

Evaluating Some Medical Lab Parameters among Hospitalized Children In Khuzestan Following Scorpion Sting, SW Iran

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Abstract

Scorpion stings are reported in the world including Iran. All of people special the children in Khuzestan a SW province of Iran are at the risk of scorpion envenomation of *Hemiscorpius lepturus* and *Androctonus crassicauda* as the most important scorpions in the region. Data of the present research have come from 179 files of scorpion stung hospitalized children who referred to different hospitals in Khuzestan during different years. The data of scorpion stung children were described and analyzed from points of epidemiologic, hematologic, biochemical and Urine analysis. The most frequent age of scorpion stung children was between 5-10 year old with frequency of 78 (43.6%). Hemoglobinuria values were introduced as the most clear parameter to distinguish the kind of scorpion agent among the children.

Key words: Scorpion sting, Medical lab parameters, Khuzestan, Iran

INTRODUCTION

Every year, more than one million cases of scorpion stings are reported in the world. Scorpion stings are a common and important health problem in Iran [1-3].

Particularly in south and southwestern Iran, including the province of Khuzestan. All of people in Khuzestan are at the risk of scorpion envenomation, however, the children are the second rank as the popular group whom are stung by scorpions after the housekeepers in Khuzestan Vazirianzadeh et al. [4]. Vazirianzadeh and Samie [5] and Chitnis et al. [6] have obtained the similar results to the above study from Khuzestan hospitals.

There are 19 reported scorpion species from Khuzestan recently Mirshamsiet al. [7] but the people are involved with three main species of them including:

Hemiscorpius lepturus, *Androctonus crassicauda* and *Mesobuthus eupeus* with 33.9%, 37.7% and 24.3% of scorpion sting frequencies based on reporting from Abozar hospital of Ahvaz (capital of Khuzestan province), respectively Vazirianzadeh et al. [4]. Vazirianzadeh and Samie [5] but two species of *H. lepturus* and *A. crassicauda* are the most medical importance orderly Mohseni et al. [2], Vazirianzadeh et al. [8].

Hemiscorpius lepturus is the most dangerous of all types of scorpions in the region, and contributes to 95% of all mortalities in scorpion stung patients [9-13]. Its venom is mainly hemolytic which is manifested with hematuria and hemoglobinuria leading to severe systemic pathology including: severe and fatal haemolysis, secondary renal failure, fatal failure of the kidney and death. Venom of *H. lepturus* is also with cytotoxic and neurotoxic effects, which is manifested with cutaneous necrosis, deep and necrotic ulcers, ankylosis of the joints and psychological

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problems [11,14-18]. This scorpion species is distributed in Iran, Iraq, Pakistan, and Yemen [19].

Androctonus crassicauda is the second most dangerous scorpion in Iran [9-11,16] and its toxin venom is neurotoxic which causes severe pain, autonomic CNS, muscle function disturbances, and death [9].

Although there are a few reports regarding hospitalized children in Khuzestan due to their clinical and epidemiological information but there are less information regarding their emergency para-clinical situations in this province.

Therefore, the current retrospective study was carried out to investigate the main emergency para-clinical data in hospitalized children with stung scorpion events because the envenomation in children is more severe than adults. The hematology and urinal data of stung children were considered due to definitive and unknown scorpion species. This helps to realize the accurate prognosis and institute adequate treatments in stung scorpion children in hospitals and ICUs.

MATERIALS AND METHODS

Data of the present research have come from 179 files of scorpion stung hospitalized children who referred to different hospitals in Khuzestan during different years.

This research was a descriptive retrospective and analytical study. The related information were described from points of epidemiologic, hematologic and urinal data using percentage basis and crude regardless the scorpion species and related to recognized scorpion species. The scorpion species were recognized using Farzanpay's [20] key of Iranian scorpions when the scorpions were present.

The data of scorpion stung children described and categorized into: 1-Epidemiologic data including: age, sex and death. 2-Hematologic data were rates of hematocrit and hemoglobin 3-Biochemical data was calculation of BUN. 4-Urine analysis included hemoglobinuria.

The above obtained data were analyzed statistically due to species of scorpions using binomial test and squared chi method by SPSS software.

RESULTS

Epidemiologic Data

Obtained results of current study showed that 89 persons (49.7%) were females and 90 (50.3%) males. The mean

age parameter was determined 6.3 ± 3.3 year old with 0.8 as minimum and 14.0 as maximum year old. The age parameters were categorized into 3 groups: lower 5 year old with frequency of 81 (45.3%), between 5-10 year old with frequency of 78 (43.6%) and upper 10 year old with frequency of 20 (11.2%). The epidemiologic data explained 4 cases of death (2.2%).

The data of current study explained that definitely two species of *A. crassicauda* and *H. lepturus* were present in envenomation of hospitalized children in Khuzestan with 48 (26.8%) and 81 (45.3%) frequencies, respectively. The rest of scorpions were remained unknown with 50 (27.9%) frequency.

Hematologic Data Analysis

Two parameters of hematocrit and hemoglobin were monitored among the hospitalized children.

Hematocrit Data Analysis

The minimum and maximum rates of hematocrit percentages were determined as 6% and 49%, respectively with the mean of $34.68\% \pm 5.36$ among the hospitalized children in the current study. Normal rate was selected as 37-47 percent. Results of descriptive analysis explained that 105 persons (58.7%) were in lower parts of abnormal data, 72 persons (40.2%) in normal rates of data and 2 persons (1.1%) in upper parts of abnormal data. A binomial statistic test were taken to evaluate the rates of hematocrit data. The results of binomial test showed a significant different between normal rate and lower part of abnormal hematocrit data after pooling upper part of abnormal data and normal rate of hematocrit data (P-value = 0.03). It means the total of scorpion stings caused a significant reduction in hematocrit rates of the victims among children.

Hemoglobin Data Analysis

The minimum and maximum rates of hemoglobin were determined as 2 and 15.1 mg/dl respectively with the mean of 11.54 ± 1.74 mg/dl among the hospitalized children in the current study. Normal rate was selected as 12-16 mg/dl. Results of descriptive analysis explained that 94 persons (52.5%) were in the lower parts of abnormal data and 85 persons (47.5%) in normal rates of data (pooling children data with normal rate in the upper rate of abnormal hemoglobin). A binomial statistic test were taken to evaluate the rates of hemoglobin data. The results of binomial test did not show a significant different between normal rate and lower part of abnormal hemoglobin data after pooling upper part of abnormal data and normal rate of hemoglobin data (P-value = 0.55). It means the total of scorpion stings did not cause a significant reduction in hemoglobin rates of the victims.

Biochemical Data Analysis

Biochemical data was calculation of BUN.

The minimum and maximum rates of biochemical were determined as 5 and 89 mg/dl, respectively with the mean of 14.41 ± 9.62 mg/dl among the hospitalized children in the current study. Normal rate was selected as 6-20 mg/dl. Results of descriptive analysis explained that 34 persons (19%) were in the upper parts of abnormal data and 145 persons (81.0%) in normal rates of data (pooling children data with normal rate in the lower rate of abnormal BUN). A binomial statistic test were taken to evaluate the rates of BUN data. The results of binomial test showed a significant different between normal rate and upper part of abnormal BUN data after pooling lower part of abnormal data and normal rate of BUN data (P-value=0.0001). It means the total of scorpion stings did not cause a significant raising in BUN rates of the victims among children.

Urine Analysis

Urine analysis included hemoglobinuria values. Totally, 41.3% of victims did not show hemoglobinuria and the rest of 58.7% demonstrated hemoglobinuria in the different rates from trace to bloody urine. Table.1 is presenting frequencies of severity of this factor among the hospitalized children after scorpion sting.

Comparison Between Para Lab Medical Data Analysis After Scorpion Sting Regarding Species

Hematocrit data

A squared chi analysis (value:5.26, df=2 and sig=0.07) showed that there was not an overall significant difference among 3 groups of scorpion species (*A.crassicauda*, *H.lepturus* and unknown species) (Table 2). It means all 3 groups have similarly decreased the percentage hematocrit data among 3 groups of scorpion species in the hospitalized children. This comparison has come after pooling normal and upper rate of abnormal hematocrit data.

Hemoglobin data

A squared chi analysis (value:5.26, df=2 and sig=0.04) showed that there was an overall significant difference among 3 groups of scorpion species (*A.crassicauda*, *H.lepturus* and unknown species) (Table 3). Two by two comparisons showed that overall significant has come from comparison between *H.lepturus* and unknown species (value:5.5, df=1 and sig=0.02). This comparison has come after pooling normal and upper rate of abnormal hemoglobin data.

UN data

A squared chi analysis (value:6.62, df=2 and sig=0.047) showed that there was an overall significant difference

Table 1: Distribution frequency of hemoglobinuria in hospitalized children following scorpion sting

Hemoglobinuria	Frequency	Percentage
0	74	41.3
Trace	21	11.7
1	21	11.7
2	19	10.6
3	23	12.8
4	16	8.9
Blood	3	1.7
Total	177	98.9
Missing	2	1.1
Total	179	100

Table 2: Distribution frequency of hematocrit changes in hospitalized children following scorpion sting

Species of scorpions	Hematocrit rate distribution		Total
	Decreased rate	Normal rate*	
Scorpion			
A*			
Count	25	23	48
% within scorpion	52.1	47.9	100.0
H*			
Count	55	26	81
% within scorpion	67.9	32.1	100.0
U*			
Count	25	25	50
% within scorpion	50.0	50.0	100.0
Total			
Count	105	74	179
% within scorpion	58.7	41.3	100.0

A* *A.crassicauda*, H* *H.lepturus*, U* unknown species

Normal rate*-pooling upper rates of abnormal hematocrit and normal rate of hematocrit

Table 3: Distribution frequency of hemoglobin changes in hospitalized children following scorpion sting

Species of scorpions	Hemoglobin		Total
	Decreased rate	Normal rate*	
Scorpion			
A*			
Count	22	26	48
% within scorpion	45.8	54.2	100.0
H*			
Count	51	30	81
% within scorpion	63.0	37.0	100.0
U*			
Count	21	29	50
% within scorpion	42.0	58.0	100.0
Total			
Count	94	85	179
% within scorpion	52.5	47.5	100.0

A* *A.crassicauda*, H* *H.lepturus*, U* unknown species

Normal rate*-pooling upper rates of abnormal hemoglobin and normal rate of hemoglobin

among 3 groups of scorpion species (*A.crassicauda*, *H.lepturus* and unknown species) (Table 4). Two by two comparisons showed that overall significant has come from comparison between *H.lepturus* and *A.crassicauda* species (value:5.97, df=1 and sig= 0.02). This comparison has come after pooling normal and lower rate of abnormal hemoglobin data.

Urine data

The distribution of hemoglobinuria according to scorpion species is presented in Table 5. The results confirmed the hemoglobinuria in all 3 groups of scorpions in the different rates of this parameter, however *H.lepturus* venom caused hemoglobinuria in a various rate in all victims.

A Chi squared test was taken to evaluate hemoglobinuria according to each species after pooling all rate of hemoglobinuria data against hemoglobinuria of 0 and trace.

Table 4: Distribution frequency of BUN changes in hospitalized children following scorpion sting

Species of scorpions	BUN		Total
	Normal rate*	Increased rate	
Scorpion			
A*			
Count	44	4	48
% within scorpion	91.7	8.3	100.0
H*			
Count	60	21	81
% within scorpion	74.1	25.9	100.0
U*			
Count	41	9	50
% within scorpion	82.0	18.0	100.0
Total			
Count	145	34	179
% within scorpion	81.0	19.0	100.0

A* *A. crassicauda*, H* *H. lepturus*, U* unknown species
 Normal rate*-pooling upper rates of abnormal hemoglobin and normal rate of hemoglobin

The result is in the Table 5 according each species. It means *H.lepturus* is the main causing of this parameter in the child victims following scorpion stings (value: 133.37, df=2 and sig=0.0001). The rates of hemoglobinuria were 93.8% in *H.lepturus* stung children and 16.7% in *A.crassicauda* stung children.

DISCUSSION

Epidemiological Data

Scorpionism studies in Iran have been focused on Khuzestan province data. Almost all of them have demonstrated that two species of *A.crassicauda* and *H.lepturus* are the major agents of scorpionism in Iran including Khuzestan as the most important scorpion sting focus in Iran.

Scorpion stings represent an important and serious public health problem worldwide due to their high incidence and potentially severe and often fatal clinical manifestations, especially among children. Pipelzadeh et al. [15] also reported that *H. lepturus* is responsible for 10–15% of scorpion sting however Vazirianzadeh et al. [4] and Chitnis et al. [6] reported that *H.lepturus* was responsible for 30% of scorpion stings.

Results of current study describes that hospitalized children data as the result of scorpion sting follow the above aforementioned pattern which means both scorpions were the major species of scorpionism in Khuzestan with the frequencies of 45.3%, 43.6% and 11.2% for *A.crassicauda* and *H.lepturus* and unknown species, respectively. It is assumed that unknown species in the current study should be more likely included *H.lepturus* and *M.eupeus* and with lesser likely *Compsobuthus spp* [21, (Farzanpay 1987, 1994). According to obtained data which will be discussed later in the present paper.

Table 5: Distribution frequency of hemoglobinuria changes in hospitalized children following scorpion sting

Species of scorpions	Degree of hemoglobinuria							Total
	0	1	2	3	4	Trace	6 (blood urine)	
Scorpion								
A*								
Count	34	1	4	1	0	6	0	46
% within scorpion	73.9	2.2	8.7	2.2	0.0	13.0	0.0	100.0
H*								
Count	5	20	15	22	16	0	3	81
% within scorpion	6.2	24.7	18.5	27.2	19.8	0.0	3.7	100.0
U*								
Count	35	0	0	0	0	15	0	50
% within scorpion	70.0	0.0	0.0	0.0	0.0	30.0	0.0	100.0
Total								
Count	74	21	19	23	16	21	3	177
% within scorpion	41.8	11.9	10.7	13.0	9.0	11.9	1.7	100.0

A* *A. crassicauda*, H* *H. lepturus*, U* unknown species

Vazirianzadeh et al. [8] described that children are one of the largest populations of scorpionism victims in Khuzestan. Results of present study explain that the most frequent victim children were under 10 years old with 88.9% frequency which is accordance with study of Vazirianzadeh and Samie [5], Vazirianzadeh et al. [8], Chitnis et al. [6] and Pipelzadeh et al. [15] in Khuzestan.

Results of the present study showed that there was not any significant between male and female frequencies among the scorpion stung children and it is in accordance with the results of Dehghani et al. [22,23] in Kashan; they reported that the percentage of stings were about the same for males and females. This rate is not consistent with results of Vazirianzadeh and Samie in Khuzestan [5]. The results of the present study were also not in accordance with the results of Al-Sadoon and Jarrar [24] and Jarrar and Al-Rowaily [25] in Saudi Arabia. This could be due to different methods and geographical locations in the different studies.

The epidemiologic data explained 4 cases of death (2.2%). All the death cases were female. Three of them were stung by *H.lepturus* and the fourth by *A.crassicauda*. All *H.lepturus* cases caused +1- +2 hemoglobinuria with 19-50mg/dl of BUN and 2-10mg/dl of hemoglobin.

Hematocrit Data Analysis

Results of the current study describe that the overall value of hematocrit has been decreased by scorpion stings among the children, significantly, and there was not a statistically different among the three groups of scorpion agents in decreasing this value in the hospitalized children, however, *H.lepturus* has decreased value of hematocrit among 67.9% of the children as the most sever agent. These results are also similar to the results of Vazirianzadeh and Samie [5], Emam et al. [26,27], Pipelzadeh et al. [16] in Khuzestan province in the reduction of hematocrit. Lack of significant different between *H.lepturus* and unknown species regarding decreasing hematocrit is referred to species composition of the 3rd group. It is assumed that this group is included some *H.lepturus* scorpions that caused a reduction in hematocrit values among the children. The haematological results from mice showed a significant reduction in hematocrit levels following *H.lepturus* stings too [28].

Hemoglobin Data Analysis

Results of the current research described that the total of scorpion stings did not cause a significant reduction in hemoglobin rates of the victims. However, 63% of

H.lepturus stung children demonstrated hemoglobinuria over this study and this rate was 45.8% and 42.0% for *A.crassicauda* and unknown species, respectively. The only significant different was between *H.lepturus* and

unknown species which means a large part of this group included *M.eupeusas* a weak producing hemolysis species. In the other hand *A.crassicauda* has a potent of strong hemolysis property in its venom because there was not any significant difference between this species and *H.lepturus* in hemoglobinuria producing. However its venom has a strong neurotoxic property.

BUN data analysis

The present study explains that overall value of BUN has not been increased following scorpion stings. Data analysis describes that *A.crassicauda* stings have not raised the BUN among hospitalized children significantly. The results show 91.7% of children had normal BUN, however 74.1% and 82% of victims had normal BUN values following stings of *H.lepturus* and unknown species respectively. Results of Table 4 explains that 25.9% of *H.lepturus* victims had abnormal BUN as the biggest value. It means that unknown species are included *H.lepturus* and other species which raised BUN in 18% of victims but this frequency was 8.3% among *A.crassicauda* victims.

In the present research study, BUN results in the Stung children were in the normal rates, and there was not any significant difference between those rates and normal values (means \pm SD, Table 4). These results are similar to the results of Vazirianzadeh and Samie [5] and Mohseni et al. [2]. Consequently, BUN values are not fitted as a major marker in regards to scorpionism in this region, according to the early results of the biochemical tests of scorpion stung patients. However, measuring these levels may become necessary later because secondary renal failures due to scorpion stings have been reported by several authors in Khuzestan.

Increasing BUN and CR levels in sting victims are good indicators of renal failure following a scorpion sting [9,10,29,30].

Urine analysis data

Results of Tables 1 & 5 showed that both *A.crassicauda* and *H.lepturus* caused significantly hemoglobinuria following their stings in the children with different rates of severity, however *H.lepturus* stings caused the majority and the most severity hemoglobinuria among the children and 19.8% *H.lepturus* hemoglobinuria were as +4 but this rate was 0 frequency regarding *A.crassicauda* stings. Hemoglobinuria has happened in 30% of stung children at trace degree in group of unknown species and the rest did not demonstrate hemoglobinuria. Therefore, the majority of unknown species should be *M.eupeus*.

An overall squared Chit test between two groups of none hemoglobinuria (0 and trace) and hemoglobinuria (pooling

+1,+2,+3,+ 4 and bloody urine data) showed a significant different (squared chi value:110, df= 2 and P-value=0.0001). Table no.5 shows that the biggest values of hemoglobinuria are belonged to *H.lepturus*Stings. This fact is accordance to the results of Mohseni et al. [2], Emam et al [26], Emam et al [27], Radmanesh [10] and Radmanesh [11] which have demonstrated *H.lepturus*venom with hemolytic property.

CONCLUSION

Based on the current study it is concluded that both *H.lepturus* and *A.crassicauda* are main agents of scorpion stings in Khuzestan Province that leading to hospitalization of children in clinical centres. However, *H.lepturus* stings because of having hemolytic property are more serious than *A.crassicauda* stings.

However, all the above mentioned tests are assumed are necessary for children patients following scorpion stings but the urine analysis tests from point of finding hemoglobinuria is the golden test to distinguish the scorpion sting agent from the other scorpion species.

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