Epidemiological and clinical survey of scorpionism in Khuzestan province, Iran (2003)

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ABSTRACT

Epidemiological and clinical survey of scorpion envenoming was carried out by statistical method of stratified cluster random sampling in Khuzestan, the southern province of Iran, cross-sectionally. We analyzed 12,150 cases recorded in Emergency Unit of the hospitals of six cities in Khuzestan province during the year 2003. The prevalence rate of human scorpion stings in the province is 3.1/1000 inhabitants. The percentage of prevalence in selected cities was as follows: Masjed-Soleiman (27.1%), Ramhormoz (26.6%), Izeh (15.3%), Shush (12%), Baghmalek (11.7%), and Behbahan (7.3%). The scorpions, responsible for the majority of stings in Khuzestan province of Iran were identified as 53.3% yellow ([Mesobuthus eupeus], [Hottentotta saulcyi], [Odonthobuthus doriae] and [Hemiscorpius lepturus]), and 17.4% black ([Androctonus crassicauda] and [Hottentotta schach]), and 29.3% unknown colors. Most stings occurred throughout the year, however, the highest and lowest frequency occurs in June (16.0%) and February (0.6%), respectively. Nocturnal envenomations (60.9%) were more common than diurnal (39.1%), and 39.3% of stings were on the hands and 37.3% on the feet. Most envenomings were mild (74.5%) that all evolved to cure, except for three deaths. Envenomation was characterized by local pain (63.3%), erythema (10.1%), vomiting (1.3%), restlessness (0.6%), hyperthermia (0.5%), sweating (0.4%), and spasmic (0.3%). With respect to the outcoming results, scorpionism in Khuzestan province of Iran is a public health problem, which needs to be monitored carefully by the government.

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1. Introduction

In Khuzestan, a southwestern province of Iran, as in numerous tropical areas nearby the Persian Gulf region, envenomation by scorpion stings is a major public health problem, particularly in children (Mirdehghan and Motlagh, 2001). There are more than 23 scorpion species in Iran, in which six species are dangerous, medically important and responsible for envenomings (Vachon, 1966). Except for one species of Hemiscorpius lepturus, others belong to the Buthidae family and include Androctonus crassicauda, Hottentotta saulcyi, Hottentotta schach, Odontobuthus odonturus, and Mesobuthus eupeus (Radmashesh, 1990a,b; Akbari et al., 1997; Fet et al., 2000; Bucherl, 1971).

Envenomations are characterized by various symptoms such as pain, sweating, fever and hypertension. The venom of Buthidae family has neurotoxic effects (Radmashesh, 1990b; Mirdehghan and Motlagh, 2001), and H. lepturus...
with cutaneous reaction. In most severe cases, hematuria due to hemolytic effect of *H. lepturus* venom was reported
(Radmanesh, 1998; Pipelzadeh et al., 2007).

In Iran, serotherapy has been one of the major therapeutic measures used in the treatment of scorpion envenomation for the last 30 years (Akbari et al., 1997; Latifi and Tabatabai, 1979). The dose of choice for the antivenom and the administration protocol are based on the instructions advised by the manufacturer or by the National Expert Committee, which mainly includes physicians, engaged in scorpion envenomation treatment.

Information on envenomation accidents in Khuzestan province is scarce and very little is known about the rate of scorpion stings in different areas of this province (Mirdehghan and Motlagh, 2001; Radmanesh, 1990a,b, 1998; Pipelzadeh et al., 2007). The current study was designed in order to investigate the demographic and clinical features of scorpion envenomation, the amount of antivenom required for treatments, and revision of current protocols. To achieve this goal, questionnaire was distributed to the Emergency Units of selected hospitals from six cities in the province during the year 2003. Statistical analyses were performed on the collected data.

2. Materials and methods

2.1. Study area and population

Due to its high envenomation frequency reports among 30 provinces in Iran, Khuzestan, a southern province with the population of 3,972,309 consisting 6.6% of the whole country population was selected for the purpose of this study. The study was carried out on the data obtained from the six major cities in the province which were selected by stratified cluster random sampling method. The selected cities were as follows. Shush (183,409 inhabitants), Ramhormoz (146,364), Masjed-Soleiman (237,418), Izeh (175,337), Baghmalek (105,504), and Behbahan (170,694).

2.2. Data collection and recording process

Questionnaire containing information on the envenomation accidents was distributed to the designated hospitals in the selected cities. The questionnaire contained information about the city where the incident was recorded, the date and place of the accident (inside or outside home, at work, etc.), the site of scorpion stung, as well as the age and sex of the injured, the signs and/or symptoms recorded at the time when patients admitted to the Emergency Units; possible known species of the scorpion; and measures taken by the Emergency Units for every envenomed individuals. The time between the sting and administration of antivenom and the amount of antivenom given to each patient was also recorded.

2.3. Patients

A total of 12,150 cases of scorpion envenomed patients were documented in Emergency Units of the selected hospitals which were responsible for admission of envenomed patients from both the rural and urban areas.

2.4. Use of antivenom

Most patients included in this study (7782 out of 12,150) received scorpion polyvalent antivenom. The antivenom is prepared by Razi Vaccine and Serum Research Institute in Karaj, Iran, through injecting the horses with a pool of venoms collected from six different scorpions including: *A. crassicauda*, *H. saulcyi*, *H. schach*, *O. doriae*, *M. eupeus* and *H. lepturus*. This antivenom is usually presented in the vials of 5 ml.

2.5. Statistics

Data in the completed questionnaires were analyzed by EPI-info2007 research statistical software (www.cdc.gov/epiinfo).

3. Results

The 12,150 questionnaires related to the cases of reported scorpionism were collected during 2003 (Fig. 1). The accidents were reported from six cities located in different parts of the province, which were selected by stratified cluster random sampling method (Fig. 2). The percentage of reported cases was as follows: Masjed-Soleiman (Bistodo-e-Bahman hospital) 27.1%, Ramhormoz (Imam Khomeini hospital) 26.6%, Izeh (Shohada and Hefdal-e-Shahrivar hospitals) 15.4%, Shush (Nezamafi hospital) 12.0%, and Baghmalek (Tabatabae hospital) 11.7%. It is estimated that the prevalence rate of scorpion envenomation in Khuzestan province is 3.1 cases/1000 inhabitants per year.

It is notable that the accidents were occurred year-round. However, about 90% of the accidents took place in the warmest months of the year (April–October). While, although scarce, there were cases (2.5%) that detected even during the seasons in which scorpion activity is lower (December–March).

There were no significant differences between sexes of envenomated individuals (52.3% female; 47.7% male). The highest incidence rate of the scorpion stings fell in the group aged 6–45 years, which was significantly different (P < 0.05) from those recorded for the other age groups. Housewives and students were under high risk for envenomation (63.3%) than those of farmers and workers (9.4%). On admission to hospital, identification of scorpion species was difficult by the information provided via the patients and or their guardians, however, a description of the scorpion’s color was obtained in 6209 (53.3%) cases as yellow and 2025 (17.4%) cases as black.

About 91.5% of the individuals stung were occurred indoor, which may be in accordance with the synanthropic behavior of these scorpions in the region. The frequency of stings in feet and legs (37.3%), hands and arms (39.3%) was clearly different from those in bodies (16.8%) and head and necks (6.5%). Most stings were happened during the night (6 p.m.–6 a.m.) which is in accordance with the nocturnal behaviors of scorpions involved.

Clinical signs and/or symptoms were reported in 44.8% of the accidents. Local symptoms were more frequent than systemic. The signs which more frequently reported were...
pain (63.3%), and edema (10.1%). Neurological symptoms like spasm (0.3%) were also observed, while central symptoms like hyperthermia (0.5%), sweating (0.4%), vomiting (1.3%), restlessness (0.6%) were less frequently reported. Other reported symptoms such as tachycardia, semi-consciousness, and local necrosis (0.1%) were also observed.

All patients were received medical treatments several hours after the sting. As depicted in Table 1, the history of previous treatment with antivenom was given by 997 (9.0%) cases. Most patients (64.0%) received the antivenom within 3 h after sting, reaching 77.5% up to 6 h, and the remaining 2647 (22.5%) patients were treated by antivenom after 6 h. About 97.6% of total patients were administered antivenom via intramuscular injection. However, a total of 4074 cases did not receive antivenom. Allergic reactions to antivenom, in the form of skin rash, were observed in 0.4% of cases and anaphylaxis shock (due to the horse origin antibodies in serum) occurred in just three cases. Most patients received 1–5 ml of antivenom; however, the dose was increased 2–3 folds according to the clinical presentation in 339 (4.4%) cases. Hemoglobinuria was observed in 1763 (14.5%), in which 145 (8.2%) cases showed positive result even after 24 h. The intensive degree of hemoglobinuria was reported in 1193 envenomed patients, among those 15 cases were with high degree of hemoglobinuria.

During the study period, three patients reported dead after being stung by scorpions. Two cases in Izeh city; one, a 13-year-old girl envenomed by *H. lepturus* at 2 a.m., with local necrosis in hand, and 3+ intensive degree hemoglobinuria. She received scorpion antivenom and blood transfusion, then for further treatment dispatched to the capital hospital and died at 2 p.m. due to the heart failure...
after 3 days of hospitalization due to hematuria. One death received scorpion antivenom and blood transfusion, died before arriving to the hospital. The second case, was a 75-year-old woman who was stung by unknown scorpion sting with local necrosis in groin (most probably due to *H. lepturus*), with 4+ intensive degree of hemoglobinuria, received scorpion antivenom and blood transfusion, died after 3 days of hospitalization due to hematuria. One death occurred in Masjed-Soleiman which was a 3-year-old boy, who stung by unknown black scorpion at 2:30 a.m., in the neck, transferred to the hospital and in spite of receiving medical cares and scorpion antivenom died due to the respiratory failure at 6 a.m.

4. Discussion

Scorpion envenomation is a major public health problem in developing countries especially in tropical and subtropical regions (Mahadevan, 2000; Osnaya-Romero et al., 2001; Ozkan et al., 2006; Radmanesh, 1990a,b, 1998; Mazzei de Davila et al., 1997; Ghalim et al., 2000). In southern regions of Iran, especially in Khuzestan province, as in numerous tropical countries, envenomation by scorpion stings is a major public health problem. Khuzestan province, neighboring with Iraq in west and Persian Gulf in south has mild winters, with average January temperatures ranging from 7 °C to 18 °C (45°F–64°F), very humid and hot in summer, with temperature exceeding 48 °C (119°F) during July in the interior areas.

The study of scorpion fauna in Khuzestan indicates that there are at least 12 scorpion species in Khuzestan from which 10 species belong to Buthidae family, one to Scorpionidae and one species to Liochelidae (Prendini, 1802; Vachon, 1966; Farzanpay, 1987; Sissom, 1998; Fet et al., 2000). Buthidae scorpions in Khuzestan province include: *A. crassicauda*, *Apistobuthus petrygocercus*, *Hottentotta leptocheles*, *H. saulcyi*, *H. schach*, *Compobuthus mattheissenii*, *M. eupeus*, *O. odonturus*, *Orthochirus scrobiculosus* and *Razianus zarudnyi* (Akbari et al., 1997). There is also *Scorpio maurus* from Scorpionidae, and *H. lepturus*, previously included in the family Scorpionidae (Lourenco, 2001), which has recently been re-classified into the family Liochelidae (Solegland and Fet, 2003). The black scorpions (*A. crassicauda* and *H. schach*) and the yellow scorpions (*M. eupeus, H. saulcyi, O. doriae and H. lepturus*) are the most dangerous scorpions in Iran and are responsible for the majority of stings in Khuzestan province (Akbari et al., 1997; Radmanesh, 1990a, 1998; Mirdelghan and Motlagh, 2001).

To our knowledge the current study is the first epidemiological survey that covers the whole province. In this present year-round clinical survey in 2003, a number of 12,150 scorpions stung patients, were cross-sectionally studied by stratified cluster random sampling method. The designed questionnaire distributed in the province which was completed by the physicians in the Emergency Unit of each designated hospitals within the cities located in the cluster which are known for their high percentage of scorpionisms reported in the province. The cities of Shush, Masjed-Soleiman, Izeh, Baghmalek, Ramhormoz, and Behbahan in Khuzestan province were selected as clusters.

Based on the previous epidemiological data available in this province, the total of 36,463 scorpion sting cases (April 1990–July 1996) were referred to Abuzar hospital in Ahvaz, with a mean of 5100 stings per year and totally 61 deaths (Radmanesh, 1998). In other report, 26,397 patients have been recorded with 32 deaths during a 5-year period from 1993 to 1997 (Pipelzadeh et al., 2007). Also, Mirdelghan and Motlagh (2001) reported 28,296 scorpionism during

![Fig. 2. Study areas in Khuzestan province of Iran: (1) Shush, (2) Masjed-Soleiman, (3) Izeh, (4) Baghmalek, (5) Ramhormoz, and (6) Behbahan.](image-url)
1995–2000, in which 11,318 (40%) were children, 1316 cases were hospitalized and 62 died. These studies were performed by using the collected data from one or two major referral hospitals of Abuazar and Golestan in city of Ahvaz, the capital of Khuzestan province.

Our finding confirms the morbidity rate in published data; however, the mortality was less than those reported in the previous works. This might be due to the improved efficacy of the local antivenom, and regional education programs carried out by local health clinics in both rural and urban areas.

Scorpion stings mostly occurred indoors (7074 cases), from which 38% were recorded in housewives and 30% in school students with the age groups of 6–20 (36%), and 21–45 (42%). About 55% of the patients had no clinical signs, but the rest showed local signs and symptoms. The most frequent symptom of scorpion envenomation was pain (63%), edema (10%), and restlessness (1%). The signs and symptoms in this study which are in local and systemic levels are in accordance with other Buthidae scorpion envenomations (Dehesa-Davila and Possani, 1994; Freire-Maia and Campos, 1987; Freire-Maia et al., 1990; Mazzei de Davila et al., 1997). It can also be pointed out that our data show that there were no significant differences between sexes across all age groups in Khuzestan province, which is in agreement with the other report (Pipelzadeh et al., 2007).

The type of scorpion species responsible for the stings in Khuzestan province is unclear, and this is due to the lack of knowledge of physicians on the type of the scorpion, and unavailability of scorpions in most accidents. The most venomous of all types of scorpions in the region is H. lepturus which is categorized as yellow scorpion that is discussed by other authors. Radmanesh (1990a,b) pointed out that our data show that there were no significant differences between sexes across all age groups in Khuzestan province, which is in agreement with the other report (Pipelzadeh et al., 2007). Feet and hands accounted for 76% of the stings, a frequency not very different from those reported by other authors worldwide (de Roodt et al., 2003; Chowell et al., 2006; Ozkan et al., 2006).

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Conflict of interest

The authors have no conflict of interest to disclose.
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