EVALUATION OF ANTI VENOM THERAPY EFFECTIVENESS IN SCORPION ENVENOMATION

KHWAJA ZAFAR AHMED, SALAH-UD-DIN* AND ABDUL REHMAN AL-SAADI**
Ziauddin College of Pharmacy, Ziauddin University, Karachi,
*Department of Biochemistry, Hamdard College of Medicine and Dentistry,
Hamdard University Karachi
**King Fahad Hospital, Al-Baha Saudi Arabia

ABSTRACT
The envenoming of the humans caused by the scorpion is the major cause of severe clinical problems or lead to death. Scorpion sting is the significant cause of mortality and morbidity in humans all over the world. Scorpion stings are a major public health problem in many underdeveloped tropical countries. For every person killed by a poisonous snake, 10 are killed by a poisonous scorpion. The present study was designed with the objective to evaluate effectiveness and comparison of the anti venom therapy of two different protocols in scorpion envenomation caused by the two different types of scorpion species. The present study was carried out King Fahad Hospital AL BAHSA Saudi Arabia from (1985 to 1991) and January 1992 to December 1998. Nine hundred patients divided in to two groups such as group A and group B were included in this study. Two hundred and three patients (45.3%) of group A and group B were stung by the yellow scorpion [Leiurus Quinquestriatus], fifty five (12.2%) patients of group A and group B were bitten by the stings of the black scorpion [Neboheirichonitious] and one hundred and ninety nine (42.66%) patients of group A and group B were stung by the unidentified scorpion. The clinical manifestations and complications of envenomation such as pain, fever, headaches, vomiting, difficulty in breathing, sweating, pulmonary edema and death were observed and recorded. Pulmonary edema was one of the prevalent complications among the patients having scorpion envenomation regardless of the type of the scorpion. Anti venom therapy of the two different protocols was given to group A and group B patients. Anti venom therapy of the new protocol was found very effective in reducing the clinical characteristics and complication of envenomation as compared to the old protocol. We there for conclude that anti venom therapy is effective in all type of scorpion envenomation and it should be administered earlier as soon as possible.

Keywords: Scorpion Envenomation; Anti venom Therapy; Effectiveness.

INTRODUCTION
The envenoming of the humans caused by the scorpion is the major cause of severe clinical problems or lead to death. Scorpion sting is the significant cause of mortality and morbidity in humans all over the world. Scorpion stings are a major public health problem in many underdeveloped tropical countries. For every person killed by a poisonous snake, 10 are killed by a poisonous scorpion. In the Middle East envenomation by scorpion sting is also a major health problem and the prevalence of the human envenomation from the venomous animals is as equal as all over the world (Wirtz and Azad 1991). Among the 650 different species of the scorpion worldwide only two are common in Al-Baha region of Kingdom of Saudi Arabia [KSA]. Among these two one is the yellow scorpion [Leirurus Quinquestriatus] where as other one is black scorpion [Neboheirichonitious] (Buchel, 1971 and Brennann et al., 1989). The clinical sign and
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Symptoms following stings vary significantly and it depends on the venom composition, amount of the venom-injected size, sex, nutritional state and geographic region where the animal was captured. In addition to this it also depends upon the victim's demographic characteristics and vulnerability to the venom. The signs occur within a few minutes after the sting and usually progress to a maximum severity within 5 hours. The signs last for 24-72 hours and do not have an apparent sequence. Thus, predicting the evolution of signs over time is difficult. Furthermore, a false recovery followed by a total relapse is common. In general the children are more affected as compared to the adults. Children present with the same symptoms and signs as adults, except their symptoms are more severe and protracted. Treatment of the scorpion envenomation depends on the severity of the signs and symptoms of the toxic component of the venom. The patient of
scorpion envenomation may develop systemic inflammatory response syndrome. Mucopolysaccharides, hyluraunidase, phoslipase, serotonin, histamines and neurotoxins constitute the scorpion venom. The important clinical effects of envenomation are neuromuscular, neuroautonomic or local tissue effect. The victims may exhibit signs and symptoms involving the central nervous system, stimulation of the Autonomic nervous system, failure of the respiration, heart failure and death due to cardio pulmonary arrest. Respiratory failure and cardiovascular manifestation are the usual causes of death (Karnad 1998). The severity of the scorpion envenoming and the rapid diffusion require that the appropriate treatment be started as soon as possible after the sting. Most investigators consider antivenom to be the only specific treatment for envenoming by the scorpion stings. However others have questioned the usefulness of antivenom in the eliminating cardiovascular manifestations of scorpion stings (Abroug et al., 1999). The treatment for the scorpion envenomation comprised of specific treatment such as antivenom and non specific or symptomatic treatment in Kingdom of Saudi Arabia the Saudi ministry of health policy is to give 5ml of the antivenom by intravenous route to all cases. The change in the dosages of antivenom was allowed according to the severity of the envenomation.

**SUBJECT AND METHODS**

The present study was carried out King Fahad Hospital AL BAHA Saudi Arabia from January 1992 to December 1998. In addition to this a retrospective data (from 1985 to 1991) of patients with scorpion envenomation who were fulfilling the inclusion and exclusion criteria of the present study was also collected from the hospital record for the comparison. The aim of this comparison was to evaluate the effectiveness (new protocol and the oldest protocol) of the antivenom of the Saudi government. The oldest protocol (1985 to 1991) for the utilization of the anti venom therapy in cases of scorpion stings was administration of only 1 ml of the antivenom or none of the antivenom and only supportive medicines were been given at that time. From 1992 onwards the protocol for the treatment of scorpion sting cases was modified with instruction that every patients except those they were showing any hypersensitivity to the anti venom therapy must be given 5ml of the anti venom by intravenous route. The dose can be repeated depending upon the signs, symptom and complications. Nine hundred patients were enrolled and divided in to two groups such as Group A and Group B.

**Group A:** Included four hundred and fifty subjects. These were the subjects who have been given the anti venom therapy with old protocol [1 ampoule]. They were sex matched to group B.

**Group B:** Included four hundred and fifty subjects. These were the subjects who have been given the anti venom therapy with new protocol [5 ampoule or more anti venom]. They were sex matched to group A. The data collection for various groups was standardized through the use of similar methodology, protocol and procedure using a standard questionnaire. Informed consent was obtained from the patients who were enrolled for the study.

**STATISTICAL ANALYSIS**

Comparison of difference between Control and Subject groups was made by using difference in percentages.

**RESULTS**

Table 1 shows the comparison of number and percent values of demographic and clinical characteristics of group A and group B patients. The group A and group B were comprised of 279(62%) male and 171(38%) females. The patients of two groups were matched by the age and sex. In age three sub groups were made, such as age between 15-25 years, 25-50 years and >50 years the numbers and percent of the patients in both the groups
were 48 (62%), 226(50.22%) and 76(16.88%) respectively. Table one also showed the number and percent of the patients stung by the scorpions of different species and by unidentified scorpions. The number and percent of the patient bitten by the yellow scorpion, black scorpion and by unidentified scorpion was matched among the two groups and was 203(45.3%), 55(12.2%) and 192(42.66%) respectively.

Table 2 shows comparison of clinical sign and symptoms like pain, sweating, burning sensation, vomiting, breathlessness, generalized symptoms and pulmonary edema (Pre treatment) of group A and group B patients. The number and percent of group A patients who were experienced pain, sweating, burning sensation, vomiting, breathlessness, generalized symptoms and pulmonary edema were [410 (91.11%), 112 (24.88%), 221 (49.1%), 105 (23.33%), 180 (40%), 216(48%) and 53 (11.77%)] respectively as compared to the group B patients [418 (92.80%), 171 (38%), 211 (46.88%), 203 (45.3%), 279 (62%), 171 (38%) and 57 (12.66%) respectively].
The most prevalent complain was of pain in both the groups, where as sweating, vomiting, breathlessness and pulmonary edema were more prevalent in group B as compared to the group A. Burning sensation and generalized symptoms were experienced by higher number of group A patients as compared to the group B patients.

Table 3 shows comparison of numbers and percent of group A and group B patients having reduction in the severity of clinical characteristics and outcome (Post Treatment). The overall number and percent of patients having reduction in severity of clinical characteristics was significantly high in group B (85.55%) as compared to 234 (50%) of group A. Similarly percent reduction in severity of other clinical characteristics such as pain, sweating, burning sensation, vomiting, breathlessness and pulmonary edema were also observed by the higher number of group B patients treated by the new protocol [348 (77.33%), 141 (31.33%), 190 (42.22%), 183 (40.66%), 249 (55.33%) and 54 (12%) respectively] as compared to the group A patients treated by the old protocol [234 (50%), 218 (48.44%), 89 (19.77%), 147 (32.66%), 89 (19.77%), 132 (29.33%) and 37 (8.22%) respectively]. The generalized symptoms was the only characteristic that was found reduced in higher number of patients of group A 170 (37.7%) as compared to the group B patients 139 (30.88%). But the percent reduction in comparison of the pre treatment group, the reduction of the generalized symptoms was experienced by higher percentage of patients (81.28%) in group B as compared to the (78.70%) in group A. the hospital stay in days was found higher in group A (6-12) days as compared to (3-6) days of group B patients. Similarly the outcome in terms of death was also higher in group A (6, 1.33%) as compared to the (1, 0.2%) of group B patients.

Table 4 shows inter group and intra group comparison of number and percent of patients having reduction in severity of clinical characteristics and outcome (post treatment). The table also shows the frequency of patients has not been relieved by the treatment or they were having mild complaints. It is reveled from the table that the higher number and percent of patients were having improvement in their clinical characteristics and outcome.
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The percentage of patients they were not having much improvement in their clinical characteristics such as pain, sweating, burning sensation, vomiting, breathlessness, generalized symptoms and pulmonary edema were higher in group A [46.82%, 20.53%, 33.48%, 15.23%, 26.66%, 21.29% and 30.18%] as compared to the Group B patients [16.74%, 17.54%, 9.95%, 9.85%, 10.75%, 18.71% and 5.26% respectively]. Figure 1 and figure 2 shows the two different species of scorpions.

**DISCUSSION**

Envenomation by scorpion stings is a major public health problem all over the world especially in the tropics; countries. The black and the yellow scorpion are the most dangerous scorpions (Ghalim et al., 2000). Scorpions are widely distributed in Saudi Arabia. Scorpion venom is soluble and antigenic. It is composed of a variety of substances including mucus, polynucleotide, small organic molecules, salts, and nontoxic proteins. The venom of some scorpions also contains a number of basic polypeptides and neurotoxins (Yarom 1970; Watt and Simard 1984). The major components of scorpion venom are comprised of short-chain peptides that affect sodium and potassium channels in excitable tissues. The toxins in the scorpion venom will block voltage-dependent inactivation of sodium channels and results in persistent depolarization of the channels (Massensini et al., 2003). Beta-toxins will make the membrane potential more negative that results in making the tissues more excitable. The toxins will also slow the repolarization due to the block of potassium channels that prolongs the action potential in neurons and monocytes. This result in persistent depolarization of the autonomic nerves and with the release of higher amount of neurotransmitters from the adrenal medulla, parasympathetic and sympathetic nerve endings. This out flow is responsible for the toxic cardiovascular manifestations. The toxin may also directly affect myocardial

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**Table-4**

Inter Group and Intra Group Comparison of Number and Percent of Patients having Reduction in severity of Clinical Characteristics and outcome (Post Treatment)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>(Group A) (n=450)</th>
<th>Frequency of patients not relieved</th>
<th>(Group B) (n=450)</th>
<th>Frequency of patients not relieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Treatment</td>
<td>Post Treatment</td>
<td>Pre Treatment</td>
<td>Post Treatment</td>
</tr>
<tr>
<td>Pain</td>
<td>410 (91.11%)</td>
<td>218 (48.44%)</td>
<td>418 (92.88%)</td>
<td>348 (77.33%)</td>
</tr>
<tr>
<td>Sweating</td>
<td>112 (24.88%)</td>
<td>89 (19.77%)</td>
<td>171 (38%)</td>
<td>141 (31.33%)</td>
</tr>
<tr>
<td>Burning Sensation</td>
<td>221 (49.1%)</td>
<td>147 (32.66%)</td>
<td>211 (46.88%)</td>
<td>190 (42.22%)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>105 (23.33%)</td>
<td>89 (19.77%)</td>
<td>203 (45.3%)</td>
<td>183 (40.66%)</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>180 (40%)</td>
<td>132 (29.33%)</td>
<td>279 (62%)</td>
<td>249 (55.33%)</td>
</tr>
<tr>
<td>Generalized symptoms</td>
<td>216 (48%)</td>
<td>170 (37.7%)</td>
<td>171 (38%)</td>
<td>139 (30.88%)</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>53 (11.77%)</td>
<td>37 (8.22%)</td>
<td>57 (12.66%)</td>
<td>54 (12%)</td>
</tr>
</tbody>
</table>

The values are expressed as number (n) and percent (%).
contractility and excitability (Sofer, 1995). Central nervous system effects include irritability, muscle rigidity, altered consciousness and convulsions (Teixeira et al., 2001). Multiple retrospective reviews and case series suggesting that scorpion antivenom is safe and effective (Sofer, 1994). Ghalim et al. (2000) found clinical improvement and outcome of patients having scorpion envenomation by antivenom therapy. De Rezende et al. (1995) and Krifi et al. (1999) in their studies have showed good evidence regarding intravenous administration of antivenom and reduction in serum venom concentrations. Severe envenomation results in pulmonary edema. Cardiogenic shock represents the most severe stage of scorpionism (Karnad, 1998). Gueron et al., (1986) have also demonstrated the interstitial edema, cellular infiltration and myocarditis with focal areas of myocardial degeneration and necrosis in patients dying of scorpion envenomation. The present study was generally based on the clinical observation, outcome and improvement by the antivenom therapy. In our study we have found a highest number and percentage of the patients having improvement in their clinical characteristics and out come by five ampoules (new protocol) of the antivenom as compared to the one ampoule old protocol our results are in agreement with Ghalim et al. (2000) and (Sofer, 1994). We have also demonstrated lower hospital stay in group B patients treated by the new protocol as compared to the group A treated by the old protocol this is in contrast to the Sofer et al., 1994 and Belghith et al., 1999 who have demonstrated no significant difference in hospital stay in their studies. Similarly the percentage of death was high in group A as compared to the Group B and this is in agreement with the Belghith et al., 1999. The over all clinical characteristics were improved more in group B treated by new protocol as compared to the group A treated by old protocol. We therefore conclude that new protocol of antivenom therapy of scorpion envenomation is more effective than the old protocol. We therefore suggest that along with the all other supportive therapy antivenom therapy should be administered, in order to achieve the better outcome and rapid improvement.

REFERENCES


