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Study On Snake Bite Poisoning and It's Outcomes In A Rural Tertiary Care Hospital.

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ABSTRACT

Poisoning is the most common problem all over the world. Snake bite is a common acute medical emergency faced by rural populations in tropical and subtropical countries with heavy rainfall and humid climate. The present study was carried out for the first time in our hospital medicine and pediatrics department with the objective to know the various drugs usage like anti-snake venoms, antibiotics, treatment cost and its outcomes. This study was an observational study [both retrospective (Jan-2011-Aug 2014) & Prospective Study (Sep-2014 to Feb-2015)]. Relevant information was obtained from the medical record and prospective information was from the lab, interview as well the treatment chart of patients, by using a case report form. The cost details were obtained from a pharmacy and hospital office. The obtained data were subjected to descriptive statistical analysis. The present study of 14 (7.37%) patients belonging to prospective study and the rest (176; 92.63%) belonging to a retrospective study. The Prospective study shows majority of the patients enrolled in study were males (9; 64.28%), Among the study population majority were belong to the age groups of 36-40years (4; 28.6%), farmers 9 (64.28%), economic status 50,000-100,000 INR (6; 42.8%), hospital stay between 1-5 days (9; 64.3%), Clinical outcome majority were improved among both in male and females and only one female patient was expired. Most of drug interventions 29 (78.62%) moderately severe, 13 (96.86%) were prescribed with anti snake venom, 85.72% corticosteroids, Pantoprazole (71.44%). Antibiotics 13 (92.86%) were the most commonly prescribed drugs in this study, majorly prescribed class of antibiotics was cephalosporin's and nitroimidazoles. In retrospective study majority of the subjects enrolled in study were males (126; 71.6%), age groups of 36-40years (23; 13.1%), hospital stay between 1-5 days (9; 64.3%), clinical outcome (124; 70.5%) were improved, drug interventions 214 (51.56%) were in moderately, Average (mean ± SD) number of anti snake venom vials prescribed among males was 9.94 ± 7.54, 73.29% corticosteroids, class of analgesics were NSAIDs (71; 40.36), Pantoprazole 97 (55.11%), Most commonly prescribed class of antibiotics were cephalosporin's (121). The cost analysis was done for both retrospective and prospective antibiotics, the cost of drugs, number of drugs and ASV. This study clearly showed that prescribing pattern of drugs (antibiotics, analgesics, corticosteroids, antiulcer agents, ASV etc.,) needs to be continuously evaluated even in snake bite poisoning in order to promote the more rational prescribing, decrease morbidity and cost of therapy to the patient.

Keywords: ARF: Acute Renal Failure, ASV: anti-snake venom, ADRs - Adverse Drug Reactions. APTT: Activated Partial Thromboplastin Time. PPIs: Proton Pump inhibitor

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INTRODUCTION

Poison is substances that cause disorders in organs, impair function, cause structural damage, or injure the body or adjacent parts-toxicity usually by chemical reaction or other activity**.** Poisoning is the most common problem all over the world. Venoms are usually defined as toxins (zootoxin substance containing Phospholipase A2, hyaluronidase enzymes & α and β - Neurotoxins) that are injected by a bite or sting whereas toxins are poisons produced by some biological function to cause its effect. Poisons are generally absorbed through epithelial linings (skin or gut) or directly into the systemic circulations. Among the five poisonous snake species families: Viperidae (vipers), Elapidae (cobras), Colubridae, Atractaspididae and Hydrophidae (sea snakes) are most common. Out of them vipers and cobras are common species in South East Asia (9)(15).The viperidae group, sea snakes, and the colubridae group causes snake bites caused Acute Renal Failure. Colubrid bite common effects like pain, oedema, erythema, headache, where as in elapid family cobra, kraits, coral snakes, mambas bite causes neurotoxicity, viperidae (family vipers) and pit vipers bites causes haemotoxicity, vasculotoxic, hydrophidae bites leads (sea snakes) neurotoxicity[14,15,13, 17].

Worldwide Snake bite is also a one of the chief problems among poisons in tropical and subtropical countries where heavy rainfall and humid climate. About 125,000 were dying each year, in which most of the deaths were occurring in the rural population because of inadequate primary treatment in the medical emergency areas and lack of tertiary care facilities [1-3].In India 35,000–50,000 people die every year from snakebite,. Kraits and Echiscarinatus are most common snakes responsible for snakebites in India [19,20].The peak incidence of snakebite cases is reported during the paddy sowing and harvesting periods(i.e: June to November (eg.kraits).)The common krait, Bunganrscaeruleus, is regarded as the most dangerous species of venomous snake in the Indian subcontinent [4-6].

Neurotoxins and Hemotoxins effects of the snake bites lead to death if untreated. The toxicity of snake venom is assessed by toxicological tests called Median lethal dose LD50. Hence Snake bite treatment is indicated immediately as a first aid to retard the systemic absorption of venom prevents life-threatening complications and to save the life [8, 16, 13, 17]. Traditionally, first aid includes local incisions or at the site of the bite, attempts at suctioning venom out of the wound, use of tight bands around the limb, and or local application of ice packs. None of the traditional remedies has any proven medical benefit. The current guidelines of first aid shows: Reassure the victim (70% of all snakebites are by nonvenomous snakes and 50% of bites by venomous species are dry bites**)** [7, 8]

Anti-venom is an immunoglobulin (Ig) usually pepsin refined F (ab)2 fragments of IgG purified from the serum or plasma of a horse or sheep that has been immunized with the venom of one or more species of snakes. The anti-venoms are produced against 4 most important venomous snakes of India - Najanaja (Indian Cobra); Bungaruscaeruleus (Indian common krait); Daboiarusselii (Russell's viper); and Echiscarinatus (Saw-scaled viper) [4,9].ASV and its rational use is the only definitive treatment to neutralize the venom in circulation and tissue fluid to save the life. In India, only polyvalent ASV is available.

ASV demand was very high because of proportion of snake bite, even deficiency in the production of ASV from horse blood attenuation. Hence biotechnological methods may be alternative to satisfy this demand [21].

Snake bite is a primary problem in rural populations and its causes is not systematically reported; only very few countries possess a reliable epidemiological data on snake bites. Most of the available data are based on a few hospital statistics, which constitute a very small percentage of cases of snake bite. Hence this study was carried out with the objective to know the incidence, treatment pattern, Drug Use & its managing cost in the departments of medicine and **pediatrics** of rural hospital.

MATERIALS AND METHODS

Study Design & Site: Retrospective (from Jan-2011- Aug 2014) and a prospective study. (Sep-2014 to Feb-2015) & AH&RC, B.G.NAGAR

Source of Data and Materials: Patient prescriptions, medicine strips, Patient medication records, Laboratory data reports and other relevant source

STUDY CRITERIA: Inclusion Criteria: poisonous snake bite patients admitted to medical wards and intensive care unit.

Exclusion Criteria: Other than snake bite poisoning.

Study Procedure:

Patients will be entered into the study by considering inclusion & exclusion criteria. A well designed data collection form was developed and used, which consist of various information like demographics of the patient data regarding diagnosis, prescribed drugs, indication and their route of administration. The required data's were collected from case records, laboratory reports and from prescription s, as well as from caretakers & from Pharmacy, billing section. The collected data will be reviewed by referring various resources for correctness of drug use, benefits and its cost. The obtained data were analyzed by using the Statistical Package Social Sciences version 20.

RESULTS

Prospective Results:

Distribution of Patients:

Out of 190 patients enrolled in the study 14 (7.37%) patients belonging to prospective study and the rest (176; 92.63%) belonging to a retrospective study..

Prospective study:

Gender wise distribution

Among patients (14) enrolled in the prospective study. All were adults (≥19 years). Most were males (9; 64.28%) and females were 5 (35.72%).

Age wise distribution

Majority of the patients enrolled in the study belong to the age groups of 36-40years (4; 28.6%) followed by 46-50 years (3; 21.4%), 21-25 years (2; 14.3%), 31-35 years (2; 14.3%), 61-65 years (2; 14.3%) and 56-60 years age groups (1; 7.1%). The average age of a prospective study population was 42.21 ± 13.02 (mean ± SD)

Socio-economic status distribution:

The entire prospective study population majority were farmers 9 (64.28%) followed by housewives 3(21.42%), students 1(7.1%) and business 1 (7.14%). Among female patients one was student, one was farmer and three were housewives.

Economic status distribution

Among 14 prospective cases majority were having 50,000-100,000 INR (6; 42.8%) followed by 100,000 - 200,000 INR (4; 28.6%), less than 50,000 INR (3; 21.4%) and only one (7.1%) patients was having more than 200,000 INR family annual income

Days of hospitalization

Among the 14 cases, most of them were hospital stay between 1-5 days (9; 64.3%) followed by 6-10 days (4; 28.57%) and 11-15 days (1; 7.1%) of hospitalization.

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Days of Hospitalization	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
1-5 days	6 (66.7)	3 (60.0)	9 (64.3)
6-10 days	2 (22.2)	2 (40.0)	4 (28.57)
11-15 days	1 (11.1)	0 (0)	1 (7.1)
Total	9 (100.0)	5 (100.0)	14 (100)

Table 1: Gender wise distribution of days of hospitalization of patients

Personal history distribution:

Among 14 patients, all the males were having social history, most of them were chronic alcoholics and smokers followed by chronic smokers. Interestingly none of the women were having habits like beetle nut and leaves chewing.

Diagnoses of snake bite type with co-morbidities:

Of all the prospective study patients, most were hospitalized due to a poisonous snake bite 13 (92.86%). Among these 11 patients were not having any co-morbidities or past medical history. Two patients had a poisonous snake bite with co-morbidities and one female patient was hospitalized due to non-poisonous snake bite and without co-morbidities.

Among the patients were having co-morbidities, one male patient was having acute renal failure, one female patient was having ARF and one female patient having other co-morbidities.

Diagnosis	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Poisonous snake bite without Co-morbidities	8 (88.88)	3 (60)	11 (78.57)
Poisonous snake bite with Co-morbidities	1 (22.2)	1 (20)	2 (14.28)
Non Poisonous snake bite without Co-morbidities	0 (0)	1 (20)	1 (7.14)
Total	9 (100)	5 (100)	14 (100)

Table 2: Distribution of snake bite types with co-morbidities

Clinical outcome:

Out of all patients, most were improved among both in male and females and only one female patient was expired.

Awareness of patients and provision of counselling about types of snakes and snake bite:

None of the patients in the study were having awareness and most (78.57%) were not interested to receive patient counselling also.

Patient counselling	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Not Provided	7 (77.8)	4 (80.0)	11 (78.57)
Provided	2 (22.2)	1 (20.0)	3 (21.43)
Total	9 (100.0)	5 (100.0)	14 (100)

Table 3: Awareness of patients and provision of counselling about types of snakes and snake bite

Drug Intervention:

Of all the 14 patients, drug interventions were found in 13 patients. Among these 10 had drug-drug interactions followed by three were drug-drug interactions and ADRs (anti-snake venom hypersensitivity).

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Severity of drug interventions:

A total of 37 drug interventions were observed in the prospective study population. Most of drug interventions are 29 (78.62%) were in moderately severe rest were severe in nature.

Severity of Drug Intervention	Male		Female		Total no. of patients (%)	Total no. of interventions (%)
	No. of patients (%)	No. of interventions (%)	No. of patients (%)	No. of interventions (%)		
None	0 (0)	0 (0)	1 (20)	0 (0)	1 (7.14)	0 (0)
Moderate	4 (44.4)	19 (79.17)	1 (20)	5 (62.5)	5 (35.72)	29 (78.38)
Severe	5 (55.6)	5 (20.83)	3 (60)	3 (37.5)	8 (57.14)	8 (21.62)
Total	9 (100)	24 (100)	5 (100)	8 (100)	14 (100)	37 (100)

Table 4: Severity and number of drug interventions according to gender wise

Utilization pattern of Anti snake venom:

Majority of the patients (13) were prescribed with anti-snake venom. Only one female patient was not prescribed as the diagnosed to have a non-poisonous snake bite. In all the patients with only polyvalent snake venom prescribed. Average (mean ± SD) number of anti-snake venom vials prescribed among males was 15.67 ± 10.69, followed by 7.25 ± 3.20 among the females prescribed anti-snake venom and for the entire prospective study population was 12.14 ± 9.99.

Anti-snake venom prescription (Polyvalent)	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Yes	9 (100)	4 (80)	13 (96.86)
No	0 (0)	1 (20)	1 (7.14)
Total	9 (100)	5 (100)	14 (100)

Table 5: Severity and number of drug interventions according to gender wise

Prescribing pattern of corticosteroids:

Out of the entire study population 85.72% were prescribed with corticosteroids. Rest was not prescribed. Of these one male and one female patient were not prescribed with corticosteroids.

Analgesics utilization pattern:

Most of the patients were prescribed with analgesics. Only four were not prescribed with any of analgesics. Most commonly prescribed class of analgesics was a combination of non steroidal anti-inflammatory drugs (NSAIDs) and opioid analgesics (3) followed by acetaminophen (3), opioid analgesics (2) and NSAIDs (2).

		Class of analgesics	Name of analgesics	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
AnalgesicsPrescription	No	None	None	3 (33.3)	1 (20)	4 (28.56)
	Yes	NSAIDs	Diclofenac	0 (0)	2 (40)	2 (14.28)
		Opioid Analgesic	Tramadol	1 (11.1)	1 (20)	2 (14.28)
		NSAIDs and Opioid Analgesic	Diclofenac and Tramadol	2 (22.2)	1 (20)	3 (21.42)
		Acetaminophen	Paracetamol	3 (33.3)	0 (0)	3 (21.42)
		Total		9 (100)	5 (100)	14 (100)

Table 6: Prescribing pattern of analgesics according to gender wise

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Utilization pattern of antiulcer agents:

Only one patient was not prescribed with antiulcer agent, rest were prescribed with various types of antiulcer agents. Most frequently prescribed class of agents were proton pump inhibitors (PPI). Pantoprazole was the principle agent prescribed among PPIs.

		Class of anti ulcer agents	Name of anti ulcer agents	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Antiulcer agentsPrescription	No	None	None	1 (11.1)	0 (0)	1 (7.14)
	Yes	Proton pump inhibitors	Pantoprazole	7 (77.8)	3 (60)	10 (71.44)
			Rabeprazole	0 (0)	1 (20)	1 (7.14)
		Proton pump inhibitors + Antihistamines (H2 receptor blocker)	Pantoprazole and Ranitidine not simultaneously	1 (11.1)	0 (0)	1 (7.14)
		Proton pump inhibitors + antiemetic	Pantoprazole and domperidone	0	1 (20)	1 (7.14)
		Total		9 (100)	5 (100)	14 (100)

Table 7: Prescribing pattern of anti ulcer agents according to gender wise

Anti tetanus toxoid usage pattern:

Among the study population one female patient and one male patient were not immunized with the tetanus toxoid.

Vitamin K usage pattern:

Vitamin K was not prescribed in any of the female patients, and prescribed only among two male patients as a haemostatic agent.

Anti histamines usage pattern:

Antihistamines were prescribed among most (88.89%) of the male population and none of the females prescribed with antihistamines among prospective study population.

Antibiotics prescribing pattern:

Antibiotics were prescribed among 13 (92.86%) patients of the prospective study population. Only one female patient was not prescribed with antibiotics.

Mode of Administration	No. of Male patients (%)	No. of Female patients (%)	Total No. of patients (%)
No antibiotics	0	1 (20)	1 (7.14)
Parenteral (intravenous injection)	8 (88.9)	3 (60)	11 (78.58)
Both parenteral (intravenous injection) and Oral	1 (11.1)	0 (0)	1 (7.14)
Oral	0 (20)	1 (20)	1 (7.14)
Total	9 (100)	5 (100)	14 (100)

Table 8: Mode of administration of antibiotics according to gender wise

Most commonly prescribed class of antibiotics was cephalosporin's (7) followed by nitroimidazoles (7), combination of cephalosporin's and β lactamase inhibitors (4) and combination of penicillin's and β lactamase inhibitors (4). Aminoglycosides (1), benzimidazoles (1), fluoroquinolones (1) and carbapenams (1) constituted for minor proportion prescriptions.

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Class of antibiotics	No. of Male patients	No. of Female patients	Total No. of patients
Cephalosporin's	6	1	7
Nitroimidazoles	5	2	7
Cephalosporins and β lactamase inhibitors	2	2	4
Penicillin's and β lactamase inhibitors	2	2	4
Aminoglycosides	1	0	1
Benzimidazole	0	1	1
Fluroquinolones	1	0	1
Carbapenams	0	1	1

Table 9: Prescribing pattern of class of antibiotics according to gender wise

Most of the prescriptions contained ceftriaxone (7) followed by metronidazole (7), amoxicillin-clavulanic acid (4), cefoperazone-sulbactam (3) and others (eg; Cefixime, Amikacin etc.,).

Name of antibiotics	No. of Male patients (%)	No. of Female patients (%)	Total No. of patients (%)
Ceftriaxone	6	1	7
Metronidazole	5	2	7
Amoxicillin-clavulanic acid	2	2	4
Ceftriaxone –Sulbactam	2	1	3
Cefoperazone-Sulbactam	0	1	1
Cefixime	1	0	1
Amikacin	1	0	1
Albendazole	0	1	1
Ofloxacin	1	0	1
Meropenam	0	1	1

Table 10: Prescribing pattern of antibiotics according to gender wise

Distribution of treatment cost of antibiotics:

The treatment average cost of antibiotics, All cost of drugs and Anti snake venom were 4016.72 ± 8950.495, 21217.42 ± 18816.8, 17176.04 ± 10410.81 respectively.

Mean values	Among prescriptions in Male patients	Among prescriptions in Female patients
Average no. of drugs	11.89 ± 6.21	10.40 ± 4.56
Average Cost of antibiotics	6070.44 ± 14816.53	1963 ± 3084.46
Average Cost of all drugs (INR)	30,593.44 ± 28140.51	11,841.40 ± 9493.09
Average cost of Anti snake venom (INR)	23,484.33 ± 16022.48	10,867.75 ± 4799.14

Table 11: Treatment cost of antibiotics according to gender wise

Retrospective Results:

Gender wise distribution:

Among patients (176) enrolled in the retrospective study. Most were males (126; 71.6%) and females were 50 (28.4%). Among the study population paediatric patients (≤18 years) constituted by 10.8% Rest was adults.

Age wise distribution:

Majority of the patients enrolled in the study belong to the age groups of 36-40years (23; 13.1%) followed by 41-45 years (21; 11.9%), 16-20 years (21; 11.9%), 51-55 years (18; 10.2), 26-30 years (16; 9.1%),

21-25 years (14; 8%), 56-60 years (10; 5.7%) and 31-35 years age groups (10; 5.7%). The rest of age groups accounted for minor proportion (24.4%) of the study population. The average age of a prospective study population was 39.09±17.82 (Mean ± SD) years.

Socio-economic status distribution:

Socioeconomic status was not available for the patients enrolled in the study as the data was collected from medical records department retrospectively.

Days of hospitalization

Most patients hospital stay was between 1-5 days (138; 78.4%) followed by 6-10 days (29; 16.5%), 11-15 days (6; 3.4%) and >=16 days (3; 1.7%) of hospitalization.

Personal history distribution:

The majority (134; 76.1%) were not having any social history (habits). Among male patients most of them were chronic alcoholics and smokers 28 (15.9%) followed by chronic smokers11 (6.3%), one person were alcoholic (1; 0.6%) and one patient was alcoholic and tobacco chewer (1; 0.6%). Interestingly only one of the female populations having tobacco chewing habit (1; 0.6%)

Diagnoses of snake bite type with co-morbidities:

Of all the retrospective study patients, most were hospitalized due to a poisonous snake bite 145 (82.38%), 30 patients with non-poisonous snake bite and one patient with an unknown snake bite. Among patients hospitalized with poisonous snake bite, 14 were having co-morbidities and in case of non-poisonous snake bites three were having co-morbidities.

Diagnosis	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Non Poisonous without co-morbidities	17 (13.5)	10 (20)	27
Non Poisonous with co-morbidities	1 (0.8)	2 (4)	3
Poisonous without co-morbidities	99 (78.6)	32 (64)	131
Poisonous with co-morbidities	9 (7.1)	5 (10)	14
Unknown without co-morbidities	0 (0)	1 (2)	1
Total	126 (100)	50 (100)	176 (100)

Table 12: Distribution of snake bite types with co-morbidities

Among the patients (17) having co morbidities most of the them were having only one co morbidity such as type 2 DM (4), ARF (3), hypertension (3) and other co morbidities (eg; hypothyroidism)and rest of the patients having more than one co morbidities.

Co morbidities	No. of Male patients	No. of Female patients	Total no. of patients
Type 2 DM only	3	1	4
ARF only	3	0	3
Hypertension only	1	2	3
Hypertension, Type 2 DM and Asthma	1	0	1
Hypertension and ARF	0	1	1
Hypertension and Type 2 DM	0	1	1
Type 2 DM and other co-morbidities	0	1	1
Other co-morbidities	2	1	3

Table 13: Distribution of co-morbidities among study population

Clinical outcome:

Out of all retrospective patients, majority (124; 70.5%) were improved among both in male and females, followed by 25 patients were discharged against medical advice (DAMA), 16 were referred to higher centre due to worsened condition of patient, eight were expired, two patients were discharged on request with advice and only one patient was referred to higher centre due to no improvement in patient condition.

Clinical outcome	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Death	5 (4)	3 (6)	8 (4.5)
Improved	89 (70.6)	35 (70)	124 (70.5)
DAMA	20 (15.9)	5 (10)	25 (14.2)
Discharge with medical advise	1 (0.8)	1 (2)	2 (1.1)
Referred to higher centre due to no improvement in patient condition	1 (0.8)	0 (0)	1 (0.6)
Refer to higher centre due to worsened condition of patient	10 (7.9)	6 (12)	16 (9.1)
Total	126 (100)	50 (100)	176 (100)

Table 14: Clinical outcome of patients

Awareness of patients and provision of counselling about types of snakes and snake bite:

Since the study was conducted retrospectively it was not possible to get the information about the awareness and to provide counselling about types of snakes and snake bites.

Drug Intervention:

Of all the 176 patients, drug interventions were found in 138 (78.4%) patients. All the interventions were drug-drug interactions only. No ADRs (anti snake venom hypersensitivity) were found in the study population.

Severity of drug interventions:

A total of 415 drug interventions were observed in the retrospective study population. Most of drug interventions are 214 (51.56%) were in moderately, 196 (47.23%) were severe and rest were minor in severity. All the minor interactions were observed in one female patient.

Severity of Drug Intervention	Male		Female		Total no. of patients (%)	Total no. of interventions (%)
	No. of patients (%)	No. of interventions (%)	No. of patients (%)	No. of interventions (%)		
None	26 (20.63)	0(0)	12 (24)	0 (0)	38 (21.59)	0 (0)
Minor	0 (0)	0 (0)	1 (5)	5 (4.5)	1 (0.6)	5 (1.21)
Moderate	59 (46.83)	158 (52)	21 (42)	56 (50.5)	80 (45.45)	214 (51.56)
Severe	41 (32.54)	146 (48)	16 (32)	50 (45)	57 (32.38)	196 (47.23)
Total	126 (100)	304 (100)	50 (100)	111 (100)	176 (100)	415 (100)

Table 15: Severity and number of drug interventions according to gender wise

Utilization pattern of Anti snake venom:

Majority of the patients (146; 82.95%) were prescribed with anti snake venom, rest was not prescribed with anti snake venom as these patients had non poisonous snake bite. In all the patients with only polyvalent snake venom prescribed. Average (mean ± SD) number of anti snake venom vials prescribed among males was 9.94 ± 7.54, followed by 7.88 ± 6.69 among the females and for the entire retrospective study population, was 9.35 ± 7.35.

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Antisnakevenom prescription (Polyvalent)	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Yes	107 (86.5)	39 (78)	146 (82.95)
No	19 (13.5)	11 (12)	30 (17.05)
Total	126 (100)	50 (100)	176 (100)

Table 16: Prescribing pattern of anti snake venom

Prescribing pattern of corticosteroids:

Out of the entire study population 73.29% were prescribed with corticosteroids, of these only one patient was prescribed with methyl prednisolone and hydrocortisone and rest were prescribed with only hydrocortisone.

Corticosteroids prescription	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
No	31 (24.6)	16 (32)	47 (26.71)
Hydrocortisone	95 (75.4)	33 (66)	128 (72.72)
Methyl prednisolone and hydrocortisone	0 (0)	1 (2)	1 (0.57)
Total	126 (100)	50 (100)	176 (100)

Table 17: Prescribing pattern of corticosteroids according to gender wise

Analgesics utilization pattern:

Majority of the patients (129; 73.26%) were prescribed with analgesics, of these most commonly prescribed class of analgesics were NSAIDs (71; 40.36) followed by combination of NSAIDs and opioid analgesics (22; 12.5) and acetaminophen (22; 12.5%). A minor proportion (14; 7.9%) of patients were prescribed with opioid analgesics (8; 4.5%), combination of NSAIDs and acetaminophen (5; 2.8%) and a combination of NSAIDs and anti-inflammatory enzyme (1; 0.6%).

		Class of analgesics	Name of analgesics	No. Of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
AnalgesicsPrescription	No	None	None	34 (27)	13 (26)	47 (26.74)
	Yes	NSAIDs	Diclofenac	58 (46)	11 (22)	69 (39.23)
			Aceclofenac	1 (0.8)	1 (2)	2 (1.13)
		Opioid Analgesic	Tramadol	3 (2.4)	5 (10)	8 (4.5)
		NSAIDs and Opioid Analgesic	Diclofenac and Tramadol	15 (11.9)	7 (14)	22 (12.5)
		Acetaminophen	Paracetamol	12 (9.5)	10 (20)	22 (12.5)
		NSAIDs and Acetaminophen	Aceclofenac and Paracetamol	3 (2.4)	2 (4)	5 (2.8)
		NSAIDs and anti-inflammatory enzyme	Diclofenac and Serratopeptidase	0 (0)	1 (2)	1 (0.6)
		Total		126 (100)	50 (100)	176 (100)

Table 18: Prescribing pattern of analgesics according to gender wise

Utilization pattern of anti ulcer agents:

Only one patient was not prescribed with antiulcer agent, **rest was** prescribed with various types of anti ulcer agents. Most frequently prescribed class of agents **was** proton pump inhibitors (PPI). Pantoprazole was the principle agent prescribed among PPIs.

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		Class of anti ulcer agents	Name of anti ulcer agents	No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Anti ulcer agents Prescription	No	None	None	17 (13.5)	14 (28)	31 (17.62)
	Yes	Proton pump inhibitors	Pantoprazole	76 (60.3)	21 (42)	97 (55.11)
			Rabeprazole	13 (10.3)	5 (10)	18 (10.23)
		Antihistamines (H2 receptor blocker)	Ranitidine	16 (12.7)	4 (8)	20 (11.37)
		Ulcer protective	Sucralfate	1 (0.8)	2 (4)	3 (1.70)
		Proton pump inhibitors + Antihistamines (H2 receptor blocker)	Pantoprazole and Ranitidine not simultaneously	3 (2.4)	2 (4)	5 (2.84)
		Proton pump inhibitors + antiemetic	Pantoprazole and domperidone	0 (0)	2 (4)	2 (1.13)
		Total		126 (100)	50 (100)	176 (100)

Table 19: Prescribing pattern of anti ulcer agents according to gender wise

Anti tetanus toxoid usage pattern:

Among the retrospective study population, 26 were not immunized with the tetanus toxoid. Among these 22 patients had a poisonous snake bite and treated with anti-snake venom.

Vitamin K usage pattern:

Vitamin K was not prescribed in majority (161; 91.5%) of patients, and prescribed among rest of the patients as haemostatic agent.

Anti histamines usage pattern:

Anti histamines were prescribed among majority (118; 67%) of study population and rest of the patients were not prescribed with any of antihistamines.

		No. of Male patients (%)	No. of Female patients (%)	Total no. of patients (%)
Anti tetanus toxoid	No	18 (14.3)	8 (16)	26 (14.8)
	Yes	108 (85.7)	42 (84)	150 (85.2)
	Total	126 (100)	50 (100)	176 (100)
Vitamin K	No	113 (89.7)	48 (96)	161 (91.5)
	Yes	13 (10.3)	2 (4)	15 (8.5)
	Total	126 (100)	50 (100)	176 (100)
Anti histamines	No	44 (34.9)	14 (28)	58 (33)
	Yes	82 (65.1)	36 (72)	118 (67)
	Total	126 (100)	50 (100)	176 (100)

Table 20: Prescribing pattern of anti tetanus toxoid, vitamin K and antihistamines according to gender wise

Antibiotics prescribing pattern:

Antibiotics were prescribed among 153 (86.93%) patients of the retrospective study population. Most commonly prescribed route of administration of antibiotics was parenteral route (intravenous injection) followed by oral and combination of both parenteral and oral route.

Mode of Administration	No. of Male patients (%)	No. of Female patients (%)	Total No. of patients (%)
No antibiotics	13 (10.3)	10 (20)	23 (13.1)
Parenteral (intravenous injection)	99 (78.6)	36 (72)	135 (76.7)

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Both parenteral (intravenous injection) and Oral	7 (5.6)	2 (4)	9 (5.1)
Oral	7 (5.6)	2 (4)	9 (5.1)
Total	126 (100)	50 (100)	176 (100)

Table 21: Mode of administration of antibiotics according to gender wise

Most commonly prescribed class of antibiotics were **cephalosporin's** (121) followed by nitroimidazoles (80), combination of **cephalosporin's** and β lactamase inhibitors (32) and combination of penicillin's and β lactamase inhibitors (13). Aminoglycosides (7), benzimidazoles (3), fluoroquinolones (3) and macrolides (2) and combination of fluoroquinolones-nitroimidazoles (1) constituted for minor proportion prescriptions.

Class of antibiotics	No. of Male patients	No. of Female patients	Total No. of patients
Cephalosporin's	86	35	121
Nitroimidazoles	62	18	80
Cephalosporin's and β lactamase inhibitors	25	7	32
Penicillin's and β lactamase inhibitors	12	1	13
Aminoglycosides	5	2	7
Benzimidazole	2	1	3
Fluoroquinolones	3	0	3
Macrolides	2	0	2
Fluoroquinolones-nitroimidazole	1	0	1

Table 22: Prescribing pattern of class of antibiotics according to gender wise

Majority of the prescriptions contained ceftriaxone (109) followed by metronidazole (80), ceftriaxone-Sulbactam (28), cefixime (11), piperacillin-tazobactam (8 and others accounted for minor number of prescriptions. (eg;, Amikacin, Amoxicillin-clavulanic acid etc.,).

Name of antibiotics	No. of Male patients (%)	No. of Female patients (%)	Total No. of patients (%)
Ceftriaxone	77	32	109
Cefotaxime	4	2	6
Cefixime	7	4	11
Ceftriaxone -Sulbactam	21	7	28
Cefixime- clavulanic acid	4	0	4
Cefoperazone-Sulbactam	1	0	1
Metronidazole	62	18	80
Piperacillin-Tazobactam	7	1	8
Amoxicillin-clavulanic acid	5	0	5
Amikacin	5	2	7
Ciprofloxacin	1	0	1
Levofloxacin	1	0	1
Norfloxacin	1	0	1
Ciprofloxacin-tinidazole	1	0	1
Albendazole	2	1	3
Azithromycin	2	0	2

Table 23: Prescribing pattern of antibiotics according to gender wise

Distribution of treatment cost of antibiotics:

The treatment average cost of antibiotics, All cost of drugs and Anti snake venom were 708.15 ± 1211.52, 15108.035 ± 11913.835, 16147.53 ± 9722.515 respectively.

Mean values	Among prescriptions in Male patients	Among prescriptions in Female patients

Average no. of drugs	9.42 ± 4.64	9.00 ± 4.72
Average Cost of antibiotics (INR)	722.08 ± 1382.76	694.22 ± 1040.28
Average Cost of all drugs (INR)	16384.69 ± 12100.37	13831.38 ± 11727.30
Average cost of Anti snake venom (INR)	17381.93 ± 10269.12	14913.13 ± 9175.91

Table 24: Treatment cost of antibiotics according to gender wise

DISCUSSION

Snake bite is major problems in the rural population were farmers working bare-footed in fields or sleeping outdoors are predisposing factors in frequent contact with a poisonous snake. The study was conducted through prospective and retrospective methods. Both prospective study and retrospective study show male patients were more when comparing to female patients. The average age of a retrospective study population (42±13.02) was more when compared to the prospective study population (39.09±17.82).

The present study shows most of the population enrolled in the study was miles (71.1%) when comparing with females (35.72%). Most of the study population were belonging 36-40 age groups (14.2%). In a similar study conducted by Thakur M S et.al .most of the population was male population and the age group (16-45 years) accounted for most cases.

In the country side of the B.G nagara (in and around), mostly the farmers are affected/admitted due to snake bite poisoning followed by housewives, and the socioeconomic status of the subjects enrolled in the prospective study are (50000-100000) while in the retrospective study there is no socio economic data information . Similar results (78%) are observed with Thakur M.S, Naik J D studies.

In this prospective study patients hospitalized due to a poisonous snake bite were 13 and among these 11 patients were not having any co-morbidities or past medical history. Two patients had a poisonous snake bite with co-morbidities and one female patient was hospitalized due to the non-poisonous snake bite and without comorbidities. In the present study, one male and one female patient had comorbidity such as acute renal failure. A similar study was conducted by P. Kalyani et.al and their result show 6.5% patients had acute renal failure as comorbidity. Similar results are observed in Thakur M.S, Naik J D where patients had a complication of acute renal failure (6.25%) and in our study one female patient was expired.

In the retrospective study 145 patients were hospitalized due to a poisonous snake bite, 30 patients with non-poisonous snake bite and one patient with an unknown snake bite. Among patients hospitalized with poisonous snake bite 14 were having co-morbidities and in case of non-poisonous snake bite three is having co-morbidities. Among the 17 patients having co-morbidities, most of them have only one comorbidity such as type2 DM, ARF, and HTN. Similar results are observed in North American snake envenomation: diagnosis, treatment, and management by Barry S. Gold,.

In our study 124 (70.5%) patients were improved among both in male and female, followed by 25 patients were discharged against medical advice (DAMA), 16 were referred to higher center's due to the worsened condition of patient, 8 were expired, two patients are discharged on request with advice. In a similar study conducted by Kalyani P et.al and the result show 77.5% recovered completely, 18.3% cases were referred, and in another study conducted by Prameeladevi R et.al 68.3% of overall patients recovered completely, 18.7% patients had cellulitis, respiratory paralysis in 4.3% patients needing ventilator support recovered and 5 patients with ARF recovered on hemodialysis fully without chronicity. 74.6% of patients recovered without sequelae in a study conducted by Arshad Anjum et.al and 7.7 % expired.[12,2]

In the prospective study population among the 13 patients 10 are having drug interactions and in the retrospective study among 176 patients 138 are having drug intervention and all are drug-drug interactions. Coming to adverse drug reactions in only three ADR are found in prospective study and no ADR in the retrospective study. In the prospective study total 37 drug interactions were observed in which 29 are moderate and rest are severe and in the retrospective study 415 drug interactions are found in which 214 are moderate and 196 are severe and the rest were minor in severity.

13 subjects were prescribed with anti-snake venom in the prospective study and one female patient was not prescribed as she was diagnosed to have non-poisonous snakebite. In a retrospective study 146 subjects were prescribed with anti-snake venom and rest was not prescribed with anti-snake venom as these patients have non-poisonous snakebite. In all the patients only polyvalent snake venom is prescribed. The average population in the prospective study (mean ± SD) of anti-snake venom vials prescribed among males are 15.67 ± 10.69, followed by 7.25 ± 3.20 among the females and 12.14 ± 9.99 for the entire study and in the retrospective study average (mean ± SD) number of anti-snake venom vials prescribed among males are 9.94 ± 7.54, followed by 7.88 ± 6.69 among the females and 9.35 ± 7.35 for the entire retrospective study population. A similar study was conducted by Arshad Anjum et.al and most of the patients were administered with anti - snake venom (81.1%).

Most of the patients were prescribed with analgesics of these most commonly prescribed class of analgesics were NSAIDs followed by a combination of NSAIDs and opioid analgesics and acetaminophen. Most frequently prescribed class of agents was proton pump inhibitors, pantoprazole was the principal agent prescribed among proton pump inhibitors. In the present study to 88.89% of subjects are prescribed with anti-histamines in the prospective study and 67% subjects are prescribed with anti-histamines in retrospective study. In our study 85.72% of patients were prescribed with corticosteroids in a prospective study whereas in a retrospective study 73.29% were prescribed with corticosteroids. A similar study was conducted by Eric K. I. Omogbai et.al in Nigeria and result shows 68.3% received ASV, 67.4% received antibiotics, 23.2% patients received antihistamines and 23% received corticosteroids. [23]

In the present study, antibiotics were prescribed among 92.86% patients of prospective study population and in the retrospective study 86.93% of patients are prescribed with antibiotics. Most commonly prescribed class of antibiotics in the prospective and retrospective study were cephalosporin's (67.36%) followed by nitroimidazoles (45.79%), combination of cephalosporin's and β lactamase inhibitors (18.95%), combination of penicillin's and β lactamase inhibitors (8.95%). In a similar study conducted by Dexter D Tagwireyi et.al 88.5% received antibiotics. [22] Ten different antibiotics from 6 different classes were used penicillins the most commonly prescribed. In another study conducted by Eric K. I. Omogbai et.al 67.4% received antibiotics and the most commonly used antibiotic was a combination of amoxicillin and cloxacillin followed by ampicillin, metronidazole, gentamycin, benzyl-penicillin, procaine penicillin and cotrimoxazole.

The treatment cost of antibiotics and anti snake venom has huge varies from the retrospective to prospective. Average antibiotics costs (4016.72± 8950.495) in prospective and in retrospective (708.15 ± 1211.52), average cost of anti-snake venom in prospective (17176.04 ± 10410.81) was as in retrospective (16147.53 ± 9722.515).

This may be because advanced technology or increased cost of formulation and data may be insufficient in the retrospective study.

CONCLUSION

This study shows that majorities of the patients were not aware about types of snakes and snake bite. The anti-snake venom cost was not affordable in rural population due to financial constraints was observed. Even sometimes not completing the required course observed which showed the need for education of the patient.

Interestingly in our India all the patients were prescribed with polyvalent snake venoms because of only availability of this preparation, even different forms of availability of ASV were observed in abroad & it's prescribing. Clinical outcomes though satisfactory, still there should be an improvement required. This is because of some cases were observed with worsening condition & referred to a higher centre & DAMA because of unaffordable cost to the further treatment. This study clearly suggests that the awareness of the patients about the first aid management referral. Need of education in the PHC s & even education to the patient's essentiality was observed. This study also highlights rationality study on the drug use of snakebite management is the need of hour to improve the better patient outcome with minimal cost. Overall the data maintenance observance was poor in the retrospective study, and it needs to be strengthened because of the snake bite data management is essential for further epidemiological research study

Limitations of study:

- Conduct of Prospective study was short duration (6 months).
- Availability of retrospective data was not completely satisfactory as per the data collection form(e.g.: Socico economic details)
- Lack of patient counseling for the patients due to time and location.

Future directions:

- Extension of study for longer, adopting strategies for documentation strengthening, toxicological departmental research initiations are the need of hours
- Primary health center should be fully equipped with facilities to give first aid measures, make availability and administrate of ASV if required.
- Educate the rural people about hazards of snake bite, early hospital referral and treatment
- Poisonous information center should create in each district.

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REFERENCES

[1] Anila N, FarwaR, Muhammad A and Mohammad S S. Journal of the College of Physicians and Surgeons Pakistan 2009;19(5): 304-307.
[2] Arshad A, Munawwar H, Shaukat H A, Syed M A, Mujhaid B, MinakshiS..J Forensic Res 2012; 3(4): 1-5.
[3] Atif S H,Abdul H K,Tariq Z S,Rafi A G and NailaS.. JAyub Med Coll Abbottabad 2008;20(3): 125-127.
[4] Brunda G and Sashidhar R B. Indian J Med Res 2007;125(5): 661-668.
[5] Ashok K L, Muhammad T A, Aftab A Z and Mumtaz A S. SnakeBite: Professional Med J 2014;21(2): 290-294
[6] Nagnath R, .Bhaisare S D. Bansod Y V and.RohanH. Sch J App Med Sci 2014;21(1): 435-441.
[7] Francis N P M, Tanuj K, Prasantha B and Pradeep K G. J Indian Acad Forensic Med 2005;32(3): 224-227.
[8] Gold B S, Dart R C and Barish R A. NEngl J Med 2002; 4(7): 347-356.
[9] Halesha B R, Harshavardhan L and Venkatesh K B. JClinDiagn Res 2013;7(1): 122-126.
[10] Inamdar I F,Aswar N R, Ubaidulla M and Dalvi S D. S. Afr.med. j 2010;100(7): 34-38.
[11] Jhuma S, RehanaN, Jeeva M S, Leena P and Mahadevan S. .Arch Dis Child 2013;98: 596–601.
[12] Kalyani P, Felix A J, Arul M A and Viknesh A. Asian J. Pharm 2015;5(2): 70-74.
[13] Paul V, Pratibha S and Prahlad K A. J Assoc Physicians India 2004;52: 14-7
[14] Murthy J M, Kishore L T and Naidu K S. J Comput Assist Tomogr 1997;21: 35-7.
[15] Narvenear K. J Assoc Physicians India 2006;54: 717-9.
[16] Malasit P, Warrell D A, Chanthavanich P, Viravan C, Mongkolsapaya J and Singhthong B..Br Med J Clin Res Ed 1986;292(6512): 17-20
[17] Saini R K, Sharma S, Singh S and Pathania N S. J Assoc Phys India 1984;32(2): 195-197.
[18] Thakur M S ,Naik J D, Sheetu M K J and Langare S D. Int J Biol Med Res 2013;4(2): 3115-3117.
[19] Subash Kumar V, Venkateswarlu B and Vijay Kumar G. J Nat SciBiol Med 2010;1(1): 35–39.
[20] Warell D A.WHO/SEARO Guidelines for the Clinical Management of snake bite in South East Asia Region. South East Asian J Trop Med Public Health 1999; 30(1): 1-85.
[21] Soares. Anti snake venom medicinal plants. In: Rahman U R, Allen B R, Iqbal M C (eds.) Frontiers in medicinal chemistry. 4th ed. Bentham science publishers LTD; 2009. p321-343
[22] Tagwireyi DD, Ball DE, Nhachi CF. BMC Clinical Pharmacology. 2001;1:4. doi:10.1186/1472-6904-1-4.
[23] Eric K. I. Omogbaietal. Tropical Journal of Pharmaceutical Research, June 2002; 1 (1): 39-44