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SCORPION ACCIDENTS IN BAHIA, BRAZIL: A RETROSPECTIVE STUDY OF UNDERREPORTINGS BY SINAN IN 2006

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Abstract
A descriptive analysis of scorpion accidents in Bahia – Brazil over 2006 was carried out, based in the reports availables in the Disease Reporting Information System (SINAN), National Poison Information System (SINITOX) and register book of Anti-Poison Center of Bahia (CIAVE). Data were analyzed in simple and relative frequency. Underreportings for each county were estimated by the positive difference between the records of CIAVE and SINAN. We found 5.988 reports from SINAN, 676 from SINITOX and 652 from CIAVE. SINAN underreportings do exist and can be estimated in 4,35%, that means a loss of 261 cases in 54 counties, including Salvador and its metropolitan area that account for 67.4% of these cases.

Keywords: Scorpionism; Underreporting; Bahia.

INTRODUCTION

Accidents by scorpions in Brazil have increased in recent ten years, reaching more than 39,000 in 2012[1] surpassing snakebites since 2000, particularly in northeastern region.[2] It is an estimated increase in over 100%, considering a national average compared to previous years, which authors have related to changes in environmental conditions.[2] Northeast region has contributed with more than 45% of these reports, in which the state of Bahia has contributed with more than 30%.[1-2] Nowadays accidents by poisonous animals are of obligatory notification, what became them nearest of reality. The reports of these injuries are visible in two systems: Dis-

ease Reporting Information System (SINAN) which data are obtained from Brazilian counties, and National Poison Information System (SINITOX), which data are restricted to the Toxicological Information and Assistance Centers (CIT) of each State, but showing difficulties in their epidemiological analyses.[3] Mainly the data obtained by SINITOX seems to have insufficient degree of standardization showing the need to design strategies to improve it to develop a reliable system and to minimize the harms associated to human poisoning in Brazil.[4] Actually, there are 36 CIT in 19 Brazilian states. Even so, the identification of the scorpion species and their distribution in the counties are still poor known,[5-6-7] leaving a gap of data essential to the proper evaluation of poisoning. It is necessary to remember that the misdiagnosis of the severity level of the envenomings increases the risk of exacerbation of mild cases and may represent risks and unnecessary costs to patients and institutions.[8] Despite the low lethality remaining below 0.2%, children under 14 years old have a higher risk of evolving to death (3.2%).[2-9]

Epidemiological data have reported that there are different aspects in the geographical distribution of scorpion species and also different aspects in the health care of each State or Region [2] and these are important variables to the success of scorpionism control in each region of the the country. It is known the severity of scorpion envenomation in human beings depends on factors, such as time elapsed between the accident and medical care, the age of the victim, the scorpion species and its size, and the sensitivity of the patient to poison.[10] Therefore, such number of variables is of crucial importance not only to be included in the data systems but also to be standardized for a good comprehension of the problem, which will lead to a good health management.

The aim of this work was to evaluate the contribution of the SINAN data used for the accidents by scorpions in the counties of Bahia, in the period of January to December 2006. To achieve these goals we established the following questions:

a) Is there underreporting of accidents by scorpions in Bahia in SINAN database?

b) Which would be the factors that could explain this underreporting?

MATERIAL AND METHODS

A descriptive analysis was carried out based on the reports of 2006, available in the sites of the SINAN (http://www.saude.gov.br/sinanweb), SINITOX (http://www.fiocruz.br/sinitox_novo/) and register's book of Anti-Poison Center of Bahia (CIAVE), analyzed on simple and relative frequency using Microsoft Office Excel 2007.

To achieve the proposed objectives, we sought to identify in each database (SINAN, SINITOX, CIAVE):

a) The frequency of accidents in the county where the accident occured;

b) The relationship between the counties with higher accident frequency and the installed capacity of the health centers or the level of training of their health staff; c) The relationship between the accidents distribution and the geographic distribution of scorpions of medical importance.

Data from CIAVE were obtained from its register book, where the treated cases were related. This was necessary because besides its consistent epidemiological data in there, they sent to SINITOX only the total number of the cases by toxic agents or group of animals. For each system, the total number of accidents was gotten, but the comparison between counties only could be made with the SINAN and CIAVE reports, because SINITOX did not supply them. Underreporting percentual was estimated from each county by the positive difference between the registers of CIAVE and SINAN in the same year, calculated as indicated by Fiszon and Bochner.[3] Given the independence of the two databases, we cannot ensure that all cases filed by CIAVE were the same contained in the database SINAN.

Many of the reports registered in SINAN were from health centers out of the counties where the accident occurred, so, to avoid distortions we crossed only the two variables: federative unit of occurrence (Bahia) with county of occurrence. Within this universe we highlighted the cases in which it was identified the patient transference to CIAVE, evaluating its justification.

The installed capacity of the health care in the counties was obtained from the governamental database health information page (http://tabnet.datasus.gov.br/tabdata/cadernos/ba.htm). To better evaluate that capacity and also the health staffs training, we use the clustering of counties in the 31 Regional Directories of Health (DIRES). Each DIRES has a headquarter county where regional hospitals are installed and trainings are conducted. Since 2000, the CIAVE staff has conducted periodic training in all DIRES with higher frequency of accidents by poisonous animals.

Unfortunately it was not possible to identify the genus or species of the scorpion that caused the accident neither in any of the systems nor in the CIAVE records. In SINAN and SINITOX databases, the only variable in this direction is defined as simply "scorpion".

This study followed the guidelines of Resolution n.196/96 of the National Council on Ethics in Research and we consider that no ethical implications are involved due to be a study that uses only secondary data.

RESULTS AND DISCUSSION

In 2006, it was obtained 5.988 records of scorpion accidents by SINAN, 676 by SINITOX and 652 by CIAVE, from the 417 counties of Bahia. It means that only about 10% of the notified cases from counties were sent to Bahia CIT database (CIAVE), and for consequence, to SINITOX. Rather, that the majority of counties give priority to include their data in SINAN.

In the records of SINAN, the highest frequency of reports was observed in DIRES 20 (Vitoria da Conquista), DIRES 24 (Caetité), DIRES 18 (Itaberaba) and DIRES 13 (Jequié): 863 (14,4%), 849 (14, 8%), 574 (9,58%) and 553 (9,23%), respectively. Unlike, in CIAVE records the highest frequency of reports was observed in DIRES 1 (Salvador), DIRES 2 (Feira de Santana), DIRES 20 (Vitoria da Conquista) and DIRES 12 (Serrinha): 193 (28,7%), 74 (11,0%) 69 (10,3%) and 60 (8,9%), respectively.
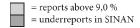
The DIRES 20 (Vitoria da Conquista) was the only one that coincided with high frequency in the two databases (Table 1). Underreporting is clearly observed in 54 counties that failed to notify the SINAN in 261 cases (Table 2). Of these counties, the majority of the underreporting (67.4%) were from DIRES 1, which groups together Salvador (n=93) and its metropolitan area (n=81), and three more counties (Conde n=0, Santo Amaro n=1 and Saubara n= 1). There were no reports to Salvador in SINAN and this absence of reports indicates that CIAVE (where all the patients from the city are treated) sent its data only to SINITOX. We can consider this a worrying fact due to the absence of important epidemiologic variables for scorpionism (like months and counties of occurrence of the accidents) in SINITOX system.

Table 1 – Reports frequency of scorpion accidents from the Regional Directories of Health (DIRES) of Bahia, in SINAN database and CIAVE (January to December, 2006)

DIRES	SINAN		CIAVE	
	Nº	%	Nº	%
01 – SALVADOR	22	0,37	193	28,76
02 – FEIRA DE SANTANA	198	3,30	74	11,02
03 – ALAGOINHAS	18	0,30	29	4,32
04 – SANTO ANTÔNIO DE JESUS	65	1,12	07	0,89
05 – GANDU	24	0,38	05	0,74
06 – ILHÉUS	15	0,25	08	1,19
07 – ITABUNA	109	1,82	10	1,49
08 – EUNÁPOLIS	65	1,00	03	0,44
09 – TEIXEIRA DE FREITAS	83	1,38	01	0,14

10 – PAULO AFONSO	04	0,06	05	0,74
11 – CÍCERO DANTAS	03	0,05	18	2,68
12 – SERRINHA	54	0,90	60	8,94
13 – JEQUIÉ	553	9,23	29	4,32
14 – ITAPETINGA	177	2,95	11	1,63
15 – JUAZEIRO	98	1,63	03	0,44
16 – JACOBINA	153	2,55	06	0,89
17 – MUNDO NOVO	111	1,85	02	0,29
18 – ITABERABA	574	9,58	29	4,32
19 – BRUMADO	216	3,60	08	1,19
20 – VITÓRIA DA CONQUISTA	863	14,41	69	10,28
21 – IRECÊ	111	1,85	05	0,74
22 – IBOTIRAMA	26	0,38	04	0,59
23 – BOQUIRA	142	2,37	01	0,14
24 – CAETITÉ	849	14,18	04	0,59
25 – BARREIRAS	298	4,95	05	0,74
26 – SANTA MARIA DA VITÓRIA	414	6,91	19	2,83
27 – SEABRA	288	4,80	07	1,04
28 – SENHOR DO BOMFIM	13	0,22	04	0,59
29 – AMARGOSA	304	5,06	14	2,08
30 – GUANAMBI	96	1,60	02	0,29
31 – CRUZ DAS ALMAS	42	0,70	17	2,53
Others localities*	0	0,00	20	2,98
TOTAL	5988	100	672	100

*Counties of other brazilian federative units treated by CIAVE

☐ = reports above 9,0 %
▓ = underreports in SINAN

Surprisingly, counties better qualified to health care, with all the requirements of human resources and infrastructure, were exactly those with the highest number of undereportings: Salvador and Camaçari. The exacerbated underreporting of DIRES 1 could be explained not only by the absence of reportings from Salvador, but by patient displacements probably unnecessaries. One may suggest that health teams from counties neighboring to Capital prefer leave to CIAVE the notification and treating of the scorpionic cases in view the proximity and convenience. As CIAVE do not notify in SINAN but in SINITOX, these data are lost to the authorising that use the first system.

Table 2 – SINAN underreportings of scorpion accidents from 54 counties of Bahia, (January to December, 2006)

	Municípios	SINAN	CIAVE	Underreporting
1.	ADUSTINA	0	2	2
2.	ALAGOINHAS	1	3	2
3.	ANGUERA	4	6	2
4.	ANTAS	0	2	2
5.	APORÁ	1	2	1
6.	ARAÇÁS	0	1	1
7.	ARACI	0	4	4
8.	ARAMARI	0	1	1
9.	BARROCAS	0	2	2
10.	CABACEIRAS DO PARAGUAÇU	1	2	1
11.	CAÉM	0	1	1
12.	CAMACAN	0	1	1
13.	CAMAÇARI	1	23	22
14.	CANDEIAS	3	12	9
15.	CANSANÇÃO	0	1	1
16.	CARDEAL DA SILVA	0	1	1
17.	CÍCERO DANTAS	0	1	1
18.	CONCEIÇÃO DO COITÉ	2	4	2
19.	CONCEIÇÃO DO JACUÍPE	0	1	1
20.	CRISÓPOLIS	0	2	2
21.	DIAS D'ÁVILA	0	5	5
22.	ENTRE RIOS	1	6	5
23.	EUCLIDES DA CUNHA	0	3	3
24.	GENTIO DO OURO	0	1	1
25.	ILHÉUS	3	6	3
26.	IPIRÁ	5	6	1
27.	ITAPÉ	0	1	1
28.	ITAPICURU	0	1	1
29.	JEREMOABO	0	1	1
30.	LAMARÃO	0	1	1
31.	LAURO DE FREITAS	0	4	4
32.	MATA DE SÃO JOÃO	0	5	5
33.	NOVA SOURE	0	2	2
34.	PAULO AFONSO	2	4	2
35.	PEDRÃO	0	1	1
36.	QUIJINGUE	0	3	3
37.	RETIROLÂNDIA	1	2	1
38.	RIBEIRA DO AMPARO	0	2	2
39.	RIBEIRA DO POMBAL	2	9	7

40.	SALVADOR	0	93	93
41.	SANTO AMARO	2	3	1
42.	SANTO ESTÊVÃO	1	3	2
43.	SÃO FÉLIX	2	3	1
44.	SÃO FRANCISCO DO CONDE	0	13	13
45. SÃO JOSÉ DO JACUÍPE		0	1	1
46. SÁTIRO DIAS		0	3	3
47. SAUBARA		0	1	1
48. SERRINHA		1	9	8
49. SIMÕES FILHO		1	16	15
50. TUCANO		0	2	2
51. UAUÁ		0	2	2
52. UNA		0	1	1
53. VALENÇA		0	2	2
54. VERA CRUZ		0	8	8
Total		**34**	**295**	**261**

There were 26 patients from 22 counties that were moved to health centers with higher capacity of medical care: Hospital Geral Roberto Santos/CIAVE (n=11), Hospital Cleriston Andrade (n=5), Hospital Geral de Camaçari (n=2), Hospital de Base de Vitória da Conquista (n=3). In just 7 (26, 9%) of them specific anti-venom serum was used and one just arrived in death (patient from Ipirá), suggesting that at least almost 70% of these cases were of mild or moderate severity and could be treated in its origin counties. It is expected that the employed number of ampules of anti-venom serum be justified for severe cases. The number of ampules of anti-scorpion serum (SAES) or anti-arachnid serum (SAAR) recommended by the Ministry of Health is 2-3 for moderate cases, 4-6 for severe cases and no indication for mild cases. The first two levels appear frequently in children stung by *Tityus serrulatus* (8% to 10% of cases), the most important scorpion species in Brazil (Ministry of health, 2001). Therefore, the criterion "use of serum" can be used as a basis to evaluate the possible severity level of the reported cases.[11] The unneeded displacements often can increase the severity of cases and the cost to the government due to excessive use of serum in original mild or moderate cases.[11]

Probably, these displacements are related to the difficulty of expertise or insecurity on poisonous animal's envenomations by the team's counties. However, it is necessary to remember that early diagnosis, time between bite and serum administration, and the maintenance of vital functions are considered essential variables for good healing evolution,[11] due to the scorpion toxin is absorbed gradually from the

bite site, and is characterized by action on receptors voltage-gated sodium and potassium channels.[12]

Meanwhile, we can emphasize that the few displacements (less than 8%) from DIRES far from Salvador, like Vitória da Conquista and Itaberaba (527 km and 313 km, respectively), could mean that these DIRES had a good training of your health care team in order to identify and resolve the accident care. These are counties where occur *Tityus serrulatus*, a scorpion that can be responsible to the severity of the cases and thus, the number of ampules used there: 44 ampules/69 cases (Vitória da Conquista) and 32 ampules/29 cases (Itaberaba). In fact undertaken training made by staff of CIAVE in the period before 2006 may reinforce it.

CONCLUSIONS

The results indicate that SINAN underreportings for state of Bahia do exist and can be estimated in 4,35%, that means a loss of 261 cases in 54 counties, including Salvador and its metropolitan area that account for 67.4% of these cases. Indicate also that SINAN can be identified as an optimum system for an epidemiological evaluation, but many data are still lost due to the existence of parallel data systems (like SINITOX) which do not complement themselves. However, the reports of CIAVE (that does not be enclosed there) are of fundamental importance for an epidemiological evaluation and, for consequence, for governmental actions of health monitoring.

The possible hypotheses for the existence of underreportings are: a) the existence of two parallel systems database; b) the lack of understanding by the health staff about the importance of inclusion of the data in systems, c) the lack of return on governmental action as a result of the revision in data inclusions.

The possible hypotheses for the patients displacements are: a) for convenience, due to the proximity of some counties to a reference health center (CIAVE) in this type of care; b) the insecurity created by the absence of periodicity in training of health teams in each county; c) the lack of multidisciplinary health teams to properly identify the accident, either directly (by identifying the animal) or indirectly (by identifying the symptoms).

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