Journal of Innovations in Pharmaceutical and Biological Sciences (JIPBS)
ISSN: 2349-2759
Available online at www.jipbs.com

Research article

Snake envenomation complications and outcome of their therapeutic management at general hospital Kaltungo, Gombe State, Nigeria

John David OHIEKU*[1], Tola A. S. MIDALA[2], David Emmanuel Agada[2], Emmanuel CALEB[2]

[1]*Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Maiduguri, PMB 1069, Maiduguri, Borno State, Nigeria.*
[2]*Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmaceutical Sciences, Gombe State University, Gombe, Gombe State, Nigeria.*

Key words: Anti-snake venom, carpet viper, Envenomation, Snakebites, Kaltungo.

***Corresponding Author: John David OHIEKU,** Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Maiduguri, PMB 1069, Maiduguri, Borno State, Nigeria.

Vol. 6 (3), 46-52, Jul-Sep, 2019.

Abstract

Background: Snake bite envenomation leads to considerable degrees of morbidity and mortality. **Objectives:** The objectives were to assess snakebite types, their pattern of symptom presentations in the region, complications and the clinical treatment outcome. **Method:** The cross-sectional and prospective study using convenient sampling method assessed patients for types of snake inflicting the bite, time interval between bite and arrival at the hospital, duration of hospitalization, complications and outcome of drug and other management procedures. **Results**: The mean age and standard deviation of the patients was 22.4 ± 14.5 years. The proportions of symptoms presented are: pain 128 (57.9%), bleeding 168 (76.0%), hypotension 30 (13.6%), blurred vision 89 (40.3%), paralysis 22 (10.0%) and shock 56 (25.3%). First aid treatments were herbs 75 (33.9%) and tourniquets 25 (11.3%). A total of 125 (56.6%) had 1-2 weeks hospital stay while in 14 (6.3%) patients it was >4 weeks. Major complications and other health related problems from carpet viper bites were GIT bleeding 20 (10.7), seizure 32 (17.1), and respiratory distress 11 (5.9%). The corresponding values for Puff adder were 5 (17.2%), 5 (17.5%) and 1 (3.4%) respectively. Multi-organ failure 9 (4.8%) occurred only with carpet viper victims. Death was recorded in 16 (7.2%) while 205 (92.8%) patients were discharged. Significant difference (X^2=31.97 P<0.001) in death rate were recorded between early transfer (first 24 hours) to hospital and late arrival (after 24 hours). Risk of death was 10.7 times higher in early compared to late arrival to the hospital. Significant differences in symptoms were observed among snakebites with weakness (P=0.021), redness around the wound (P=0.014), blurred vision (P=0.008), vomiting (P=0.009), and Sweating (P=0.008). **Conclusion:** Carpet viper constitutes the major snakebite in the region, and early hospital visit and the length of hospital stay are important to survival and/or complications. Pharmaceutical care is required in area of monitoring of anti-snake venom (ASV) and other adjunct therapies in the area as well as in patients' education.

Introduction

The envenomation caused by snakebites is a common occurrence in most parts of the world. It has been estimated that over two million people are bitten each year by poisonous snakes leading to very high envenomation, and at least 100,000 deaths, and 300,000 amputations as well as other permanent disabilities [1]. Deaths resulting from snakebite are common occurrences in Asia as well as Sub-Saharan Africa [1]. Snake-bite events can occur at any time of the year depending on environment, but more cases happen in the summer season around the world and their venoms are usually distributed to various organs and tissues after it is injected into victims.

Snake venom is complex poison of different proteins such as enzymes, polypeptide toxins and non-toxic proteins. The venom also contain other proteins and enzymes including; glycosides, sterols, ATPase, amino-acid oxidase, RNA, DNA, transaminase, collagenase, protease, phosphodiestrases, phospholipase A, B, C, and D, cholinesterases and hyaluromidases and so on [2]. Phospholipase A2 is one of the snake venom enzymes that damages mitochondria, red blood cells, leucocytes, platelets, peripheral nerve endings, skeletal muscle, vascular endothelium, and other membranes, produces presynaptic neurotoxic activity, opiate-like sedative effects, and leads to the auto-pharmacological release of histamine and anti-coagulation.

Snake bite is associated with certain degree of morbidity and mortality particularly in resource-poor countries and is sometimes related to socioeconomic problems [3] since more cases are seen in the rural poor communities of tropical countries in South Asia, Southeast Asia, and sub-Saharan Africa [1, 4, 5]. Certain occupation which increased exposure to snakes like agricultural practices makes certain people more vulnerable than others. However problems like lack of good health care services, poor access to available services, influence of health-seeking behaviour on accessing the available health care

services, and lack of effective anti-snake venom may often contribute to high morbidity and mortality rate following snakebites in most places [3, 6].

In Africa, the incidence of snakebites in the Benue Valley of northeastern Nigeria was 497 per 100,000 people per year, with a mortality of 12.2% [7]. The high levels of snakebite mortality in tropical developing countries was said to be associated with scarcity of anti-snake venoms, poor health services, and difficulties with rapid access to health centers [8]. Large numbers of victims survive with permanent physical and psychological sequelae, mostly due to the tissue-damaging effects of anti-snake venoms. The General Hospital Kaltungo, Gombeis one of the snakebite treatment centres in the North-eastern region which served several communities in the environs. The other centres are Zamko in Plateau State, Bambur in Taraba State, Lafiya-Lamarde and Savannah in Adamawa State, and Bauchi in Bauchi state. In the Kaltungo snakebite treatment centre, Snakebite victim admitted could go as high as 6 snakebites per day while at certain periods, 74% of hospital beds in this region are occupied by snakebite victims [9]. The major species responsible for bites in North-Eastern Nigeria is the saw scaled or carpet viper i.e. *Echisocellatus* [10, 11].

Aim and objectives

This study is aimed to assess the pattern of symptom presentations of snakebites in the region, identify their complications and the clinical treatment outcomes of hospitalized snakebite patients at Kaltungo General Hospital.

Materials and Method

The study was conducted at the General Hospital Kaltungo in Kaltungo Local Government Area of Gombe State, Nigeria which lies between longitude 10º and 12º west and latitude 90º and 11º North, covering about 881sq Km.The General Hospital Kaltungo hosts the regional snakebite reference center in Kaltungo. Kaltungo is located within the Sudan savannah vegetation of the Benue river valley known for carpet vipers' envenomation.

The study design is a prospective and cross-sectional study design. However, retrospective survey was made on patients who have had repeated episode of snakebites in the past and who currently presented with fresh episode. The duration of the study lasted from January to April 2018. Convenient sampling technique was adopted and all patients who met the inclusion criteria within the study period were enrolled into the study until the sample size was obtained. Ethical Clearance was obtained from the Gombe State Ministry of Health, Department of Research and Statistics. A of total 221 patients was studied.

The data was collected from the patients' case folders in a predesigned data collection form over a period of 4 months. A total of 221 patients and their folders from the Snake bite clinic were sampled and screened. Information retrieved from folder or directly obtained from patients are: Age, gender, occupation, marital status, educational level, ethnic group/tribe, type of snake, area of the body affected, environment of bite, season of bite, level of exposure to snake (intentional/ unintentional), occupational setting, time between bite to hospital visit/treatment, first aid treatment carried out, medication list, hospital duration, symptoms presented by the patients, complication experienced by the patients, laboratory results, clinical outcome and general outcome. Statistical analysis was carried out with SPSS version 23. Chi square analysis was performed to find an association between two variables with significant level set at $P<0.05$.

Results

A total of 221 comprising 105 males and 96 female (Table 1) snakebite victims from carpet viper, puff adder and cobra were studied. Herbal and tourniquets use as first aids treatment measures were 75 (33.9%) and 25 (11.3%) respectively. A total of 111 (50.2%) experienced complications while 110 (49.8%) do not (Table 2). Repeated episode of snake bite occurred in 38 (17.2%) patients while 212 (95.9%) patients were transferred to the hospital within 24 hours of bite. Only 14 (6.3%) stayed in the hospital above 4 weeks (Table 2).

Anti-snake venom (ASV) was used in 220 (99.5%) of all snakebite patients (Table 3) with other drugs like analgesic 221 (100%), Anti-tetanus sera 35 (15.8) and management with blood transfusion 55 (24.9) as part of the therapeutic management plan for patients (Table 3).

Patients' proportion that experienced some symptoms varied considerable among the snakebites but pains, bleeding, weakness and headache were the commonest among the three types of snake studied. All the victims of cobra bites experienced bleeding, blurred vision, and salivation. The duration of hospitalization varies but majority of patients 125(56.6%) spent 1-2 weeks while 14 (6.3%) patients were hospitalized for more than 4 weeks (Table 4).

The proportions of symptoms presented in all the species are pain 128 (57.9%), bleeding 168 (76.0%), hypotension 30 (13.6%), blurred vision 89 (40.3%), paralysis 22 (10.0%) and shock 56 (25.3%) (Table 5). The major complications from carpet viper bites were GIT bleeding 20 (10.7), seizure 32 (17.1), and respiratory distress 11(5.9%). The corresponding proportions for Puff adder were 5 (17.2%), 5 (17.5%) and 1 (3.4%) respectively. Multi-organ failure 9 (4.8%) occurred only with carpet viper victims (Table 6). Death was recorded in 16 (7.2%) patients while 205 (92.8%) patients were discharged or

under treatment. The highest death rate was recorded in patients with multi-organ failures as complication. High cure rates were recorded in patients who arrived the hospital during the first and second 5 hours post bite being 107 (94.7%) and 60 (92.3%) respectively while high death rates were observed in patients who arrived the hospital 1-2 days 2 (66.7%) and beyond 2 days 3 (50.0%) (Tables 7-9).

Table 1. Age and gender distribution of snakebite victims.

Age band of patients (Years)	Gender distribution of patients		Total (%)
	Male (%)	Female (%)	N (%)
0-10	15(12.0)	15(15.6)	27(12.2)
11-20	39(31.2)	38(39.6)	77(34.8)
21-30	55(44.0)	31(32.3)	86(38.9)
31-40	6(4.8)	4(4.2)	10(4.5)
41-50	7(5.6)	6(6.3)	13(5.9)
51-60	5(4.0)	1(1.0)	6(2.7)
61-70	1(0.8)	0(0)	1(0.45)
71-80	0(0)	1(1.0)	1(0.45)
>80	0(0)	0(0)	0(0)
TOTAL	125(100)	96(100)	221(100)

Table 2. Description of events in victims of snakebite.

S/no.	Description	Yes (%)	No (%)	Total(%)	P-value*
1.	Herbs Remedies pretreatment	75(33.9)	146 (66.1)	221(100)	
2.	Tourniquets Used	25(11.3)	196 (88.7)	221(100)	
3.	Complications	111(50.2)	110(49.8)	221(100)	P=0.026
4.	Previous snakebite	38(17.2)	182(82.8)	221(100)	P>0.05
5.	Transfer to hospital before 24hrs. of bite	212(95.9)	9 (4.1)	221(100)	P=0.042
6.	Duration of Hospital stay above 4wks.	14(6.3)	197(93.7)	221(100)	P>0.05
7.	Experienced Death as Outcome	16(7.2)	205(92.8)	221(100)	P>0.05

***P-values evaluated on the types of snakebites**

Table 3. Drug therapy used in the management of victims of snakebites.

S/no.	Treatment	Frequency	Percentage (%)
1	Snake Anti-Venom	220	99.5
2	Multivitamins	52	23.5
3	Ascobic Acid	189	85.5
4	Antibiotics	219	99.1
5	Anti-tetanus Sera	35	15.8
6	Analgesic	221	100
7	Adrenaline injection	19	8.6
8	Hydrocortisone injection	110	49.8
9	Chymotrypsin	56	28.3
10	Blood transfusion	55	24.9

Table 4. Hospital duration spent by patients.

Duration	Carpet Viper (%)	Puff Adder (%)	Cobra (%)	TOTAL (%)
< 1 week	6(3.2)	0(0)	0(0)	6(2.7)
1-2 weeks	105(56.1)	17(58.6)	3(60.0)	125(56.6)
2-3 weeks	48(25.7)	9(31.0)	0(0)	57(25.8)
3-4 weeks	16(8.6)	2(6.9)	1(20.0)	19(8.6)
4-5 weeks	1(0.53)	1(3.4)	1(20.0)	3(1.4)
5-6 weeks	1(0.53)	0(0)	0(0)	1(0.45)
>6 weeks	10(5.3)	0(0)	0(0)	10(4.5)
TOTAL	187(100)	29(100)	5(100)	221(100)

Table 5. Symptoms presentation of the three types of snakebite in the region.

Symptoms	Carpet Viper (%) N=187	Puff Adder (%) N=29	Cobra (%) N=5	Total (%) N=221	(P-Value)
Dysphagia	12(6.4)	3(10.3)	0(0)	15(6.8)	P>0.05
Swelling	36(19.3)	4(13.8)	1(20.0)	41(18.6)	P>0.05
Deep cut	10(5.3)	3(10.3)	0(0)	13(5.9)	P>0.05
Pain	108(57.8)	16(55.2)	4(80.0)	128(57.9)	P>0.05
Ptosis	15(8.0)	8(27.6)	2(40.0)	61(27.6)	P>0.05
Bleeding	145(77.5)	18(62.1)	5(100.0)	168(76.0)	P>0.05
Headache	78(41.7)	15(51.7)	2(40.0)	95(43.0)	P>0.05
Apnea**	11(5.9)	6(20.7)	2(40.0)	19(8.6)	P=0.001
Shock	47(25.1)	7(24.1)	2(40.0)	56(25.3)	P>0.05
Weakness*	68(36.4)	18(62.1)	3(60.0)	89(40.3)	P=0.021
Hypotension	24(12.8)	4(13.8)	2(40.0)	30(13.6)	P>0.05
Redness around wound*	71(38.0)	14(48.3)	5(100.0)	90(40.7)	P=0.014
Salivating**	34(18.2)	16(55.2)	3(60.0)	53(24.0)	P=0.001
Blurred vision*	67(35.8)	14(48.3)	5(100.0)	89(40.3)	P=0.008
Vomiting*	59(31.6)	17(58.6)	3(60.0)	76(34.4)	P=0.009
Face/Limb numbness	5(2.7)	2(6.9)	0(0)	7(3.2)	P>0.05
Sweating*	59(31.6)	18(62.1)	4(80.0)	91(41.2)	P=0.008
Convulsion	9(4.8)	0(0)	1(20.0)	10(4.5)	P>0.05
Stomach Pain	15(8.0)	5(17.2)	1(20.0)	21(9.5)	P>0.05
Paralysis	16(8.6)	5(17.2)	1(20.0)	22(10.0)	P>0.05
Others	0(0)	1(3.4)	0(0)	1(0.45)	

Table 6. Complications and other health related problems associated with snakebites.

Complications	Carpet Viper N=187(%)	Puff Adder N=29(%)	Cobra (%) N=5	Total (%) N=221	X^2 (P-Values)
GIT Bleeding**	20 (10.7)	5(17.2)	4(80.0)	29(13.1)	P<0.001
Hypertension	17 (9.1)	2(6.9)	0(0)	19(8.6)	P>0.05
Anemia*	38(20.3)	12(41.4)	2(40.0)	52(23.5)	P<0.05
Seizure	32(17.1)	5(17.2)	2(40.0)	39(17.6)	P>0.05
Hypotension	38(20.3)	9(31.0)	3(60.0)	50(22.6)	P>0.05
Multi-organ failure	9(4.8)	0(0)	0(0)	9(4.1)	P>0.05
Encephalopathy	1(0.53)	0(0)	0(0)	1(0.45)	P>0.05
Acute Respiratory Distress	11(5.9)	1(3.4)	0(0)	12(5.4)	P>0.05
TOTAL	166	34	11	211	

Table 7. Clinical outcome after drug management in patients with complications.

S/No.	Complications	Discharged n (%)	Died n (%)	TOTAL N (%)	P-value
1	GIT Bleeding	27(93.1)	2(6.9)	29(100)	P>0.05
2	Hypertension	17(89.5)	2(10.5)	19(100)	P>0.05
3	Anemia	48(92.3)	4(7.7)	52(100)	P>0.05
4	Seizure	34(87.2)	5(12.8)	39(100)	P>0.05
5	Hypotension	46(92.0)	4(8.0)	50(100)	P>0.05
6	Multi-organ failure**	2(22.2)	7(77.8)	9(100)	P<0.001
7	Encephalopathy	1(100)	0(0)	1(100)	P>0.05
8	Acute respiratory distress	10(83.3)	2(16.7)	12(100)	P>0.05
	TOTAL	185(87.7)	26(12.3)	211(100)	

Table 8. Outcome assessment between snakebite interval and transport to hospital.

S/No.	Arrival Time (Hours)	Discharged n (%)	Died n (%)	TOTAL N (%)
1	0-5 hours	107(94.7)	6(5.3)	113(100)
2	5-10 hours	60(92.3)	5(7.7)	65(100)
3	10-15 hours	14(100)	0(0)	14(100)
4	15-20 hours	6(100)	0(0)	6(100)
5	20-24 hours	14(100)	0(0)	14(100)
6	1-2 days	1(33.3)	2(66.7)	3(100)
7	2-5 days	3(50.0)	3(50.0)	6(100)
8	>5 days	0(0)	0(0)	0(0)
9	TOTAL	205(92.8)	16(7.2)	221(100)

***X^2=31.97 P<0.001: There was a significant difference in death rate when early visiting of hospital within the first 24 hours of snakebite was compared with late arrival after 24 hours.**

****Risk of death is 10.7 times higher in patients who visit hospital after 24 hours of snakebite compared to those who visit clinic within 24 hours of bite.**

Table 9. Outcome assessment of snakebite patient and duration of hospitalization.

S/No.	Hospital duration	Discharged n (%)	Died n (%)	TOTAL N (%)	P-Values
1.	< 1 week	1(0.49)	5(31.3)	6 (2.7)	
2.	1-2 weeks	120(58.5)	5(31.3)	125(56.6)	
3.	2-3 weeks	54(26.3)	3(18.8)	57(25.8)	P<0.001
4.	3-4 weeks	18(8.8)	1(6.3)	19(8.6)	
5.	4-5 weeks	3(1.5)	0(0)	3(1.4)	
6.	5-6 weeks	1(1.5)	0(0)	1(0.45)	
7.	>6 weeks	8(3.9)	2(12.5)	10((4.5)	
8.	TOTAL	205(100)	16(100)	221(100)	

Discussion

Snakebite victims peaked in male with those who are in the age bands of 21-30 years while a similar peaked age was observed among the female who are in the age band of 11-20 years. The mean and standard deviation of all the victims irrespective of gender difference is 22.4 ± 14.5 years.

First aids treatments may be relevant only when it is aimed at retarding systemic absorption, or preserve life and prevent complications before patient receive medical care and control distressing symptoms of envenoming [2]. The acceptable first aids in snake bite include the reassurance of victim, immobilization of the affected limb and early transport to medical facilities. Contrary to these measures, most patients think of using tourniquet to localize the pain and ironically to prevent the spread of the venom. The danger of using tourniquets for a long time can be associated with risk of severe local damage including ischemia, necrosis, and gangrene [12, 13]. A little above one-tenth of the patients encountered in this study engaged in such practices. Many patients hold that view in many places. For instance, the proportions of patients who used tourniquets in this study is lower than the almost one-fifth of patients in a region in Brasil [14] and the nine-tenth in Nepal or almost all the patients in Bangladesh [7, 15] who applied tourniquets as first aid treatment. There is need during pharmaceutical care services to educate patients or the community against these practices.

Traditional treatment with herbal products is another measure adopted in about one-third of the victims. This practice which is worldwide is possibly promoted by far distances from medical centres and/or poor accessibility to one. This may have a way of delaying early arrival to the hospital for medical care and possibly increase complication particular in an ineffective first aids treatments. The world Health Organizations in its guidelines warns that most traditional treatment should be discouraged because they do more harm than good [2].

Snake anti-venom remains the mainstay in combating envenomation of snake and preventing complications arising from them. Nearly all the victim of snake bite in this study was placed on ASV as primary treatment. As high as 98.1% victim of snakebites are treated with ASV in Brasil [14]. A few proportion of individuals received anti-tetanus prophylaxis in anticipation to prevent tetanus setting in, although some practitioners often consider this as inappropriate in some cases. A few proportions of patients in our study received adrenaline treatment while close to half of the population received hydrocortisone treatment in order to combat anaphylactic reactions. Early anaphylactic reactions are common symptoms in many snakebite victims, which could be induced either by the snake venom or the anti-venom treatment. The potential risk of allergic reactions due to the snake venom is known

to occur after a previous episode of envenomation. Adrenaline and hydrocortisone are particularly relevant in patients who possibly developed anaphylactic reactions due to early reaction of ASV or who presented with shock and possibly for patients who are transfused with blood products. In this present study, fairly high proportion of individuals have previously been bitten by snake and therefore could put them at high risk of early anaphylactic reactions, and this seemed to justify the use of the parenteral as adjunct in the therapy of most patients. Furthermore, early anaphylactic reactions to equine serum proteins are reported to range from 3% to 54% by some authors [16-18].

Nearly one-quarter of victims were transfused with blood since snake envenoming can be associated with excessive blood loss from bleeding and or blood coagulation. Antibiotics usage was justified in patients in case secondary bacterial infections.

The clinical outcomes vary considerably and seemed to depend on many factors such as time interval between bite incident and arrival at the hospital, a factor that may similarly control the levels of complications. For instance, the time taken after snakebite and arrival at the hospital constituted a risk factor for the development of complications and/mortality rates. In our study, high mortality rates were observed among patients who arrives the hospital after 24 hours of snakebite incident. There was a significant difference (X^2=31.97; P<0.001) in death rate when visiting hospital within the first 24 hours of snakebite was compared with after 24 hours. Furthermore, the risk of death is 10.7 times higher in patients who visit hospital after 24 hours of snakebite compared to those who visit clinic within 24 hours of bite. The highest death rate was recorded in patients who presented with multiple organ failures followed by patients with acute respiratory distresses. The death rate of 7.2% in this study appeared high when compared with the 5.4% mortality rate recorded in Ecuador [19], 3.0% or the 0.9% death rate of victims of snake bite in other regions [14, 20]. Some studies have similarly indicated that time of transport was a crucial determinant of snake bite mortality in eastern Nepal [7], while in southern India delayed antivenom administration was associated with an increased risk of complications [20, 21].

Several symptoms are common among the three types of snake, but symptoms like pains, headache, weakness, and sweating, vomiting, bleeding and clouded vision occurred in high proportions in all the snakebites. These symptoms are similarly reported in snakebites from other regions of the world. Hypotension for instance occurred in 22.6% cases which are within the range of 6.3%-45.2% reported cases in other studies [22-27]. Similarly the 76.0% bleeding cases in this study is compared to 27.8%-88.6% cases in other studies [23-25, 27, 28-31].

Our study however showed significant differences in some symptoms among the three types of snake studied. For instance, the occurrence of symptoms like apnea and salivating was significantly different (P<0.001) among the three types of snake. Similarly significant differences in symptoms were observed among the three types of snakebite in symptoms like weakness (P=0.021), redness around the wound (P=0.014), blurred vision (P=0.008), vomiting (P=0.009), and Sweating (P=0.008). These symptoms are commonly reported in other parts of the world.

Bites from Cobra appeared to be the most lethal of the three types of snake in terms of symptomatic presentation such as pain, bleeding, salivating, blurred vision, vomiting, sweating, weakness and apnea; which were most of the symptoms that indicated significant differences when compared with similar symptoms from other snakebites. None of the patients bitten by Cobra was presented with dysphagia and limb numbness while convulsion was noticed with carpet viper and cobra bites only. Headache is more common symptoms with puff adder bite than with carpet viper and cobra bites.

These symptomatic variations may be determined by several factors such as patient's factor, drug/medication and the bite pattern etc. A clear understanding of these variations is necessary in order to focus care attention particular on most lethal symptoms so as to prevent complications, morbidity and mortality from snakebites. According to Brutto and Brutto [32], serious neurological complications, including stroke and muscle paralysis, are related to the toxic effects of the venom, which contains a complex mixture of toxins affecting the coagulation cascade, the neuromuscular transmission, or both. These clinical findings are consistent with symptoms reported by several authors from various regions [33, 34]. Seizures were manifested in few patients due to neurotoxic involvement. These presentations have similarly been reported by several authors [35-37]. Paralysis which affected 10% cases of victims and limb numbness which affected 3.2% of victims in this study are considered to be associated with neurotoxic effect of snake venoms and are within the range of 3.2%-100% cases of similar symptoms reported by other researchers elsewhere in the world [24, 27-29, 31].

The proportions of patients who experienced complications as negative clinical outcomes vary from different snakebites. The number of patients who experienced one complications or the other are in nearly in equal proportion from those who do not. Half of the victims (50.2%) experienced one form of complication or the other from snakebites in a region. The snake venoms contain several toxins capable of affecting all organs when poorly managed or when there is delay in seeking for medical care. Many factors could account for these observed variations particularly those relating to early transfer to clinic, initial reliance on traditional herbal treatment, types of snake, medical facilities, trained personnel in area of snakebite management, government

and government policy support, medication factors, educational levels and a host of others. Most of the complications reported here are similarly reported in other parts of the world particularly bleeding, renal dysfunction and ulcer [33].

Conclusion

Carpet viper constitutes the major types of snakebite in the region and early hospital visit is important to survival of snakebite victims. The length of hospital stay is in part related to the level of complications developed. Pharmaceutical care is required in area of monitoring of ASV and other adjunct therapies in the area as well as in patients' education.

References

1. Kasturiratne A, Wickremasinghe AR, de Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, Savioli L, Lalloo DG and de Silva HJ: The global burden of snakebite: a literature analysis and modelling based on regional estimates of envenoming and deaths. PLoS Med. 2008; 5:e218.
2. WHO: World Health Organisation Guidelines for the management of snake-bites; Edited by DA Warrell; WHO Library Cataloguing-in-Publication data (NLM classification: WD 410). 2010: pp. 1–162.
3. Harrison RA, Hargreaves A, Wagstaff SC, Faragher B, Lalloo DG: Snake envenoming: a disease of poverty. PLoSNegl Trop. Dis. 2009; 3: e569.
4. Cruz LS, Vargas R, Lopes AA: Snakebite envenomation and death in the developing world. Ethn. Dis.19: S1–42-6.
5. Alirol E, Sharma SK, Bawaskar HS, Kuch U, Chappuis F: Snake bite in South Asia: a review. PLoSNegl Trop. Dis. 2010; 4: e603
6. ChippauxJ-P: Estimating the global burden of snakebite can help to improve management. PLoS Med. 2008; 5: e221.
7. Sharma SK, Chappuis F, Jha. N, Bovier PA, Loutan L, *et al.* Impact of snake bites and determinants of fatal outcomes in southeastern Nepal. Am. J. Trop. Med. Hyg. 2004; 71: 234–238.
8. Theakston RDG, Phillip RE, Warrell DA *et al*: Envenoming by the common krait (*Bungaruscaerulus*) and Sri Lanka cobra (*Najanajanaja*): efficacy and complications of therapy with Haffkineantivenom. Trans. roy. Soc. trop. Med. Hyg. 1990; 84: 301-308.
9. Revault P: Ecology of *Echisocellatus* and Peri-Urban Bites in Ouagadougou. Toxicon. 1996; 2:114.
10. Habib AG, Abubakar SB, Abubakar IS, Larnyang S, Durfa N, Nasidi A, Yusuf PO, Garnvwa J, Theakston RDG, Salako L, Warrel DA: Envenoming after Carpet Viper *(Echisocellatus)* Bite During Pregnancy: Timely Use of Effective Antivenom Improves Maternal and Foetal Outcomes. Journal of Tropical Medicine and International Health. 2008; 13(9): 1-4.
11. Abubakar SB, Habib AG, Abubakar IS, Larnyang S, Durfa N, Nasidi A, Yusuf PO, Garnvwa J, Theakston RDG, Salako L, Warrel DA: Factors Affecting Snakebite Mortality in North- Eastern Nigeria. Royal Society for Tropical Medicine and Hygiene. 2010; 10. 1016.
12. Amaral CF, Campolina D, Dias MB, Bueno CM, Rezende N: Tourniquet ineffectiveness to reduce the severity of envenoming after *Crotalusdurissus* snake bite in Belo Horizonte, Minas Gerais, Brazil. Toxicon. 1998; 36: 805–808.
13. Pochanugool C, Wilde H, Bhanganada K, Chanhome L, Cox MJ, et al: Venomous snakebite in Thailand. II: Clinical experience. Mil. Med. 1998; 163: 318–323.
14. Caiaffa WT, Antunes CMF, de Oliveira HR and Diniz CR.Epidemiological and clinical aspects of snAkebite in Belo Horizonte, Southeast Brazil. Rev. Inst. Med. Trop. S. Paulo.1997; 39(2).
15. Harris JB, Faiz MA, Rahman MR, Jalil MA, Ahsan MF et al. Snake bite in Chittagong Division, Bangladesh: a study of bitten patients who developed no signs of systemic envenoming. Trans. R. Soc. Trop. Med. Hyg. 2010; 104(5): 320-327.
16. Warrell DA. Clinical snake bite problems in the Nigerian savanna region. Teclmische Hochschule Danmstadt, Schiftetnreihe Wissenschaftu-Technik1979; 14:31-60.
17. Cardoso JLC, Fan HW, França FOS et al. Randomized comparative trial of three antivenoms in the treatment of envenoming by lance-headed vipers (*Bothropsjararaca*) in São Paulo, Brazil. Quart. J. Med. 1993; 86: 315-325.
18. Reid HA. Antivenom reactions and efficacy. Lancet 1980; i:1024-5.
19. Kevin RK. Venomous Snakebite in Eastern Ecuador. The Am. J. Trop. Med.Hyg.1991; 44(1): 93-99.
20. Suchithra N, Pappachan JM, Sujathan P: Snakebite envenoming in Kerala, south India: clinical profile and factors involved in adverse outcomes. Emerg. Med. J. 2008; 25: 200–204.
21. Narvencar K: Correlation between timing of ASV administration and complications in snake bites. J. Assoc. Physicians India 2006; 54: 717–719.
22. Chugh KS: Snake-bite-induced acute renal failure in India. Kidney Int. 1998; 35:891–907.
23. Athappan G, Balaji MV, Navaneethan U, Thirumalikolundu subramanian P: Acute renal failure in snake envenomation: a large prospective study. Saudi J. Kidney Dis. Transpl. 2008; 19:404–410.
24. Dharod MV, Patil TB, Deshpande AS, Gulhane RV, Patil MB, Bansod YV: Clinical predictors of acute kidney injury following snake bite envenomation. N. Am. J. Med. Sci. 2013; 5:594–599.
25. Harshavardhan L, Lokesh AJ, Tejeshwari HL, Halesha BR, Siddharama SM: A study on the acute kidney injury in snake bite victims in a tertiary care centre. J. Clin. Diagn. Res. 2013; 7:853–856.
26. Li W, Chen F and Wu S: The Related Risk Factors Analysis of Snake-Bite Induced Acute Kidney Injury. Med. Sci. Monit. 2016; 22:2335–2339.
27. Singh RR, Uraiya D, Kumar A, Tripathi N: Early demographic and clinical predictors of developing acute kidney injury in snake bite patients: A retrospective controlled study from an Indian tertiary care hospital in North Eastern Uttar Pradesh India. Indian J. Crit. Care Med. 2016; 20:404–408.
28. Pinho FM, Zanetta DM, Burdmann EA: Acute renal failure after Crotalusdurissus snakebite: a prospective survey on 100 patients. Kidney Int. 2004; 67:659–667.
29. Albuquerque PL, Silva GB, Jacinto CN, Lima JB, Lima CB, Amaral YS, VerasMdo S, Mota RM, Daher EF: Acute kidney injury after snakebite accident treated in a Brazilian tertiary care centre. Nephrology (Carlton). 2014; 19:764–770.
30. Krishnamurthy S, Gunasekaran K, Mahadevan S, Bobby Z, Kumar AP. Russells Viper Envenomation-associated Acute Kidney Injury in Children in Southern India. Indian Pediatr. 2015; 52:583–586.
31. Naqvi R: Snake-bite-induced Acute Kidney Injury. J. Coll. Physicians Surg. Pak. 2016; 26:517–520.
32. Del Brutto OH,Del Brutto VJ: Neurological complications of venomous snake bites: a review. Acta Neurol. Scand. 2012; 125(6):363-72.
33. Avila-Aguero ML, Valverde K, Gutiérrez J, París MM, Faingezicht I Snakebites In Children And Adolescents: A 12-Year Retrospective Rev. J. Venom. Anim. Toxins. 7(1): Botucatu 2001.
34. Tan HH. Epidemiology of Snakebites from A General Hospital in Singapore: A 5-year Retrospective Review (2004-2008) Ann. Acad. Med. Singapore. 2010; 39:640-7.
35. Morrison JJ, Pearn JH, Covacevich J, Nixon J. Can Australians identify snakes?Med. J. Aust. 1983; 2: 66–70.
36. Jeyarajah R. Russell's viper bite in Sri Lanka: A study of 22 cases. Am J Trop Med Hyg. 1984; 33:506–510.
37. Seneviratne U, Dissanayake S: Neurological manifestations of snake bite in Sri Lanka. J. Postgrad. Med. 2002; 48: 275–278.