EVALUATION OF SNAKE BITE POISONED CASES "CLINICAL AND BIOCHEMICAL PREDICTORS"

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ABSTRACT

Background: in Egypt, there are several species of poisonous snakes. The current work aimed to evaluate the clinical and biochemical predictors of snakebite-poisoned patients admitted to Menoufia university poison control center (MPCC). **Patients and methods**: this work was an observational study done on 67 snakebite cases. Patient's data included sociodemographic data, site of bite, season of bite occurrence, time of presentation to hospital, and clinical manifestations with local and systemic examination. Required laboratory investigations were arterial blood gases (ABGS), complete blood count (CBC), international normalized ratio (INR), prothrombin time (pt), liver enzymes (ALT and AST), serum creatinine and blood electrolytes (sodium and potassium). Cases were classified according to the snakebite weakness and paralysis scoring into symptomatized four groups. The outcome is categorized as cured or dead. **Results**: the total number of cases was 67 patients manifested with neurotoxicity. Patients were sorted into grade 1 (38 cases), grade 2 (14 cases) grade 3 (8 cases), and grade 4 (7 cases). Most of the cases in whole and in different severity groups were males, in the age group 18-60 years, and from rural areas. As regards the time of presentation, 44.8% of all cases were presented in less than 4 hours. Regarding the place of admission, 77.6% of patients were admitted to the toxicology department. The most common local manifestations were fang marks and pain. Ptosis was the most common neuromuscular manifestation. Most cases were cured (97.0 %). Mortality rate was 3%. Patients with grade 3 and grade 4 snake severity scores were associated with affection of ABGS findings with hypoxia and respiratory acidosis, and with increased white blood cell count, elevated serum creatinine, and liver enzymes (AST, and ALT). **Conclusion and recommendations**: snakebites are a life-threatening condition. In the present study, neurotoxic snakebites were the most common type of snake in the Menoufia governorate. Patients with respiratory failure and needing mechanical ventilation were associated with increased mortality. Laboratory parameters such as ABGS, WBC, serum creatinine, AST, and alt were important predictors of severity.

Keywords: snakebite, poisoned, biochemical, predictors, venom.

INTRODUCTION

Most snake species are non-venomous and venomous ones use venom mainly to kill prey rather than for self-defense (**Avau et al., 2016).**

In African countries, snakebite statistics are insufficient, making it difficult to assess the morbidity and mortality associated with snakebites. Preliminary estimates suggest 3-8 thousand envenomation in the Middle East and North Africa **(World Health Organization, 2018).**

In Egypt, there are several species of snakes as cobra and viper that can deliver deadly venom. Snakes are widely distributed in Egypt either in sandy deserts or the Nile Delta (**Bernardoni et al., 2014).**

The Egyptian cobra is a highly venomous snake that is found in Egypt, and it prefers to live near inhabited areas to prey on domestic birds such as chickens and this endangers residents of these areas (**Morsy et al., 2021)**.

Depending on the type of snake venom, it can be classified as blood venom, nerve venom, and mixed venom. Neurotoxicity occurs by impairing the release of neurotransmitters or blocking the binding of acetylcholine to the receptor site, resulting in acute muscle weakness or paralysis, and even respiratory failure. In addition, neurotoxins can affect the autonomic nervous system leading to shock, respiratory failure, impairment of other organs, and impairment of glandular secretion **(Wong et al., 2021).**

In addition, some non-neurotoxic manifestations such as coagulopathy and local

inflammation at the bite site may also occur **(Gutiérrez et al., 2017).** Some snakes have a hemolytic effect in the form of petechia under the skin and mucous membrane, free bleeding may also occur **(Bajracharya et al., 2017**).

Many enzymes are found in snake venom that can destroy the integrity of connective tissue, resulting in severe local symptoms such as local edema, and ecchymosis which may spread beyond the bite site and affect the entire limb (**Pandey et al., 2016**). Early medical treatment and administration of antivenom are the most important factors for outcome **(Bolon et al., 2020)**. However they are less effective in treating local damage and some studies suggested that local excision of the tissue at the venom injection site decreased local and systemic manifestation of viper snakes **(Fujioka et al.,2019, Ashery et al .,2018)**.

In Egypt, the incidence of the problem of snakebite is not well studied. There are no official studies, snakebites are treated in different centers with no multicenter reports (**Salah Eldin and Hafez, 2017).**

The present study aimed to assess the clinical and biochemical predictors of snakebite poisoned patients admitted to Menoufia University Poison Control Center (MPCC).

PATIENTS & METHODS

The present work was a prospective observational study conducted on all snakebite cases admitted to Menoufia University Poison Control Center over two years, from the 1st of March 2021 to the last of February 2023 that met the inclusion criteria.

Inclusion criteria: Patients with a clear history of snakebites and developed characteristic clinical manifestations of envenomation.

Exclusion criteria: Patients who did not develop clinical manifestations after the specified observation period (8 hours), patients referred from primary care hospitals with initial treatment, and patients who had chronic diseases (e.g. hepatic, renal, pulmonary, cardiac, hematologic, neurologic, or diabetic patients).

Approvals were obtained from the head of MPCC and the Ethics Committee of Menoufia University Hospital with approval number (IRB7/2022FORE4). Written informed consent was obtained from the patients or their guardians after explaining the aim of the study. To ensure confidentiality, patient data were kept anonymous. Data were collected in clinical sheets developed for this purpose including sociodemographic data (age, sex, and residence), site of bite, season of bite occurrence, time of presentation to hospital, and clinical manifestations with local and systemic examination. Patients with disturbed consciousness levels were classified according to the Reed toxic coma scale; Patients with grade I toxic coma respond to painful stimuli and with intact reflexes. Patients with grade II toxic coma had no response to painful stimulation, but reflex reactions were present. Patients with grade III had impaired reflexes. Patients in the grade IV toxic coma were unstable with affected vital center functions (**Stanca et al., 2019).**

Required biochemical laboratory investigations were complete blood count (CBC) (hemoglobin concentration, red blood cells (RBCs), white blood cells (WBCs) and platelet counts), arterial blood gases analysis (ABGs), international normalized ratio (INR), prothrombin time (PT), liver enzymes (alanine transferase (ALT) and aspartate transferase (AST)), serum creatinine and blood electrolytes (sodium and potassium). Treatment data included the need for mechanical ventilation, the number of antivenin vials, and the hospital stay period. Outcome at the time of hospital discharge (cured or died). Patients were classified according to the snakebite weakness and paralysis scoring **(Bickler et al. 2023)** as follows: Grade1: Minimal affection of cranial nerve (e.g., variable degrees of ptosis) with no bulbar affection; the patient can move his limbs and raise his neck unsupported, can ambulate without aid. Grade 2: Cannot move limbs or raise neck against gravity, has difficulty in swallowing, and cannot walk independently. Grade 3: Severe muscular weakness resulting in impaired respiratory function, although spontaneous breathing is still present. Grade 4: Respiratory muscles are completely paralyzed, absence of reflexes, and dependence on mechanical ventilation. All patients received standard treatment based on the patient's clinical manifestations. Patients with only local manifestations were observed in the department for the progression of manifestations. Grade 1 and grade 2 were treated in the toxicology department. Patients with grade 3 and 4 snake severity scores were

transferred to the Intensive Care Unit. Anti-venom, intubation, mechanical ventilation, and supportive measures were performed when indicated (**Mishal et al. 2015).**

Data were analyzed using IBM SPSS software package version 20.0. **(**Armonk, NY: IBM Corp**)**.

RESULTS

The total number of symptomatized cases through the study period was 68, categorized by characteristic manifestations into 67 patients manifested with neurotoxicity, and only one patient with hemotoxic manifestations was excluded, as she was referred from another hospital with initial treatment. The Patients with neurotoxicity were classified according to neurotoxic snake severity score into grade 1 (38 cases), grade 2 (14 cases) grade 3 (8 cases), and grade 4 (7 cases).

Most of the cases in whole and in different severity groups were males, in the age group 18-60 years, and from rural areas. No significant differences were found between the four severity groups regarding these variables **(Table 1).** All cases were bitten in the limbs (52.2% in the lower limbs and 47.8% in the upper limbs). Most snake bites occurred during the summer season (73.1%) followed by spring (16.4%) **(Fig. 1).**

Considering the time of presentation 44.8% of all cases were presented less than 4 hours, 23.9% presented between 4 and 8 hours, and 31.3% presented more than 8 hours after the bite. There was a significant difference among grades of severity as most of grade 3 and grade 4 were presented after 8 hours **(**p=0.004*) **(Fig.2).**

Regarding the place of admission, 77.6% of patients were admitted to the toxicology department, and 22.4% were admitted to the intensive care unit (all severity grades 3 and 4) **(Fig. 3).**

The most common local manifestations were fang marks and pain which were found in all cases followed by swelling (47.8%) and lastly ecchymosis (25.4%) **(Fig.4)**.

Ptosis was the most common neuromuscular manifestation occurring in all patients followed by external ophthalmoplegia, difficulty in swallowing, blurred vision, and last difficulty in breathing (38.8%, 34.3%, 32.8%, and 22.4 respectively) **(Fig.5).**

Vertigo was present in 40.3%, headache in 29.9%, and vomiting in 38.8% of cases. There were no significant differences among the severity grades regarding these manifestations. About 22.4% of cases had disturbed consciousness levels according to the toxic coma scale and 13.4% were hypotensive at the time of presentation. These two variables showed significant differences among different severity grades of cases as these manifestations were present in grade 3 and grade 4 snake severity score**s (Table 2).**

When considering ABGs findings in the studied groups, significant differences were found considering the mean of the pH, PO_2, and PCO_2 findings where pH and PO_2 were significantly decreased in grade 3 and grade 4 while PCO_2 findings were significantly increased in grade 3 and grade 4. Also**,** a significant increase was found regarding the mean of white blood cell count (WBCs) with increasing the grade of severity of studied groups but there were insignificant differences regarding RBCs, platelet count, and hemoglobin concentration **(Table 3).**

The mean values of liver enzymes (ALT and AST) and serum creatinine were significantly increased with increasing severity of the studied groups. Prothrombin time, blood electrolytes (sodium and potassium), and international normalized ratio (INR) showed no significant differences between the four severity groups **(Table 4).**

Considering the hospital stay period, 59.7% of total cases stayed for less than 2 days, 32.8% for 2-7 days, and 7.5% for more than 7 days. A significant difference was noticed as most grade 1 cases stayed for less than 2 days and most grade 4 cases stayed for more than one week. About 10.4% of patients needed mechanical ventilation. A significant difference was observed between the considered groups regarding the number of antivenin vials used as the median was significantly increased with increasing severity grades. Almost all cases were cured (97.0 %), and 3% died (2 cases). Also, a significant difference was noticed considering the outcome as the two dead cases were grade 4 **(Table 5).**

Table (1): Comparison between the specified severity groups regarding socio-demographic data (sex,

age, and residence) (n=67)

		Snakebites Severity Grades				Total	Test of	P
		Grade1 n=38	Grade2 n=14	Grade3 n=8	Grade4 n=7	n=67	Sig.	value
Sex	**Male**	27(71.1%)	10(71.4%)	6(75.0%)	7(100.0%)	50(74.6%)	χ^2=2.713	0.438
	Female	11(28.9%)	4(28.6%)	2(25.0%)	0(0.0%)	17(25.4%)		
Age	**<18y**	10(26.3%)	8(57.1%)	2(25.0%)	1(14.3%)	21(31.3%)	χ^2=8.034	0.236
	18-60 y	24(63.2%)	4(28.6%)	6(75.0%)	5(71.4%)	39(58.2%)		
	>60y	4(10.5%)	2(14.3%)	0(0.0%)	1(14.3%)	7(10.4%)		
Residence	**Rural**	30(78.9%)	10(71.4%)	5(62.5%)	7(100%)	52(77.6%)	χ^2=3.418	0.332
	Urban	8(21.1%)	4(28.6%)	3(37.5%)	0(0.0%)	15(22.4%)		

χ^2: Chi square test *: Statistical significance at $p \leq 0.05$

Table (2): Comparison between the specified severity groups regarding clinical manifestations (n=67)

Clinical manifestations	**Severity grades**				**Total**	**Test of**	**P**
	Grade1 n=38	**Grade2 n=14**	**Grade3 n=8**	**Grade4 n=7**	**n=67**	**Sig.**	**value**
Vertigo	14(36.8%)	8(57.1%)	3(37.5%)	2 (28.6%)	27(40.3%)	χ^2=2.266	0.519
Headache	13(34.2%)	6(42.9%)	1(12.5%)	0 (0.0%)	20(29.9%)	χ^2=5.605	0.133
Vomiting	15(39.5%)	6(42.9%)	3(37.5%)	2 (28.6%)	26(38.8%)	χ^2=0.418	0.936
Conscious level							
Fully conscious	38(100%)	14(100%)	0 (0.0%)	0 (0.0%)	52 (77.6%)		
Grade I Toxic coma	0 (0.0%)	0 (0.0%)	7(87.5%)	0 (0.0%)	7 (10.4%)	χ^2=119.6	<0.001*
Grade II Toxic coma	0 (0.0%)	0 (0.0%)	1(12.5%)	4 (57.1%)	5 (7.5%)		
Grade III Toxic coma	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (28.6%)	2 (3.0%)		
Grade IV Toxic coma	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (14.3%)	1 (1.5%)		
Blood pressure							
Normal	34 (89.5%)	12 (85.7%)	5 (62.5%)	1 (14.3%)	52 (77.6%)	χ^2=44.21	<0.001*
Hypotension	0 (0.0%)	0 (0.0%)	3 (37.5%)	6 (85.7%)	9 (13.4%)		
Hypertension	4 (10.5%)	2 (14.3%)	0 (0.0%)	0 (0.0%)	6 (9.0%)		

χ^2: **Chi square test** *: Statistical significance at $p \leq 0.05$

Table (3): Comparison between the specified severity groups regarding arterial blood gases (ABGs),

White blood cells (WBCs), Red blood cells (RBCs) count, hemoglobin concentration, and platelets count findings (n=67)

	Grade 1 n=38	Grade 2 n=14	Grade3 n=8	Grade4 n=7	Total n=67	Test of Sig.	p-value
pH (Mean ±SD.)	7.38± 0.03	7.37 ± 0.02	7.27± 0.03	7.17± 0.13	7.34± 0.08	F=46. 81	<0.001*
Sig. between Groups	p1=0.06, p2, p3, p4, p5 and p6 <0.001						
PO_2 (Mean ± SD.)	90.63±1.85	89.93±2.5	81.00±3.1 6	70.85±7.1 3	87.27±7.13	F=98. 35	<0.001*
Sig. between Groups	P1=0.462, p2, p3, p4, p5 and p6 <0.001						
PCO_2 (Mean ± SD.)	34.32±3.99	34±3.49	47.46±1.8 9	56.14±5.4 3	38.10±8.45	F=83. 09	<0.001*
Sig. between Groups	p1=0.794, p2, p3, p4, p5 and p6 <0.001						
HCO_3 (Mean ± SD.)	22.26 ± 1.51	21.64 ±0.50	21.62 ±0.52	22.14 ±1.07	±1.2422.04	F=1.1 8	.3240
WBCs (Mean ± SD.)	7.26 ±1.49	9.34 ±1.72	12.00 ±2.65	14.33 ±2.94	9.00 ±3.04	F=36.7 1	0.001*
Sig. between Groups.	p1=0.001, p2 & p3 <0.001, p4=0.002 and p5 <0.001, p6=0.02						
RBCs (Mean ± S)D.	±0.764.97	4.67±0.73	4.62±0.44	4.41±0.72	4.81±0.74	F=1.71	0.174
Hb (Mean ± SD.)	13.19±1.29	12.72±1.2 8	12.69±0.5 8	13.37±1.6 3	13.05±1.26	F=0.83	0.48
Platelets (Mean ± SD.)	246.8 ±50.4	268.4±75. 1	289.3±54. 6	270.9 ±29.9	258.9±56.2	F=1.65	0.186

SD: Standard deviation, **F**: **F for One-way ANOVA test**,
p_1: p-value for comparing grade 1 to grade 2. P2: value for comparing grade 1 to grade 3.
P3: value for comparing grade 1 to grade 4. P4: value for comparing grade 2 to grade 3.
P5: value for comparing grade 2 to grade 4. P6: value for comparing grade 3 to grade 4.
*: Statistical significance at $p \leq 0.05$

Table (4): Comparison between the specified groups regarding liver enzymes (ALT and AST), blood electrolytes (sodium and potassium), prothrombin time, international normalized ratio (INR), and creatinine (n=67)

	Grade 1 n=38	Grade 2 n=14	Grade3 n=8	Grade4 n=7	Total n=67	Test of Sig.	P
ALT (Mean ± SD.)	22.53±5.45	26.14±6.9 4	41.63±4.8 7	56.57±6.7 5	29.12±12. 59	F=80.4 6	<0.001 *
Sig. between Groups.	p1= 0.053, p2, p3, p4 p,5 and p6 <0.001						
AST (Mean ± SD.)	30.79±9.66	29.64±6.5 2	47±5.61	60.71±8.3 4	35.61±13. 19	F=30.8 8	<0.001 *
Sig. between Groups	**p1=0.671, p2, p3, p4 and p5 <0.001 and p6=0.003**						
Sodium (Mean ± SD.)	136.95±2.9 6	136.71±2. 61	137.25±3. 37	138.43±3. 74	137.09±2. 99	F=0.58 5	0.640
Potassium(Mean ± SD.)	3.95 ±0.42	4.04±0.43	4.11±0.64	3.93±0.54	3.98±0.45	F=0.37 5	0.771
PT (Mean ± SD.)	12.0±0.52	11.93±0.4 3	12.28±0. 20	12.27±0.3 0	12.05±0.4 7	F=1.72 8	0.170
INR (Mean ± SD.)	1.04±0.06	1.04±0.04	1.06 ± 0.05	1.09 ±0.03	1.05 ± 0.05	F=1.78 1	0.160
Creatinine Mean ± SD.	0.81±0.17	0.91±0.27	1.13±0.13	1.34±0.11	0.92±0.26	F=19.0 7	<0.001 *
Sig. between Groups	**P1= 0.09, p2, p3 <0.001, p4=0.01, p5<0.001 and p6=0.03**						

SD: Standard deviation F: F for One-way ANOVA test, p1: p-value for comparing grade 1 to grade 2.
P2: value for comparing grade 1 to grade 3. P3: value for comparing grade 1 to grade 4. P4: value for comparing grade 2 to grade 3. P5: value for comparing grade 2 to grade 4. P6: value for comparing between grade 3 to grade 4. *Statistical significance at $p \leq 0.05$

Table (5): Comparison between the specified groups regarding duration of hospital stay, number of

anti-snake venoms (ASV) vials, and outcome (n=67)

	Severity grades				Total n=67	Test of Sig.	P value
	Grade 1 n=38	Grade 2 n=14	Grade3 n=8	Grade4 n=7			
Duration of hospital stay							
<2days	35(92.1 %)	3 (21.4%)	0 (0.0%)	2 (28.6%)	40 (59.7%)	χ^2=67.5	<0.001 *
2-7days	3 (7.9%)	11 (78.6%)	7 (87.5%)	1 (14.3%)	22 (32.8%)		
>7 days	0 (0.0%)	0 (0.0%)	1 (12.5%)	4 (57.1%)	5 (7.5%)		
Mechanical ventilation	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (100%)	7 (10.4%)	χ^2=67.0	<0.001 *
N of snake antivenom vials							
Median (Range)	6 (5-8)	9.5 (9-12)	20 (15-32)	29 (21-65)	7 (5-65)	H=44.6	<0.001 *
Outcome							
Cured	38 (100%)	14 (100%)	8 (100%)	5 (71.4%)	65 (97.0%)	χ^2=17.67	0.001*
Died	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (28.6%)	2 (3.0%)		

χ^2: Chi-square test, H: H for Kruskal Wallis test, *: Statistical significance at $p \leq 0.05$

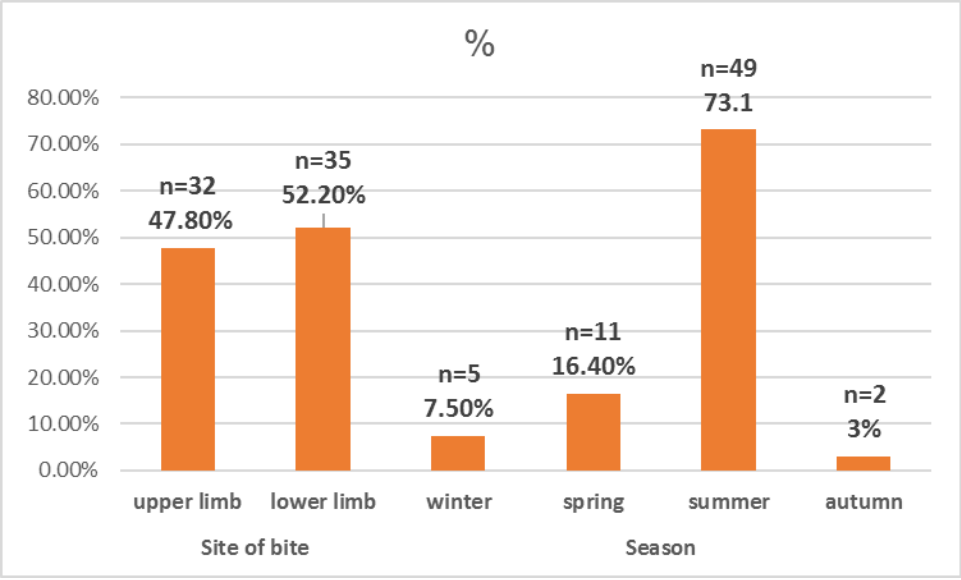

Figure (1): Distribution of snake bite cases regarding the site of bite and season of occurrence (n=67)

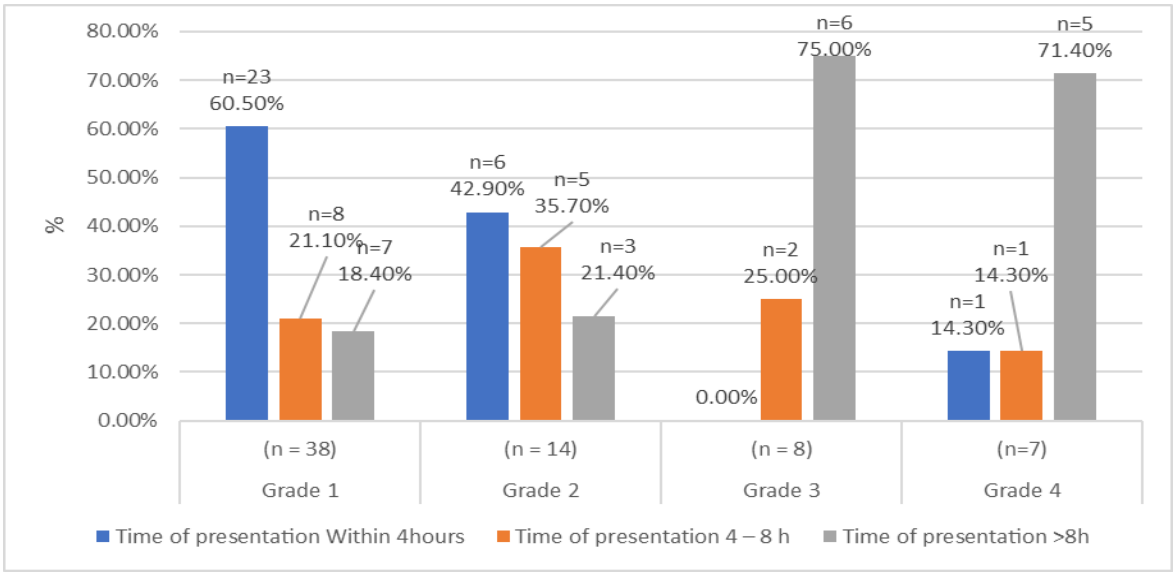

Figure (2): Comparison between severity grades of snakebite cases according to time of presentation (n=67) (χ^2=19.291, p=0.004*)

χ^2: Chi-square test *: Statistically significant at $p \leq 0.05$

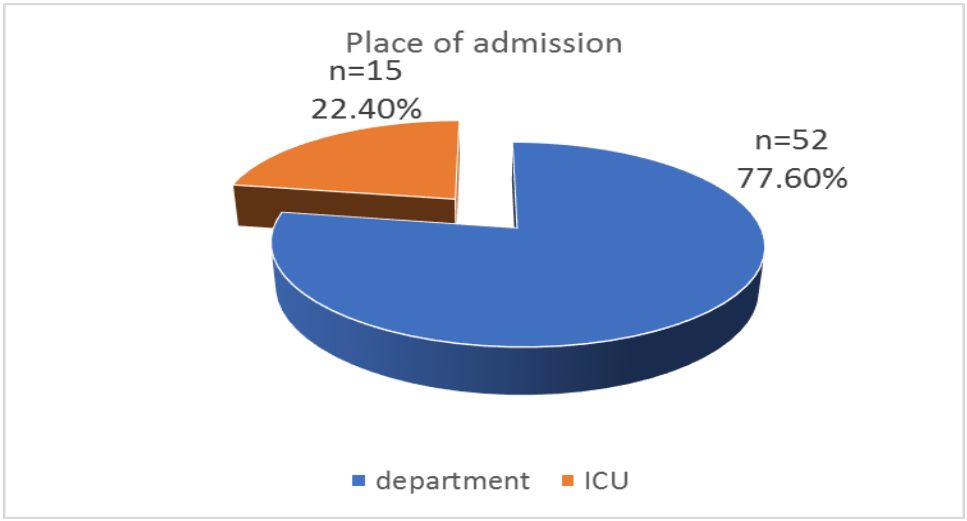

Figure (3): Place of admission of snake bite patients

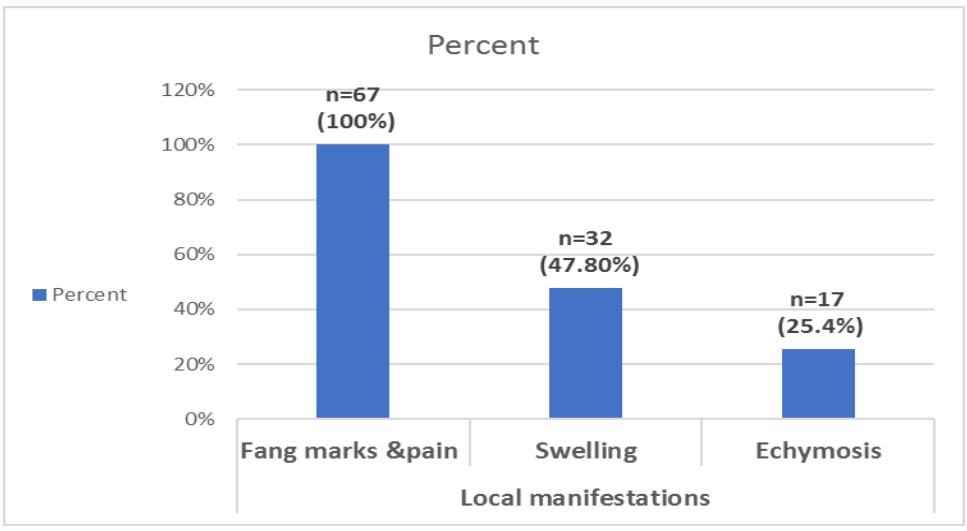

Figure (4): Percent of local manifestations in snake bite patients (n=67)

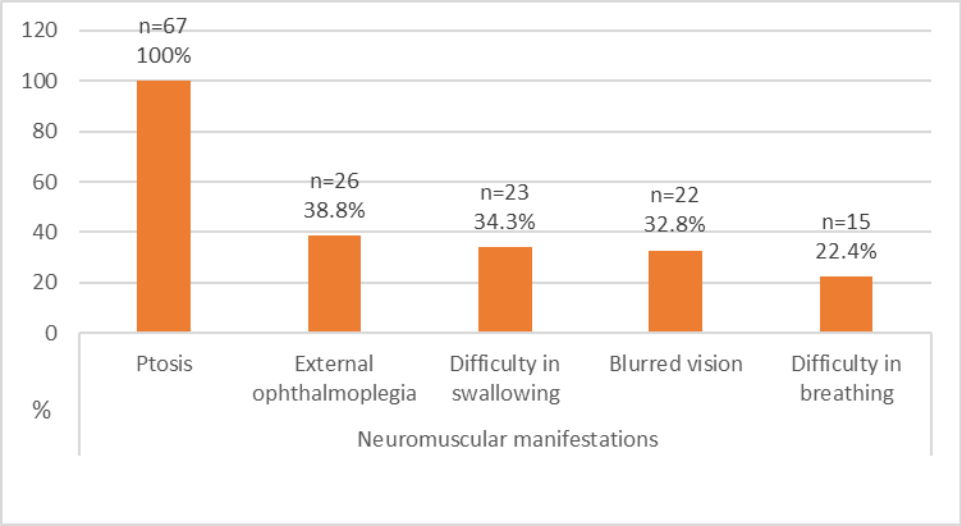

Figure (5): Percent of neuromuscular manifestations in snake bite patients (n=67)

DISCUSSION

Snakebite is an outstanding but neglected health problem in tropical areas (**Warrell, 2010**).

In the present study, most of the patients were middle-aged, as this is the age when activities related to work indoors or outdoors take place. A similar result was noted by **Casewell et al., 2020 and Saleh, 2023.**

Considering sex, most cases in total were males, which agrees with **Kumar et al., 2018**. Males are more engaged in outdoor and agricultural activities and may work at night, on the counter, females' activities are mainly in their houses and properties (**Dharod et al., 2013).** In contrast, **Casewell et al., 2020** found that females were more suffered from snakebites. This could be due to the different activities and habits of women in these communities or unsafe houses.

Regarding residence, most cases in the current study were from rural areas. These areas contain many rodents which attract snakes **(Kumar et al., 2018**). Bad sleeping habits in open unsecured places, increase the incidence of snakebites in rural areas (**Chaudhari et al., 2014)**.

All cases were bitten on the limbs with a slightly higher proportion in lower limbs. Snakes usually bite humans on the lower limbs; the main reason for this could be the habit of walking barefoot in fields (**Zubair et al., 2022**). This result was the same as **Satyanarayan et al., 2022.**

Most snakebites occur in summer as hot weather is the most suitable time for reptiles to emerge from hibernation to search for food **(Chaudhari et al., 2014)**. The same conclusion was obtained by **Peterson 2006**.

Considering the time of presentation, most of the grade 3 and 4 cases presented after 8 hours. This clarified the importance of rapid transfer of patients to receive appropriate treatment before clinical symptoms worsen. **Dharod et al., 2013** showed a significant association between the development of complications or occurrence of death and delayed transmission to hospital.

Ptosis was the most common presentation of neuromuscular paralysis in all patients in the present study. This was followed by external ophthalmoplegia, difficulty in swallowing, blurred vision, and lastly difficulty in breathing.

Zubair 2022 stated that ptosis was present in all cases of neurotoxic envenomation and respiratory paralysis was the most dangerous manifestation requiring mechanical ventilation. **Kiran and Senthilnathan** 2012 noted the same results.

a significant difference was observed in relation to blood pressure as most of grades 3 and 4 were suffering from hypotension at arrival. Many factors may participate in hypotension development. Venom influences blood vessel permeability and may also increase vasoactive substances, as bradykinin leading to vasodilation and depression of cardiac muscle which may result in hypotension (**Salah Eldin and Hafez 2017).**

Regarding the consciousness level, the percentage of patients with disturbed

consciousness was significantly increased in grade 3 and grade 4. Although the physical characteristics of snake venom components hinder them from passing through blood–brain barrier, the brain may be secondary affected due to respiratory muscles paralysis with development of hypoxemia and hypercarbia (**Bhaumik et al., 2020).**

There a significant affection in the ABGs findings in patients with grade 3 and 4 severity scores. This can be explained by increasing hypoxemia and hypercarbia with the development of respiratory acidosis due to respiratory muscle paralysis (**Bhaumik et al., 2020). Zanaty and Girgis 2010** also concluded that snakebite cases were significantly associated with hypoxia and respiratory acidosis.

Also, a significant increase in mean white blood cell (WBCs) count was found with increasing severity in the studied groups. Similar results were found by (**Elawady and Tawfik 2016)**. The leukocytic changes may be due to the stress response to bite and/or the immunological response to the snake venom **(Karlson et al., 2006**).

Considering serum creatinine, a significant increase was noted in patients with grade 4 snake severity scores. **Dahbord et al., 2013** concluded that snake venom had a bad direct effect on the kidney and the development of hypotension may aggravate this effect**. Alam et al., 2014** also stated that hypotension-related neurological affection, shock, and other organ impairments (e.g. renal affection) are also common with neurotoxic snakes.

Considering liver enzymes (ALT and AST**)**, there was a significant increase in their levels with increasing grade of severity of studied groups. The same results were obtained by **Pałgan et al., 2015** who stated that envenomation following snake bites can result in hepatocyte damage and cell destruction.

A significant difference was noted in relation to hospital stay period as most grade 1 cases stayed for less than 2 days and most grade 4 cases stayed for more than one week. **Al-Asmari**, **2015** noted that there was a significant relation between increasing severity grade and liability for developing complications, the need for a larger dose of antivenom, and prolonged periods of hospital stay.

Regarding the number of snake antivenin vials used, there was a significant increase with increasing grade of severity. There were no detected side effects from antivenin injection in the present study**. Gouda et al., 2017** correlated higher doses of snake antivenin with an increased degree of severity.

Considering the outcome, most cases were cured, and the mortality rate was 3%. The decreased mortality in the present study might be due to the availability of specific treatments and less aggressive types of snakes present in this locality. A low mortality rate was also obtained by **Meenakshi et al., 2017** (2%).

Kumar et al., 2021 explained the low level of mortality in the snakebite population would be due to the better availability of treatment facilities, better awareness regarding the public, and a well-developed protocol for management of snakebite patients by an experienced and trained healthcare team.

World Health Organization (2018) report in hospital-based studies stated that mortality rates ranged from 3% to 20%.

In conclusion, snakebites are a life-threatening condition, In the present study,

The neurotoxin type of snake was the most commonly encountered type of snakebite in the Menoufia governorate. Most patients were males, in the middle age, from rural areas. Ptosis was the most common feature of muscular paralysis. Patients with respiratory failure and needing mechanical ventilation were associated with increased mortality. Laboratory parameters such as ABGs, WBCs, serum creatinine, AST, and ALT were important predictors of severity.

RECOMMENDATIONS

Further multiple toxicological centers studies are recommended to assess the incidence of snakebites and mortalities.

Early transfer, availability of enough antivenin vials, and closed monitoring of clinical and laboratory parameters such as ABGs, WBCs, serum creatinine, AST, and ALT are important predictors of severity and are mandatory in the management of snakebite patients. The availability of enough intensive care unit beds and mechanical ventilators is lifesaving.

For the prevention of snakebites, many means may be effective, such as wearing protective clothes for feet, good illumination in dark places, and proper control of rodents.

LIMITATIONS

The present research was a single-center study with a small sample size. There was an absence of facilities considering venom antigen identification by ELISA or PCR techniques which gives a proper identification of snake species. Hemotoxic snakebites were rarely encountered.

CONFLICT OF INTEREST

The authors had no conflict of interest.

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الملخص العربي

تقييم حالات التسمم بعضة الثعبان " تنبؤات سريرية وكيميائية حيوية "

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يوجد في مصر عدة أنواع من الثعابين السامة. وتوجد هذه الثعابين في أماكن متنوعة في مصر تنتشر من الصحاري الرملية الشاسعة إلى دلتا النيل الخصبة. هدفت الدراسة الحالية إلى تقييم المنبئات السريرية والكيميائية الحيوية لمرضى التسمم بعضات الثعابين الذين تم حجزهم في مركز السموم بمستشفى جامعة المنوفية. **المرضى وطرق البحث**: كانت هذه دراسة قائمة على الملاحظة أجريت على 67 حالة من عضات الثعابين. نم تجميع بيانات المريض بما في ذلك البيانات الاجتماعية الديموغرافية، موقع العضة، موسم حدوث العضة، وقت الوصول إلى المستشفى، الفحص الإكلينيكى وفحص موضع العضة. وتم عمل الفحوصات المختبرية المطلوبة. تم تصنيف الحالات على حسب شدة الأعراض إلى أربع مجموعات. ونم تصنيف مصير الحالات الى شفيت أو توفيت. **النتائج**: بلغ العدد الإجمالي للحالات 67 حالة سمية عصبية. تم تصنيف مرضى السمية العصبية حسب درجة شدة الثعبان العصبي إلى الدرجة 1 (38 حالة)، الدرجة 2 (14 حالة) والدرجة 3 (8 حالات)، والدرجة 4 (7 حالات). كانت معظم الحالات بشكل عام وفئات الشدة المختلفة من الذكور، في الفئة العمرية من 18-60 عامًا، ومن المناطق الريفية. فيما يتعلق بمكان الحجز، تم قبول 77.6٪ من المرضى في قسم السموم وتم حجز باقي الحالات بالعناية المركزة. كانت الإصابات الموضعية لمكان العضة الأكثر شيوعًا هي علامات الأنياب والألم. كان تدلي الجفون أكثر المظاهر العصبية العضلية شيوعًا. تم شفاء معظم الحالات (97٪) بينما توفيت حالتان. ارتبط المرضى الذين يعانون من الدرجات الخطيرة للتسمم من الدرجة الثالثة والرابعة بتأثير مع نقص الأكسجين وزيادة نسبة ثانى أكسيد الكربون، وزيادة عدد خلايا الدم البيضاء، وارتفاع الكرياتينين في الدم، وإنزيمات الكبد. **الخلاصة**: عضات الثعابين من الأمور التي تهدد الحياة، في هذه الدراسة كانت لدغات الثعابين التى تؤثر على الجهاز العصبى من أكثر أنواع الثعابين شيوعًا في محافظة المنوفية. ارتبط المرضى الذين يحتاجون إلى جهاز التنفس الصناعى بزيادة معدل الوفيات. كانت التحاليل المعملية مثل غازات الدم الشرياني، وعدد خلايا الدم البيضاء، ونسبة الكرياتينين في الدم، وإنزيمات الكبد من العوامل الهامة للتنبؤ بالحدة عضة الثعابين. يوصى بإجراء المزيد من دراسات مراكز السموم المتعددة لتقييم حدوث لدغات الثعابين والوفيات والمراقبة للعلامات السريرية والتحاليل المعملية في إدارة مرضى عضات الثعابين. مع توافر أسرة العناية المركزة الكافية وأجهزة التهوية الميكانيكية لإنقاذ حياة المرضى.