 (70%) -KKM 26 (55.4%) -LKK
Site of bite	Legs	38/47 (81%)-LKK
	Hands	32/46 (70%)-KKM
	Legs and hands	45 and 49 -DPB (47.9% and 52.1%)
Occupation	Fishing (n=187)	158 (84.49%)
	Street vender	12 (6.4%)
	Ad hoc.	11 (5.8%)
	Farmer	4 (2.1%)
	Dependent	1 (0.53%)
	Carpenter	1 (0.53%)

LKK =Letkokekone

KKM=Kyaikkami

DPB=Daedaye-Pyarpon-Bogalay

more than right (21 and 11) in KKM. Both legs 47.9% (n=45) and hands 52.1% (n=49), right more than left (35 and 14) were equally bitten in DPB.

Table 3. Circumstances of the bites

	Activity	Number(%)
1	Fishing activities	162/187 (86.6%)
	Conical net	(34.7%)
	Setting up	12 (6.4%)
	Drawing	53 (28.3%)
	Stake net	(19.25%)
	Setting up	23 (12.29%)
	Drawing	13 (6.95%)
	Bag net	17 (9%)
	Casting net	16 (8.5%)
	Fish sorting	22 (11.76%)
	Carrying fish baskets	6 (3.2%)
2	At seashore	25/187 (13.4%)
	Walking (LKK)	6 (3.2%)
	Sitting (LKK)	1 (0.5%)
	Getting into sea (DPB)	3 (1.6%)
	Activities at seashore	15 (8.02%)

Lkk =Letkokekone

DPB=Daedaye-Pyarpon-Bogalay

### Site of bite and circumstances of the bite

Legs are bitten more than hands while setting up stake net (18 and 5), catching fish with a bag net (11 and 6), getting into shallow sea (18 and 0) and walking/sitting at sea shore (7 and 0). In contrast setting up of conical net carries equal risk on both hands and legs(6 and 6), however, hands are bitten more than legs in sorting fish (20 and 2), while drawing /wrapping up conical net (34 and 19) and casting net (10 and 6). Both legs and hands are equally at risk while carrying fish baskets from boat to sea shore (3 and 3) and drawing stake net (7 and 6).

### First aid/prophylaxis

None of the victims used prophylaxis against sea snake bite. About 80% (n=187) of the sea snakebite victims carried out wound treatments such as incision 23.5%, local herbal application 16%, application of tourniquet 11.2% and coagulation of the wound 11.2%. Ingestion and or local

application of herbs on incised wound was recalled in 46% (n=47) victims from KKM.

#### *Treatment seeking behavior*

Seeking treatment with local healers was a common practice in LKK 66% (n=46) and in KKM 57% (n=47) and home remedy in DPB 73.4% (n=94). Hospital treatment was sought in 9% (n=187) and at local clinic 6.4% (n=187) (Table 4).

Table 4. Treatment seeking behaviour of the victims

Sources	Letkoke-kone	Kyaik-kami	Daedaye-Pyapon-Bogalay (DPB)	Total
Local healers	31(66%)	26 (57%)	14 (14.9%)	71 (37.9%)
Home remedy	11(23%)	3 ( 6.5%)	69 (73.4%)	83 (44.3%)
Hospital	5 (11%)	9 (19.6%)	3 ( 2.2%)	17 ( 9%)
Clinic	0	8 (17.4%)	4 ( 4.3%)	12 ( 6.4%)
No treatment	0	0	4 ( 4.3%)	4 ( 2.1%)

Treatment provided by traditional healers consists of either ingestion and or local application of herbs to the wound in KKM and wound incision and suction in LKK. Home remedy practiced in LKK (to take coconut flesh with jaggery) differs from KKM (to take coconut juice and rub the wound with lime) and DPB (ingestion of local herbs, to take coconut flesh/juice with jaggery or herbs and drink meditated water).

#### *Clinical features of the victims*

The common clinical features recalled by the victims (n=187) are drowsiness (78.6%), muscle ache (71.6%), muscle stiffness (62.5%), heavy upper eye lid (56.6%) and passing dark urine (myoglobinuria) (31.5%) denoting systemic envenoming. Passing dark urine was recalled in 71% (n=47) of the victim from KKM and 22.3% (n=94) in DPB.

## **DISCUSSION**

#### *Incidence/case fatality rate*

The study highlights that sea snake bite is an occupational hazard of fishermen. Yearly

incidence of sea snake bite in LKK in earlier years is 3 to 8 times more than that of KKM and DPB. Recent decrease in incidence of the bite in LKK could be attributed to recent introduction of modified fish catching technique and advancement of sand bank in sea shore creating unfavourable condition for catching fish and prawn in sea shore. Although yearly incidence of the bite is decreasing, the figures are still high.

It is likely that inclusion of a proportion of systemic envenomed cases (myoglobinuria 22.3%) in home remedy group is responsible for high fatality rate (20.2%) in DPB. In contrast low mortality rate (2%) in KKM with 71% passing dark urine must be misdiagnosed by the victims for passing high coloured urine in dehydrated victims since they refused to drink after bites. Passing dark urine (myoglobinuria) signifies systemic envenoming and carries a bad prognosis.

Since 9% of the victims sought hospital treatment, the true incidence of sea snakebite based on hospital data was underestimated. In order to get a true incidence of the bite it should be made a notifiable disease.

#### *Prophylaxis/ first aid*

Use of no longer recommended wound treatments should be discouraged. Since none of the victim used prophylaxis against sea snake, health education on use of prophylaxis such as wearing protective gloves, taking precaution at work and provision of proper illumination at work site after dark should be given to fishing communities. Two accidental sea snake bite cases admitted to Yangon General Hospital occurred after dark while sorting fish under insufficient light [1]. Health education on use of the correct first aid for neurotoxic envenoming i.e. compression immobilization using crepe bandage [11] should be promoted.

#### *Treatment seeking behaviour*

Majority of the victims from DPB prefer home remedy in KKM and local healers in

LKK. Their treatments have no scientific values and give a false sense of security and their uses should be discouraged. According to Reid [2], 80% of sea snake bite victims are not envenomed. Majority of the cases treated by local healers and home remedy fall into this group and will recover with conservative treatment. This favourable outcome has attracted fishing communities to seek treatment from them. Only very sick victims were advised to seek treatment at hospital. It is likely that wrong treatment seeking behaviour of the victims leads to high fatality rate in DPB. Less than 10% of the victims sought treatment at hospital. It is recommended that all sea snake bite cases should be kept under observation and if no myoglobinuria (passing dark urine) developed in 4-6 hours after the bite, the victim will not be systemic envenoming [12]. Health education on such information should be given to fishing communities, so that they will be well informed about prognosis of the illness and where to seek treatment.

Early referral to hospitals with capability of performing renal dialysis and assisted ventilatory support to treat renal failure and neurotoxic respiratory paralysis in severe envenomed cases should be practiced. In summary, health education leading to changes in behaviour on use of prophylaxis and correct first aid should be given to fishing communities and encourage them to seek treatment at hospital.

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