

Clinical and Laboratory Findings and Prognosis of Snake and Scorpion Bites in Children under 18 Years of Age in Southern Iran in 2018-19

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Abstract

Background

Biting is one of the major medical and social problems in many tropical and subtropical regions, including the Middle East. Identification of clinical signs and other factors in children and adolescents is important. The aim of this study was to evaluate the clinical and laboratory symptoms and prognosis of snake and scorpion bites in children under 18 years.

Materials and Methods: This retrospective descriptive study was performed on 60 bite patients with an age range of one month to 18 years in Ali-Ibn-Abitaleb hospital of Zahedan, Iran. Demographic data, bite characteristics and clinical symptoms were recorded from files withdrawn from hospital data center. Frequency of studied variables was expressed as percentage.

Results: From all patients 32 (53.3%) were male and 28 (46.7%) were female with mean age of 9.73 ± 4.26 years. The most children with scorpion or snake bite were male gender, older than 10 years, more happened in summer, represented mostly by pain, swelling in the area, hematuria (58.3%), and hepatic enzymatic abnormalities. 95% of patients had complete recovery without complications and only 5% recovered with complications. Most of them took less than an hour to reach the clinic.

Conclusion

Due to the high prevalence of scorpion bites in specific seasons and the lack of specificity of clinical signs and symptoms, it is necessary to treat patients in case of high-risk bites.

Key Words: Children, Clinical symptoms, Laboratory, Snakebite, Scorpion bite.

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1- INTRODUCTION

Scorpion is one of the major medical and social problems in many tropical and subtropical regions, including the Middle East (1). In Iran, due to the climate and variety of scorpion species, bites from different parts of the country are annually reported. Especially in the hot months of the year, and according to the Director General of the Ministry of Health's Prevention and Fighting Against Diseases Act, in the year 2017, there were 33,731 cases of scorpion stings, of which 39 of them resulted in death, 23,437 of them (70 percent) occurred in Khuzestan province, and 32 (82 percent) of them died.

The statistics show that the highest rate of scorpion stings and the highest number of deaths are in Khuzestan province (2). The prevalence of scorpion sting in the cities of Masjid Suleiman is 27.1%, Ramhormoz 26.6%, Izeh 15.3%, Shush 12%, Baghmalek 11.7%, and Behbahan 7.3% (3). Gadium scorpion is the most dangerous scorpion in Khuzestan province (4). In Khuzestan province, 12% of scorpions are related to Gadium, whereas 95% of deaths following scorpion stings are related to bites from this species (5). Its venom is cytotoxic and hemotoxic which can affect all organs and can be life threatening (4). This animal is abundantly found in Khuzestan province, especially in the east and north, in short shelters or habitats. In Khuzestan, the prevalence of bites is higher in May and October (6).

Scorpions are more common in the northern areas of Khuzestan. Ramhormoz and Masjid Soleiman, located northeast of Khuzestan province, are reportedly two of the most important scorpion stings sites, according to local health authorities in Khuzestan province (7). Symptoms of scorpion stings are usually delayed. Symptoms are topical like other bites, such as pain, blisters, redness, and swelling. Within hours of the bite, symptoms of pulse rate increase, hypertension,

dizziness, nausea and vomiting, dyspepsia, shortness of breath, convulsions, and increased salivary secretion may occur in the individual (8). Often, severely ill patients have more pronounced neurological symptoms, such as seizures, drowsiness, distraction, restlessness, nausea, headaches, and possibly cyanosis, symptoms of acute and chronic psychiatric disorder (9). Scorpion venom most commonly affects the central nervous system, cardiovascular system, skin and blood cells (9). It can also cause severe hemolysis of red blood cells, impaired vascular system, impaired pumping and heart rhythm, and respiratory failure. Moderate to severe hemoglobinuria has also been reported in scorpion bites (10).

About 3,500 species of snakes are known worldwide, and about 600 of them are poisonous. Snakes exist in most parts of the world. Toxic snakes are found in most parts of the tropical and temperate regions of the world, although they are more numerous in tropical or subtropical areas. These animals have an elongated body with no limbs, bladder, outer and middle ear. Bite snake poisoning can occur from the injection or absorption of the toxin through cuts or scratches. Snake poisons are complex compounds and contain proteins that have enzymatic activity.

The effects caused by the toxins are: neurotoxic effects (neurotoxicity) with sensory, motor, cardiac and respiratory problems. Cellular toxic effects appear on red blood cells, blood vessels, heart muscle, kidneys and lungs. Coagulation defects and the effects of local release of substances by enzymatic action are also noted. Clinical signs and symptoms of snakebite depend on several factors, such as the type of snake (the chemical composition of the snake varies), the age of the snake and the amount of venom injected, the presence of various bacteria in the snake's mouth, the location of the bite, the age and the victim's weight, any

underlying disease, and the amount of activity and mobility after the bite (11-13). Pain and inflammation progress to the central part of the body and to the trunk. Redness of the skin and the blisters and swelling of the lymphatic vessels in the organ are selected and the progression of redness and swelling to the central parts of the body occurs. The edges of this area are very painful and touch sensitive. Nausea, vomiting, dizziness, weakness, Hypotension, fever, chills and sweating, needles or tingling around the lips and mouth, bleeding from the nose, blood in the urine or stools, shortness of breath, with symptoms appearing to be divided into mild and severe depending on the type and the amount of toxin (11-13):

- Mild snakebite symptoms:

Inflammation, discoloration, low back pain, heartburn, rapid beating, general malaise, nausea, vomiting, visual impairment.

- Severe snakebite symptoms:

Inflatable swelling and weakness, pain, pinpoint pupils, self-twisting, delirium, shock, convulsions, paralysis, lack of pulse (11-13).

As mentioned, the scorpion bite and snake bite in Iran are high due to the high abundance of these animals. It was also pointed out that the coagulation and hematology problems are very critical in the victims. Since each of these poisonings has its own symptoms, recognizing the symptoms and their prognosis is effective in treating patients. Therefore, the aim of this study was to evaluate the clinical and laboratory symptoms and prognosis of snake bites and scorpion sting in referred children to Ali-Ibn-Abitaleb Hospital of Zahedan considered as a reference hospital in Sistan and Baluchistan province of Iran to investigate the prevalence of this event and its clinical symptoms.

2- MATERIALS AND METHODS

2-1 Study design and population

This retrospective descriptive study was performed to evaluate the clinical and laboratory symptoms and prognosis of snake and scorpion bites in children under 18 years of age referring to Ali-Ibn-Abitaleb Hospital of Zahedan city, Iran.

2-2 Methods

After making the necessary coordination with the hospital management and medical records, the list of all patients with scorpion bites between September 2018 and September 2019 were provided to the plan administrator and then the records were reviewed.

2-3 Measuring

After entering the study, demographic information, clinical findings (swelling, discoloration, pain, palpitations, rapid beating, general malaise, nausea, vomiting, visual impairment, rapid swelling and numbness of the body, pinpoint pupils, Self-twisting, delusions, shock, seizures, paralysis, lack of pulse), type of bites (snake bites and scorpions), location of bites (including hands, feet, trunk, face and neck), patient tests (including CBC tests, coagulation factors, liver and kidney tests), complications (coma, tissue necrosis and renal complications, rhabdomyolysis), and mortality were recorded. It should be noted that throughout the study, the patients' personal information was only available to the project manager and every effort was made to protect the information.

2-4. Data Analysis

All patient information including demographic factors, clinical and paraclinical symptoms were recorded in a checklist made by the executor and finally entered into SPSS software for analysis.

3- RESULTS

In this study 60 cases of scorpion and snake bites were studied as case entered to study, 32 (53.3%) were male and 28

(46.7%) were female. The results of our study showed that the mean age of the subjects was 9.73 ± 4.26 years (range 1-18 years) (**Table.1**). Of the 60 patients included in the study, 38 had scorpion bite (63.3%) and 22 (36.7%) had snake bites. As shown in the **Table.1**, most children

were older than 10 years (41.7%), and were male (53.3%). According to the available statistics, the most frequent bite was in the lower extremities (46.7%), and then in the upper extremities (43.3%) (**Table.2**).

Table-1: Age and Sex Distribution of Children with scorpion and snake bite.

Variables	Sub-group	Frequency	Percentage
Age	Less than 5 years old	11	18.3
	5-10 years old	24	58.3
	More than 10 years old	25	100.0
Gender	Male	32	53.3
	Female	28	100.0

Table-2: Frequency distribution sites of bites in children with snake and scorpion bites.

Variable	Region	Frequency	Percentage
Bites	Upper extremity	26	43.3
	Lower extremity	28	90.0
	Head and neck	2	93.3
	Trunk	4	100.0

In post-bite symptoms, as seen in **Table.3**, the most frequent clinical symptoms were pain (96.7%), swelling (63.3%), discoloration (53.3%), nausea (43%), rapid pulse (35%) and the lowest frequency was related to paralysis (zero), pinpoint pupils (1.7%), delirium (3.3%), absence of pulse (3.3%) and seizure (8.3%). Investigation of laboratory findings showed that the most frequent abnormalities included hematuria (58.3%), liver problems (30%), anemia (26.7%), coagulopathy (16.7%), and kidney involvement (6.7%). The laboratory findings are fully illustrated in **Table.4**. In this study, it was shown that

95% of patients had complete recovery without complications and only 5% had complications with no morbidity and mortality. The high and good prognosis of this study was due to the presence of toxicology in the mentioned hospital and prompt treatment of patients. Complications evaluation showed 80% without complications, 7 patients (11.7%) had decreased consciousness, 3 patients (5%) had renal impairment and 2 patients (3.3%) had rhabdomyolysis (**Table.5**). As shown in previous studies (14-17), 63.3% of bites were in summer, 25% in spring, 8.3% in autumn, and 3.3% in winter.

Table-3: Frequency distribution of clinical symptoms of children with snake and scorpion bite.

Variables	Sub-group	Frequency	Percentage
Symptoms	Inflammation	38	63.3
	Color change	32	53.3
	Pain	58	96.7
	Sense of tickling	8	13.3
	Tachycardia	21	35.0
	Weakness	18	30.0
	Nausea	26	43.3

	Vomiting	13	21.7
	Blurred vision	9	15.0
	Swelling	12	20.0
	Pinpoint pupils	1	1.7
	Twisting	12	20.0
	Delusion	2	3.3
	Shock	8	13.3
	Seizure	5	8.3
	Paralysis	0	0
	Absence of pulse	2	3.3

Table-4: Frequency distribution of abnormal tests of children with snake and scorpion bites.

Variable	Subgroup	Frequency	Percentage
Laboratory Data	Coagulation tests	10	16.7
	Liver	18	30.0
	Kidney	4	6.7
	Hematuria	35	58.3
	Hemoglobin drop	16	26.7

Table-5: Frequency distribution of complications in snake and scorpion bite.

Variable	Subgroup	Frequency	Percentage
Complications	Non	48	80.0
	Renal	3	5.0
	Coma	7	11.7
	Rhabdomyolysis	2	3.3

4- DISCUSSION

The aim of this study was to evaluate the clinical and laboratory symptoms and prognosis of snake and scorpion bites in children under 18 years of age referred to Ali-Ibn-Abitaleb Hospital in Zahedan, Iran, in 2018-2019. From all sixty cases, 32 (53.3%) were male and 28 (46.7%) were female. The results of our study showed that the mean age of the subjects was 9.73 ± 4.26 (1-18 years) and most of the children were older than 10 years (41.7%). Of the 60 patients included in the study, 38 had scorpion bite (63.3%) and 22 (36.7%) had snake bites. The highest frequency of bites was in lower extremities (46.7%) and upper extremities (43.3%). The most frequent clinical symptoms were pain (96.7%), swelling (63.3%), discoloration (53.3%), nausea (43.3%), rapid beating (35%) and the least frequent occurrence was related to paralysis (zero), pinpoint pupils (1.7%), delirium (3.3%),

absent pulse (3.3%) and seizure (8.3%). The most common laboratory abnormalities were hematuria (58.3%), hepatic disorders (30%), hemoglobin decreasing (26.7%), coagulopathy (16.7%) and renal involvement (6.7%). 95% of patients had complete recovery without complications and only 5% had complications with no mortality. 11.7% of patients had coma, 5% had renal complications and 3.3% had rhabdomyolysis. 63.3% of bites were in summer, 25% in spring, 8.3% in autumn and 3.3% in winter. 41.7% of patients visited the clinic in less than one hour, 30% between 1 and 2 hours, 15% between 2 and 3 hours, and 13.3% more than 3 hours. In a study conducted by Vazirianzadeh et al. in the first six months of 2007 in Ahwaz, it was shown that the rate of scorpions was 50.3% among male and 49.7% in female patients (14). The results of this study are about the higher prevalence in men, similar to our study. A

study by Ozkan et al. (2006) found that pain at the site of stinging, sweating, fever, and hypertension was a common symptom. In more severe cases pulmonary edema, central nervous system disorders and death can also be due to cardiac dysfunction and cardiac muscle injury (15). The results of this study on general symptoms are consistent with the findings of our study. In a study by Abdollahi Fard et al., patients who referred to medical centers in Jahrom between the years of 2001 and 2003 were evaluated for clinical signs and treatment for scorpion sting, suggesting that the most common site for scorpion sting was hands, 50.8%, and 33.3% was in the legs and the rarest site of bite was chest and back.

The most important symptoms were local pain (88.9%) and regional redness (68.3%). Other symptoms included cardiovascular problems with palpitations (46%), respiratory symptoms and dyspnea (56.7%), (16). While the most common site of bite was lower extremities in our study, the most common symptoms were pain the same as this study. In a study by Al Asmari et al., conducted on 251 cases of scorpion sting in Saudi Arabia between years 1986 and 2000, 95% of patients had localized pain and 78.3% had various systemic symptoms, the most common of which was perspiration, hypertension, and salivary secretion (17).

The results of this study are consistent with the findings of our study. In the study of Hosseini Nassab et al., published in 2009 in which 301 patients were diagnosed with scorpion sting in the south of Kerman province over a period of 3.5 years, out of 301 cases of scorpion-bites, 146 were women (48.5%) and 155 persons were male (51.5%). The average age of males was 25 and the average age of females was 23 years. Among the age groups, the highest and lowest percentages of bites belong to the age groups of 70 years and above, respectively. 45.8% of bites happened in the hands, 47.5% in the legs,

2% in the head and neck and 4.7% occurred in the trunk. The highest incidence of scorpion bites is from May to September. In most cases, hospitalization time is less than 3 hours (238 cases, 71.9%). Clinical manifestations include pain (86%), redness (2.7%), anesthesia and drowsiness (9.6%) and severe muscle pain (1.7%) have been recorded. In terms of the effect of bites on the nervous system, 3% of the subjects had sympathetic stimulation, 1% parasympathetic stimulation, 0.7% central nervous system symptoms, and 5% were asymptomatic. One case presented with vomiting, discoloration of the urine, and decreased consciousness resulting in death. The second case was a three-year-old child who died of pulmonary edema (18).

The results of this study are in line with the findings of our study. A study conducted by Chaichi in 2005 showed that more than 100,000 people were bitten by scorpion in Iran every year, of which children are the main victims (75%), and at least 60000 cases are fatal. Between 35 and 40% happen in spring and more than 60% in summer in Ahwaz region (19). The results of this study on the prevalence of bites in summer and spring are similar to our study, except that no mortality was noted in our study. This difference may be due to differences in sample size, in demographic characteristics, in inclusion and exclusion criteria, and the type of bites. In another study by Al Asmari et al., published in a 2-year period (2012) at two hospital centers in Riyadh, Saudi Arabia that examined the clinical frequency of scorpion sting, reported that 63% cases were female and 37% were male. The worst clinical effects were in the age group of 21–30 years, with more incidence summer months, at night and at distal extremities. Most patients were admitted to the hospital within the first hour. Yellow scorpion sting was more common than black scorpion, with 75% of patients

having localized sign and symptom versus 25% showing systemic symptoms of poisoning. Thus, the study is more prevalent in the Riyadh region with mild signs and symptoms without any mortality, and in the Riyadh region, the prevalence of less dangerous scorpion species is more common (20). The results of this study regarding the symptoms and non-mortality are consistent with the findings of our study, although the prevalence in women was low in our study. In a study by Kathiri et al. (2012), in a one-year period, 524 patient's files were studied in Khuzestan.

The prevalence of scorpion bite was 69.3%. The most involved age group was 15-24 years old and 69.3% of bites happened in citizen areas. 57.6% of patients were male and 42.4% were female. The prevalence of bite sites were hands, legs, trunk, head and neck respectively (21). The results of this study related to the location of the bites and the demographic characteristics are different from our study. This difference may be due to differences in sample size, differences in demographic characteristics, in inclusion and exclusion criteria, and in the type of bites. In a study by Qeshlaqi et al. (2010), in Noor and Khorshid hospitals in Isfahan, the majority of cases of scorpion bites (74.8%) were men and the most commonly bitten age group was 20-30 years old. Summer had the highest incidence (65.3%).

The minimum time between scorpion bite and emergency services was 10 minutes and the highest rate was 48 hours. Lower extremity bite (57.1%) as the most common site and neck (2%) as the least common were reported. The type of localized reaction observed in the bite site according to incidence was pallor, erythema, inflation and erythema and swelling combination respectively. In general, most cases, 75.5%, had no local reaction. No cases of necrosis or blackness were observed among the patients studied

(22); while our study found that topical reactions, especially pain and swelling and discoloration, were high, but reported below 20%. This difference is due to differences in the type of population studied and the type of sting. In a study presented by Rafizadeh and colleagues in 2012, it was reported that 44,366 cases of scorpions bites were reported in 2009. The majority of cases of them were males (51.8%). 40.5% of cases were bitten in the lower extremities and 40.3% in the upper ones (23). The results of this study are in line with the findings of our study. The study of Bosnak et al., was conducted at a hospital in southeastern Turkey on 52 children (ages 1.5 to 15 years old) bitten by a toxic scorpion to predict the need of Intensive Care Unit (ICU). The most frequent bite site (48%) was lower limbs, with most occurring in the summer (78%).

Cold extremities (39%) and tachycardia (39%) were the most clinical findings. 31 patients (60%) were admitted from a rural area. Hospitalization from a rural area was a specific risk factor for severe toxicity. 20 patients (38.5%) had serious symptoms of toxicity for ICU admission. Finally, no useful epidemiological and demographic information was found to guide the need for pediatric ICUs in scorpion victims and it was suggested that decision-making for pediatric ICU admissions should be based on Systemic signs and symptoms (24).

However, in our study just less than 12% had coma and required ICU admission. This difference may be due to differences in sample size, differences in demographic characteristics, and differences in inclusion and exclusion criteria and differences in the type of bites. A retrospective study by Tan et al. (2013) in a Singapore hospital on 13 scorpion patients over a 5-year period was conducted. The most common symptoms reported were pain (92%), local anesthesia (31%), and weakness (23%), and the most signs reported were swelling (77%), tenderness (77%), and edema

(46%), respectively. Abscess, anaphylaxis, cellulitis requiring hospitalization was seen in 3 patients. No deaths were recorded, and all patients recovered well. So scorpion bites were uncommon at this center and most bites had a local reaction. They were controlled by supportive treatment (25). However, our study found that the most common symptom was pain and then discoloration (swelling), and edema. In a retrospective study published by Isbister et al., in 2003 on 95 patients that examined the clinical and environmental effects of Australian scorpion stings (three species of Buthidae, Bothriuridae and Urodacidae), the most cases of sting were reported to be by Buthidae (76%), occurring more often between 18pm and 8am, and at home and at distal extremities. All patients had immediate local pain, with severe pain in 80%; other local effects included redness (66%), tenderness (35%), anesthesia (12%), and paresthesia (11%).

Mild systemic effects (nausea, headache and Anorexia) occurred in 11% and no deaths or severe systemic effects were reported. Therefore, bites of these three Australian species of scorpions do not appear with severe or life-threatening effects, even in children, and severe poisoning is caused by bites of other scorpions (26). The results of this study are in line with the findings of our study. In a study published by Imam et al., in 2002, on 66 patients with scorpion bite from Gadium scorpion referred to the Hindijan Health Center, total blood count and renal failure were evaluated in patients. 51.1% were in age group of 20-40 years. Most laboratory changes were seen in partial thromboplastin time (PTT) (72.7%). Hematuria was observed in 83.3% and hemoglobinuria was seen in 42.4% of patients. Anemia was detected in 31% (27). The results of this study are in line with the findings of our study. A study by Besharat et al., aimed to investigate one hundred snakebite cases at Loghman

Hakim Hospital from 2000 to 2005 showed that among one hundred cases, all patients received anti venom, tetabuline and tetanus vaccine and all were treated with antibiotics. In 9 cases fasciotomy was performed. In 35 cases, local treatments were performed prior to referral to the hospital, such as rubbing and sucking discharge. The patients were mostly male and in half of the cases they were farmers, and bites occurred in more than 80% of the cases in the lower limbs. In the end, it was concluded that despite mortality in snakebite, therapeutic measures including antivenom, tetabuline, and tetanus vaccine could play a significant role in the improvement of patients. Antibiotic treatment and the type of antibiotic are controversial. Some traditional methods for treating snakebite have been rejected and prevention of snakebite has been emphasized (28). The results of this study are in line with the findings of our study. In another study conducted by Hafizi et al., to investigate the frequency of clinical symptoms of snakebite patients admitted to Ahwaz Sina Hospital in 2006, 287 cases of snakebites patients were studied, 73.5% were male and 66.9% of patients were in the age group of 21 to 60 years.

The most common site of bite was the lower extremities and the most frequent complaint initially was pain (74.6%) and edema (43.9%). All patients received antivenom, the majority of them were between 5 and 10 vials. The most common systemic disease was coagulopathy (70.7%). In the treatment process, 25.7% of patients received Fresh Frozen Plasma (FFP), and 19.5% received Packed Cell (P.C). 48.1% of patients were admitted to ICU. 50.9% of patients were hospitalized for less than 3 days. Three deaths occurred. There was a significant relationship between the time of onset of antivenom after bites and the rate of coagulopathy ($P = 0.035$), and FFP ($P=0.029$), and Pack Cell transfusion

($P=0.038$). In the end, it was concluded that a quick referral to health centers and initiation of treatment would reduce the incidence of coagulopathy and decrease the need for blood products (29). The results of this study are in line with the findings of our study.

5- CONCLUSION

The results of the present study showed that most children with scorpion or snake bite were male gender, older than 10 years, were in summer, had pain symptoms, swelling in the area, hematuria (58.3%), and hepatic enzymatic abnormalities. 95% of patients had complete recovery without complications and only 5% recovered with complications. Therefore, given the high prevalence of scorpion bites in specific seasons and the lack of specificity of clinical signs and symptoms, it is imperative to have quick response for patients suspected of high-risk animal bites.

6- AUTHOR CONTRIBUTIONS

S.H.S and Z.T analyzed the data and S.H.S wrote the first draft of this manuscript. E.S. did data-cleaning and supported analysis of the data and then reviewed all statistical analyses and critically revised this manuscript. The authors read and approved the final manuscript.

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8- CONFLICT OF INTEREST: None.

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