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SERUM ELECTROLYTE CHANGES IN PEDIATRIC PATIENTS STUNG BY SCORPIONS

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ABSTRACT: Scorpion sting is a health problem in some places of Mexico. The clinical manifestations of scorpion envenomation are variable and include metabolic alterations. Hyperkalemia is the most frequently reported metabolic alteration. We conducted a prospective, observational, descriptive and transversal study in an emergency room at Hospital del Niño Morelense, Mexico. Eighty-two patients were included and classified as mild (17%) moderate (33%) and severe (46%). The mean serum level of sodium was 146.4meq/l, standard deviation (SD) 5.58; potassium 3.86meq/l, SD 0.53, and calcium 9.55mg/dl, SD 0.76. We found 30.4% hypernatremia, 12% hypokalemia, 10.9% abdominal distension, and 14.6% visual alterations.

KEY WORDS: serum electrolytes, scorpion stung children.

CONFLICTS OF INTEREST: There is no conflict.

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INTRODUCTION

Scorpion stings currently represent an important public health problem. In 1998, scorpion stings ranked 15 among the 20 most important recorded diseases in Mexico. The state of Morelos in Mexico has a high prevalence rate of scorpion sting cases (6). On average, at “Hospital del Niño Morelense” (HNM) in Cuernavaca, Morelos, over 30 cases of scorpion stings are reported monthly and are the third cause for urgent medical care (Department of Statistics and Information, HNM).

Certain factors are known to contribute to the severity of scorpion sting envenomation, among which are the patient’s age and health status, as well as the involved scorpion species (4, 5).

Scorpion venom acts on the sodium-potassium pump, producing from local symptoms to systemic problems which lead to changes in the victim’s life.

Current studies on the toxins mechanisms of action have shown that they act on cell membranes producing changes on the trans-membrane action potential and permeability changes in calcium and potassium channels altering the release of neurotransmitters such as acetylcholine (2). One of the main metabolic changes produced by scorpion stings is hyperkalemia.

In Mexico, there is one report on hyperkalemia and hyponatremia in scorpion-stung children as part of the clinical manifestations. However, in HNM, we have reports of hypokalemia and hyponatremia. In the case of hyponatremia, we think this could explain abdominal distention caused by hypokalemic intestinal paralysis and hypernatremia, the cause of irritability and sleepiness manifested by our patients. In view of this situation, we aimed at studying scorpion-stung children with a clinical record of not having received any treatment 24 hours after the sting (1, 3).

Thus, a prospective, observational, descriptive and transversal study was carried out at the HNM Emergency Service where patients suspected of having been stung by a scorpion provided blood sample for the measurement of serum sodium, potassium and total calcium levels. Blood samples were collected before the application of anti-scorpion serum. The patients were classified depending on the envenomation severity into mild, moderate and severe. This classification is based on Mexican Official Health Norms.

The administered treatment consisted of chlorpheniramine, 0.09mg/kg, hydrocortisone, 10mg/kg, and an intravenous injection of anti-scorpion serum

independent of the patient's age or weight, with repeated dosages until the abatement of symptoms.

Patients with mild envenomation were observed for an hour.

We only used descriptive statistics for this study.

Eighty-two patients were included in the study, 49 (52.7%) of them were male. The majority of the patients had symptoms related to scorpion envenomation. Only 17% had mild symptoms, and the remaining were classified as having moderate or severe symptoms (Figure 1).

The patients' mean age was 60 months, ranging from 6 to 156 months. Mean weight was 17kg (range: 6.5–97kg).

The mean time to onset of care after the scorpion sting was 40min (minimum: 5min; maximum: 300min).

The average serum sodium level was 146.4±5.58 (Table 1). The average potassium level was 3.86±0.53 (Table 2), and the average serum calcium level was 9.55±0.76 (Table 3). We detected 13% hyperglycemia, 30.4% hypernatremia, 1.2% hyponatremia, 12% hypokalemia and no hypokalemia.

Weight and age are factors that have been described as determining for the envenomation severity. However, our study did not show statistically significant results. Nonetheless, we did note that the group with the most severe symptoms was the youngest group of children.

Patients with severe symptoms tended towards hypernatremia, whereas potassium levels were low, causing hypokalemia. These electrolytic changes, both hypernatremia and hypokalemia, were seen to normalize only with the antivenom injection without the need of applying any specific treatment.

It is worth mentioning that we observed metabolic activity of the ileum in 10.9% of the cases.

Other observed alterations were diplopia, 14.63%, local hyperemia, 2.4%, and conjunctival hyperemia, 1.2%; we did not observe cardiac alterations in our patients.

Calcium has always been a controversial topic for the treatment of scorpion sting envenomation. In our patients, serum calcium levels were within normal limits. We suggest removing calcium from the current therapeutic scheme for treating scorpion stings.

All alterations were absent after the treatment with antivenom.

The onset time of care after a scorpion sting is an important factor in the degree of severity and the presence of complications. We saw that patients treated earlier had less severe symptoms. The later patients were treated, the more severe their envenomation state. Therefore, patients treated later were clinically worse. This translates into a probable relationship between immediate medical care and the presence of severe envenomation.

Further clinical studies should be conducted correlating serum electrolytes and electrocardiograms when the patient is admitted to verify whether hypokalemia is the cause of QT segment lengthening and cardiac changes described by other authors, and whether hypernatremia could be associated with the irritability seen in envenomed patients.

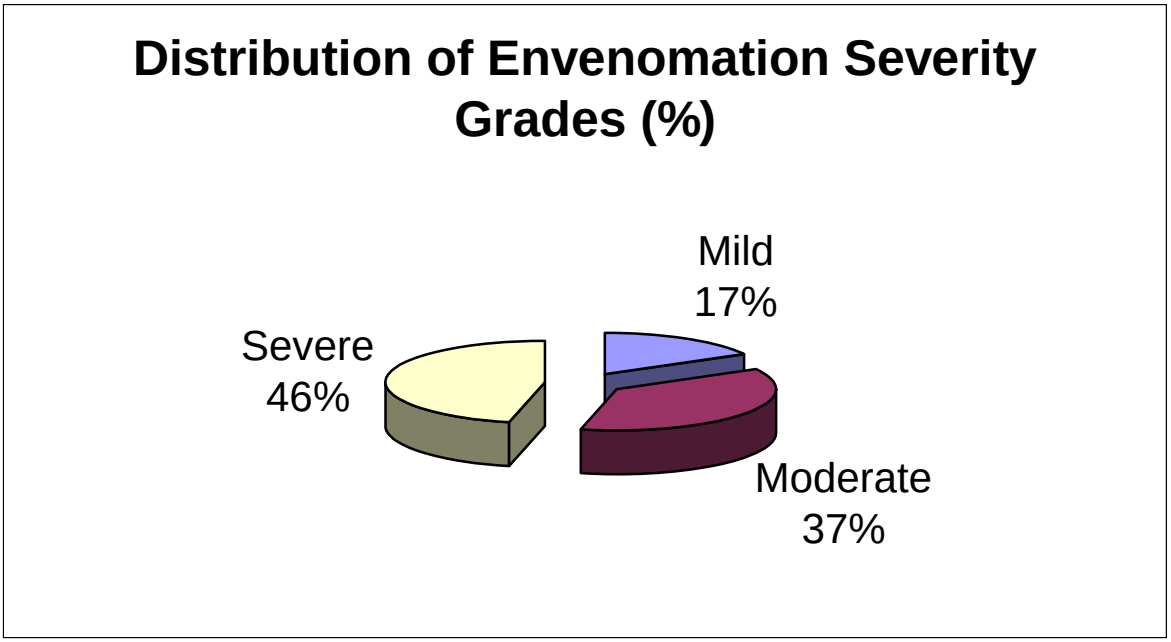

Figure 1. Distribution of envenomation severity grades.

Table 1. Serum sodium levels according to symptomatology (n=82).

Symptomatology	**Number of Patients**	**Sodium (mean meq/l)**	**Standard Deviation**
Mild	14	144.93	1.77
Moderate	30	146.57	6.93
Severe	38	146.89	5.33
Total	82	146.44	5.58

Table 2. Serum potassium levels according to symptomatology (n=82).

Symptomatology	**Number of Patients**	**Potassium (mean meq/l)**	**Standard Deviation**
Mild	14	4.03	0.323
Moderate	30	3.80	0.43
Severe	38	3.85	0.64
Total	82	3.86	0.53

Table 3. Serum calcium levels according to symptomatology (n=67).

Symptomatology	**Number of Patients**	**Calcium (mean mg/dl)**	**Standard Deviation**
Mild	8	9.15	0.56
Moderate	25	9.57	0.72
Severe	34	9.64	0.82
Total	67	9.55	0.76

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