

# The economic impact of anti-scorpion serum in the medical management of scorpion envenomation in Algeria

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### **Abstract**

This study evaluates the economic impact of Anti-scorpion Serum (SAS) for scorpion envenomation (SE) within the Algerian healthcare system. Using an Excel model and data on public sector cost, it showed an annual cost reduction exceeding 13 million USD due to decreased examinations, shorter hospital stays, and reduced progression to severe SE classes. The analysis emphasizes the imperative need of investing in SAS to alleviate the economic burdens associated with SE.

# Introduction

Scorpionism in Algeria represents a public health problem, especially in the Highlands and southern regions, with over a million confirmed cases of scorpion stings between 1996 and 2017, according to the National Institute Of Public Health (INSP). Envenomations vary in severity and require early treatment, including the controversial use of antiscorpionie serums. At present, Algeria has only one type of monovalent scorpion antivenom, manufactured by the Pasteur Institute Of Algeria (PIA) using conventional methods. The adoption of more advanced technologies in antivenom production entails increased costs, making this approach unaffordable for many developing countries.

In this context, the aim of this study is to assess the healthcare savings achieved in Algeria through the use of SAS versus symptomatic treatments, which justifies increased financial support to strengthen SE management capacities and reduce healthcare expenditures in the long term.

### **Methods**

This work was carried out in two parts, spanning the period from January 2023 to May 2023.

# A. Investigation on the medical management of envenomated patients.

A survey to gather information on the management of envenomated patients was carried out using a questionnaire for emergency and intensive care physicians, given their crucial role in this process. The questionnaire was distributed online.

# B. Pharmaco-economic evaluation of the use of antiscorpionic serum in the medical management of SE.

A precise methodology was applied to assess the difference in total costs between specific medical management combined with symptomatic management of Scorpion Envenomations compared to symptomatic management alone. Medical and hospital costs were obtained from reliable sources. Calculations integrated medical and non-medical costs for each severity stage, using appropriate equations.

Cost of managing an envenomed patient = Cost of medication + Cost of paraclinical examinations + Cost of hospital stay.

Total cost of managing the envenomed population = Cost of all cases across the 3 severity classes + Total cost of aggravation.

In addition, an assessment of the total cost of medical managing envenomated patients was carried out based on INSP epidemiological data, with a rigorous methodology for determining aggravation rates. Finally, the economic impact of SAS use was assessed by calculating the difference in costs between the two management pathways, with data processing and analysis carried out using Microsoft Excel software.

# Results

#### A. A.Study of Hospital Care Management

A questionnaire was sent out to doctors treating envenomated atients, and 47 replies were received from practitioners in 23 ifferent wilayas. According to the responses received, the number of stings varies in the different wilayas,

ranging from less than 10 to over 800 cases received per year. The majority of cases are considered benign. Treatment of ES requires a number of araclinical examinations. The frequency of drugs administered varies according to the class of ES.

#### **B.** Estimated cost of treating the envenomed population

#### 1. Estimating the cost of caring for an envenomed patient

The costs of medication and paraclinical examinations, as well as the cost of hospital stays for an envenomed patient, have been estimated and presented in the table below.

**Table 1**: The total cost of medical management for one envenomed patient.

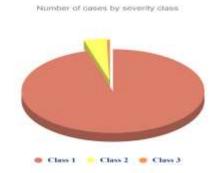
	The medical management when SAS is available			The medical management when SAS is not available		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Total (USD)	29,40	72,99	4286,15	20,38	59,77	4945,73

#### 2. Estimated cost of treating the envenomed population

In 2021, the INSP recorded a total of 44463 cases of scorpion stings. These cases fall into three categories: 42356 class 1 cases, 1790 class 2 cases, and 221 class 3 cases. shown in the figure above, were determined.

In both scenarios, management costs increase with the severity of the envenomation. However, costs remain relatively low for classes 1 and 2, although slightly higher in scenario 1 due to the additional costs associated with the use of SAS. Class 3, on the other hand, has the highest costs in both scenarios. However, scenario 2 is characterized by a much higher cost per hospital stay. This underlines the importance of SAS in the management of severe cases of envenomation.

According to the questionnaire response filtering method used to assess the rate of aggravation of envenomation cases, 7 responses were selected from 5 different wilayas (El Oued, Ghardaïa,Ouargla, Tiaret and Batna), representing 33% of cases stung nationwide.



Based on these responses, the aggravation rates for classes 1 to 3 and 2 to 3.

Combined specific and symptomatic management for the three severity stages generates a total cost approximately twice as high as symptomatic management alone for these three stages.

However, specific management of envenomated people can reduce aggravation rates from class 1 to class 3 by 5.59%, and from class 2 to class 3 by 8.74%. Thus, it should be noted that the population at risk of ES is considerable, given that the national incidence rate, calculated from data provided by the INSP, amounts to 101 cases per 100,000 inhabitants. This highlights the importance of investing in specific management to reduce the costs associated with the costly complications of stage 3 aggravation.

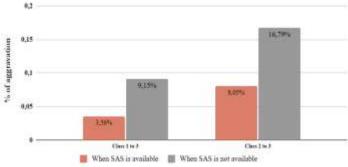


Fig.1 The general rate of aggravation associated with the envenomed population.

# 3. Evaluation of the economic impact of using SAS in the management of ES

The use of SAS in the management of envenomation cases for the entire envenomated population saves expenditure amounting to dollar

13446937,96 per year. This corresponds to a significant 58.57% decrease in expenses associated with the management of this envenomated population..

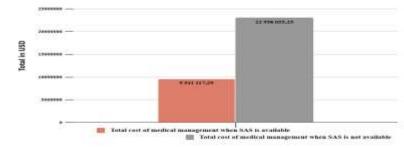


Fig.2 The economic impact of using SAS in the management of ES

# **Conclusion**

This study shows that the use of SAS offers many advantages in the management of SE. In addition, it demonstrates that its use

considerably reduces the costs associated with this envenomation compared with symptomatic management alone. In the light of the results obtained and in order to maximize the benefits of using SAS, certain recommendations and perspectives are proposed.

First and foremost, it is crucial to revitalize and support the production of this serum in order to optimize the cost savings associated with SE. This is a long-term investment, where the expenses incurred for the serum will be recouped each year through the savings generated by its use.

In addition, it is essential to step up efforts to raise public awareness of preventive measures, while consolidating existing monitoring and reporting systems to ensure rapid and effective intervention.

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