

Corrected science textbooks and snakebite casualties in Brazil: 1993-2007

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Abstract

First-aid methods recommended for snakebites are included in Science textbooks in Brazil. Books published before 1996 provided misleading information in this respect and it is possible that such recommendations derived from North-American experiences conducted at the beginning of the 20th Century. The official evaluation of textbooks carried out by the Ministry of Education in 1996 initiated a major public discussion on the several mistakes which had been present in Brazilian educational materials, mainly those relating to mistaken snakebite first-aid procedures. As from 1996, a significant decrease in the number of casualties from snakebites was reported, both in the total number of deaths and among the patients who had received medical assistance. The official data showed this decrease was consistent and remained so for the following ten years. The number of deaths might be associated with the reduced number of victims who developed complications resulting from improper first-aid procedures. This article is intended to relate the changes implemented in textbooks as a result of the first national evaluation and the great impact caused by the publication of the serious mistakes found in these materials, with the reduction in the number of casualties from snakebites in the same period.

Key words: *textbooks, health education, science education, assessment, snakebites first-aid*

Introduction

Methods and procedures to be followed for snakebites before seeking medical treatment have traditionally been part of the curricula of Science for basic education and Biology for middle education, in Brazil, as well as in many other countries.

The term curriculum, used here is understood as “an educational path, a connected set of learning experiences to which an individual is exposed in the course of a given period of time

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within the context of a formal educational institution” (Forquin 1993, p.22), depends on decisions and choices on themes to be addressed, their logical articulation, activities proposed, evaluation process, etc.

Accordingly, several additional materials are used to support these decisions and provide a technical and methodological basis for the development of the curricula, among which the textbooks can be highlighted.

Despite the existing criticism and opposition, the textbooks still stand as one of the most important reference sources for the learning/teaching process in Brazil. Given the great diversity and inequality prevailing in the country with regard to the access to information and teachers’ education processes, the textbooks provide teachers and students not only with guidance on the curricula to be developed, but also on the logical articulation of topics, the methodology to be followed and the activities to be carried out by the students. Therefore, within this scenario, the textbooks play a core role in the accomplishment of curricular proposals and in the classroom routines.

In 1995, the Ministry of Education (MEC), within the scope of the National Program of Textbooks (PNLD), initiated a series of evaluations, which directly affected textbooks distributed all over the Brazil and reaching over 30 million students and two million teachers (Bizzo, 1996). This program asks teachers of public schools to choose freely from textbooks which are not only low cost for students, but also approved by an official evaluation, focusing on correctness, safety, methodological and moral aspects. Approved books are included in official catalogues called “the MEC Guide of Textbooks”.

In the presentation volume of the Guide of Textbooks 2007, the MEC explains its understanding of the role that the textbook should play in the curricular development, by pointing out that “the textbook of any subject is an essential tool (sometimes the only one) to provide ‘lower-class children’ (the expression used by Darcy Ribeiro, in Portuguese, ‘criança popular’, and according to MEC, refers to the characteristics of children enrolled in public schools) with access to reading and writing activities.” (Ministério da Educação 2006, p.25).

According to the MEC, the PNLD is the main strategy to ensure that appropriate supporting materials are provided to teachers and students and has the purpose of:

“offering students and teachers of basic education in public schools, on an equal and free basis, good quality textbooks and dictionaries of Portuguese, aiming at providing support to the teaching-learning process developed in the classroom”. (Ministério da Educação, 2006. p.26).

Also, according to the Guide of Textbooks 2007,

“in order to meet didactical and pedagogical objectives, textbooks select some topics to the detriment of other ones and arrange these topics according to a certain plan and sequence. In that sense – and playing the teacher’s role – textbooks: 1) select the topics to be addressed; 2) establish the type of approach and treatment to be used, and 3) propose an appropriate itinerary to exploit the topics selected.” (Ministério da Educação, 2006, p.28).

As part of the PNLD 1997, the Ministry of Education began to act more rigorously with respect to the evaluation of textbooks’ content and proposals, aiming at reducing or eliminating conceptual mistakes, ineffective teaching methodologies, unsafe experimental

suggestions, images and texts with a prejudice against minorities, and also to provide quality to the material distributed to the public educational network (Bizzo, 1996, 2000).

The official results from the first MEC's evaluation, published in June 1996, caused a major public reaction, with repercussion in newspapers' headlines and nationwide TV news, by broadcasting the errors and mistakes existing in Brazilian textbooks (Bizzo, 1996). Specifically, regarding the first-aid procedures for snakebites, an issue usually addressed by school curricula, practically all the books provided misleading information, which, instead of being of some help to a possible victim, could worsen the situation and even lead to fatal complications.

Several pieces of wrong information were consistently presented in Science textbooks before 1996. Recommendations for using tourniquets and cutting around the bitten area to subsequently suck the "venom" were widely disclosed (Figure 1). The very same book that suggested sucking blood with snake venom contained warnings about the risk of blood-borne diseases through blood contact, like hepatitis and Aids, especially those ones that were published after the implementation of the Brazilian STD/Aids National Program in 1985.

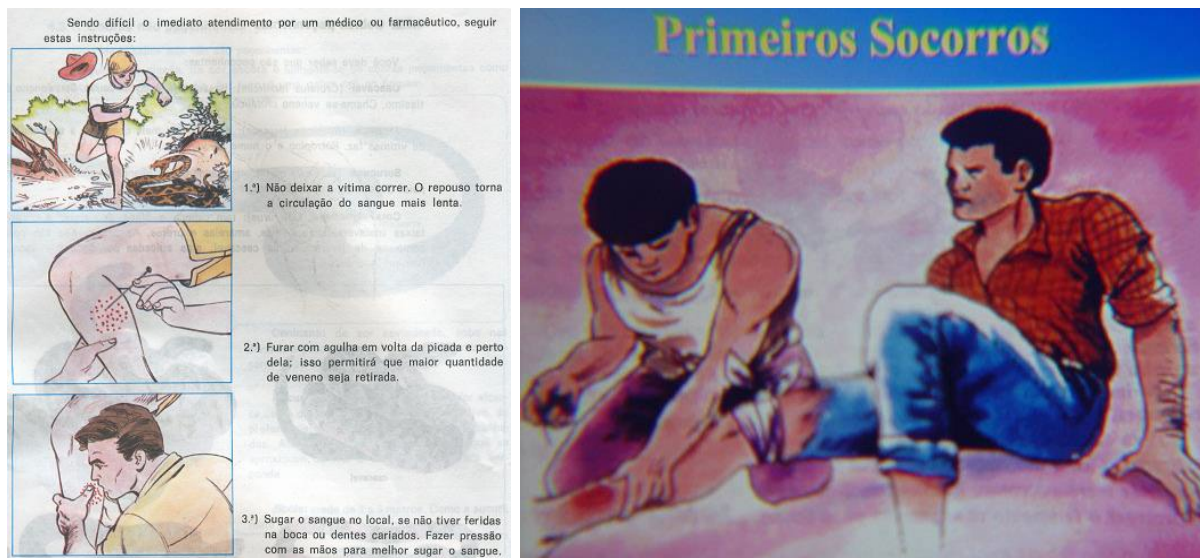


Figure 1. Examples of Brazilian textbooks. On the left, a book published in 1986, which recommended the following procedures after snakebite: “report the accident; apply a tourniquet; puncture the area with a nail”. Also, the same text states that the nail should be at least 10 cm long and that approximately 16 punctures should be made around the wound area”. On the right, a book rejected by the first official evaluation in 1996, which recommended nail punctures after the application of a tourniquet.

It is well known that these procedures are not only ineffective, but inadvisable, since the use of tourniquets, wounds caused by punctures of sharp metallic objects such as nails, and suction in the area, may lead to serious health complications, including secondary and opportunist infections, amputations and pulmonary thromboembolism. (Hardy, 2003).

As a result of the MEC's evaluation process, all textbooks distributed to public schools since June 1996 recommend placing the snakebite victim in a comfortable position and provide transportation to the nearest hospital emergency room since. Textbooks produced in the following years included the corrections (Bizzo, 2000), and this tendency was maintained. Considering the eleven book set approved in PNLD 2010, eight of them brought information

about snake bite first aids, and all of them had the correct information (Monteiro, 2012). Textbooks aimed at private schools, which represent around 10% of total number in the country, soon followed this change.

Possible historical origin of the recommendations

Despite the possibility that many misguided procedures related to first aid after snakebites may have different origins based on popular beliefs and home treatment, the standardization of procedures based on scientific patterns is well established. Indeed, there are records of the mentioned procedures in experiments carried out in San Antonio (Texas – USA) in the early XXth century (1927-8). These studies indicated that the condition of dogs contaminated with *Crotalus atrox* venom (rattlesnake) presented significant improvement when the wounded area was punctured and sucked. Indeed, these results influenced the medical practice in the United States at that time, although afterward studies could not confirm the effectiveness of this method. During many years, the standard medical procedure in the U.S.A. followed the recommendations established by the American Panel of Venomous Snakebite Authorities, of 1960, which included cutting, sucking and tourniquets. The same recommendations were repeated by the American National Research Council of the National Academy of Sciences in a report dated 1979, issued by the American Red Cross (Hardy, 2003).

During the 1960's, an international agreement between the Brazilian Ministry of Education (MEC) and the United States Agency for International Development (USAID) brought Brazilian textbooks authors to the US. It is possible that this close contact with documents and standards used in the U.S.A. influenced Brazilian textbooks. In the early 1970's, a huge program of distribution of textbooks took place in Brazil, following recommendations by MEC, in a rigid right wing political context in which there was no possibility of questioning books distributed by the government. Although it is not our aim to track down the precise origin of such recommendations, it is well possible that the translation of the North-American procedures was the base for the introduction of those procedures in the Brazilian context. In addition, as there are similarities between rattlesnakes of the two countries, this may have been an additional factor in Brazilian textbooks' including such snake bite first aid recommendations.

It is clear that the misguided procedures were not part of a Brazilian tradition. As far back as 1933, a very influential science textbook written by a distinguished professor, included precise and correct information on the matter. It was widely used all over the country and many other textbooks which followed took it as a major reference. The text below was taken from the above-mentioned book:

the first-aid procedure for treating snakebites is to transport the victim to a place where the correct measures could be taken, keeping him/her laying down with the head lower, being highly recommendable to identify the snake species so that the specific anti-venom could be administered. (Mello-Leitão, 1933, p.210).

Nature of snakebites in Brazil

The first issue to consider is that less than 7% of snakebites in Brazil involve rattlesnakes (*Crotalus*). This means that even if an old practice could be still considered valid, it would not be recommendable in Brazil due to the nature of most snakebite occurring. In fact, more than

92% of the snakebites in Brazil involve snakes of the *Bothrops* genus (“Jararacas”), whose venom has quite a lower mortality rate, with very different characteristics and action from those of the *Crotalus* species.

In Brazil, snakebite are caused by snakes of the *viperidae* family, belonging to four different genera (Cardoso & Wen, 2003). We describe below the venom action of these snakes, in order to provide better understanding of the relationship between this action and the first-aid procedures described in Brazilian textbooks.

Bothrops: in general, the bothropic venom has three psychopathological activities: (a) proteolytic, defined as acute inflammatory activity, (b) coagulating activity and (c) hemorrhagic activity. Local symptoms include intense pain, ecchymosis (which may spread all over the affected limb) edema (noted a few hours after the bite and which, if medical assistance is not readily available, may evolve to hemorrhagic blisters), necrosis (when occurring in lower extremities as fingers, for instance, it is three times more likely to evolve) and compartmental syndrome, or systemic complications such as serious hemorrhage, hypotension/shock, acute kidney injury (AKI), which occurs in 0.5 to 13.8 % of the cases, depending on the species. (França & Málaque, 2003).

Crotalus: the venom from this snake presents three action forms: neurotoxic, myotoxic and coagulating. Local manifestations may be reduced to only fang punctures, erythema and edema and slight pain, if any. In most cases there is no alteration in the bite site; however, an attempt to remove the venom or minimize the effects of envenomation by cutting the site, applying a tourniquet and extracting the venom by suction may worsen the edema and even seriously damage the victim’s skin. A *Crotalus* bite triggers strong systemic reactions, such as facial myasthenia, hematuria, myalgia, coagulation problems and acute kidney injury (Azevedo-Marques, Hering & Cupo, 2003).

Lachesis: snakebites caused by this genus are rare, representing only 1.4% of the cases reported with venomous snakes in Brazil. The physiopathology is similar to that of the *Bothrops*, i.e., coagulating activity, hemorrhagic activity and acute inflammatory action. The effect with this genus can be classified according to the victim’s clinical condition: local manifestation characterized by pain, edema and ecchymosis in the affected region, with possibility of reaching the entire limb. Hematological alterations occurs, with limited bleeding, in general on the spot of the bite; in some cases, the occurrence of hematuria, bleeding gums and internal bleeding is reported. The neurotoxic reaction, which occurs at a variable frequency and distinguishes this from the bothropic venom, leads to a condition of serious hypotension (soon after the bite), as well as nausea, sweating, abdominal pain and diarrhea (Málaque & França, 2003).

Micrurus: the number of accidents caused by this genus is low; representing only 0.5 % of snakebites reported in Brazil and usually involves the hands, occurring when the snake is being manipulated. Local manifestations are discreet and the fang marks may be either absent or more than one may be seen. A slight edema may occur (usually associated with the use of tourniquets) and there is no occurrence of ecchymosis or local hemorrhage. Systemic manifestations are related to neurotoxic reactions, such as the paralyzing effects that may appear from minutes to hours after the envenomation and are characterized by dropping of the eyelid (*ptosis*), double vision (*diplopia*), difficulty to swallowing and chewing (*dysphagia*), difficulty to standing upright and restrictive and obstructive dyspnea, evolving to diaphragm paralysis (da Silva jr. & Bucarechi, 2003).

To exemplify the use of mistaken first-aid procedures, we cite the well-known 1991 episode which occurred in a school in the municipality of Andradina, in the State of São Paulo. While at school, a student was bitten by a *Bothrops* viper and the first-aid recommendations of the Science textbook, which included the application of a tourniquet, were followed. Death occurred soon after that, probably due to the loosening of the tourniquet, which led to a cerebral vascular accident (Bizzo, 2002).

It is therefore clear that the first-aid recommendations included in Brazilian Textbooks up to 1996 may severely complicate the situation, particularly for victims bitten by snakes of the *Bothrops* genus, since the use of tourniquets worsens and accelerates the venom's necrotizing action, subjecting the victim to serious cerebral vascular problems and also enhancing the risk of infections through skin perforations and other situations. A detailed clinical study, which involved over 80,000 cases showed that more than 90% of snakebites occurred in Brazil with identified venomous snakes in the period from 1990 to 1993, involved snakes of the *Bothrops* genus (Araújo, Santalúcia & Cabral, 2003). This confirms that the use of tourniquets definitively does not improve and probably worsens the conditions of most snakebite victims.

Epidemiology of Snakebites in Brazil

Currently, in Brazil, four information systems record this kind of accident: National System for Notification of Diseases (SINAN), Mortality Information System (SIM); Hospital Information System (SIH-SUS) and National System of Toxic-pharmacological Information (SINITOX).

In the period between 1990 and 1995, SINAM recorded 122,441 snakebites in Brazil, with the annual average of 20,000 cases/year remaining practically unchanged (Bochner & Struchiner, 2003). Although the Brazilian legislation includes snakebites in the list of compulsory notification diseases, the number of cases reported may be underestimated, since the notification only occurs when the victim has access to health institutions, which have the responsibility of reporting the case.

It is not an easy task to know the exact number of snakebite victims in such a large and complex country as Brazil. In rural areas, snakebites are treated in different ways, using methods and treatments based on popular culture and many times without any assistance from local health institutions.

Reinforcing the idea that inappropriate first-aid procedures are common practice when it comes to snakebites, Bochner & Struchiner (2003) point out the tourniquet as the main procedure used in the pre-hospital assistance in Brazil for the last two decades. Ribeiro and Jorge (1997) show that during the decade of the 1980s, 38.2% of the victims of bothropic venom treated in *Hospital Vital Brasil* in *Butantan Institute*, São Paulo, were subjected to the use of tourniquets for their wounds.

It may be inferred that many of the deaths could have resulted from complications caused by inappropriate first-aid procedures which, besides not doing any good to the victims, may lead to complications such as hemorrhages, secondary infections, necrosis, thromboembolism, etc. During 1985-1986, many people died in Brazil due to the lack of antiophidic serum in the hospitals (Bochner & Struchiner, 2003). After the dramatic repercussion of deaths from lack of proper treatment, a new policy was established, determining the compulsory notification

(ICD10: X20), of contact with venomous lizards and snakes (International Classification of Disease, World Health Organization) and the large-scale production and distribution of antiophidic serum.

Since the implementation of the compulsory notification, the deaths occurring in hospitals have been well documented. The policy established (*National Program of Ophidism*) substantially lowering of the death rate for snakebites between 1986 and 1994, when this rate became stable (approximately 110 deaths per year) (Cardoso & Wen, 2003). Also, with the implementation of this policy by the Ministry of Health, the accidents started to be more frequently as reported to the official information systems.

Figure 2 displays data from three information systems. The total notifications of snakebites to SINAM present an anomalous number in 1987 and in the subsequent years, remains around 20,000, with a strong decrease in 1997 and 1998, possibly as a result of modifications introduced in the notification forms. Up to 1977, the information forms included every type of snakebite, from venomous or non-venomous snakes. Even taking into account only the absolute numbers of the SIM database, without considering the population variation in the period, it can be noted that there are three stable mortality levels and one period of quick change (Figure 2). According to the notifications to SIM, between 1979 and 1986, the average number of deaths remained stable, around 255.1 ($Mdn = 264.5$, $SD = 11.6$). From 1987 to 1990, the average number of deaths gradually decreased and the annual average was about 194.6 ($Mdn = 209$, $SD = 47.24$). The reduction was consistent, even with the constant number of reported accidents to the SINAM database. From 1990 to 1995, the average number of deaths alternated between 151 and 119, with an annual average of 161.4 ($Mdn = 148$, $SD = 47.34$). From 1996 to 1998, the average number of deaths stabilized around 99.3 ($Mdn = 96$, $SD = 6.6$).

Hospital patients form a very reliable database, due to details in the registration forms. From the patients admitted to hospitals for snakebites, in the period between 1993, when the SIH database started to receive data, and 1995, 229 deaths occurred, on an average of 76.33 deaths/year ($Mdn = 76$, $SD = 4,50$). When these data are compared to those obtained in the three subsequent years (1996-1998), from the same database, it can be noted that the annual average was significantly reduced, falling to 46 ($Mdn = 46$, $SD = 3.20$). This figure indicated a new threshold, which remained consistent over the following years. From 1996 and 2007, the annual average of deaths was around 42 ($Mdn = 45$, $SD = 7.07$).

The consolidated data in Figure 2 show a large number of deaths, which may be related to precarious treatment, even in hospitals. During the period between 1987 and 1990, the number of deaths decreased significantly, although the number of accidents remained stable. This reduction indicates higher efficiency in the assistance provided to the victims. It is important to note that there is a certain gap between the reported date of an accident and a possible death, due to the fact that snakebites, particularly when the victim's initial condition gradually worsens, may lead to death after a few weeks.

In the period between 1991 and 1995, a new threshold was observed, based on fully compatible data from the databases of SIM and SIH, the latter showing great consistency. Again, between 1995 and 1996, the two databases recorded a brusque change, when a new period started, with lower standard deviations. It is exactly on this abrupt change, with a reduction of 46% in the number of deaths and the new threshold that we intend to focus our attention (Figure 3).

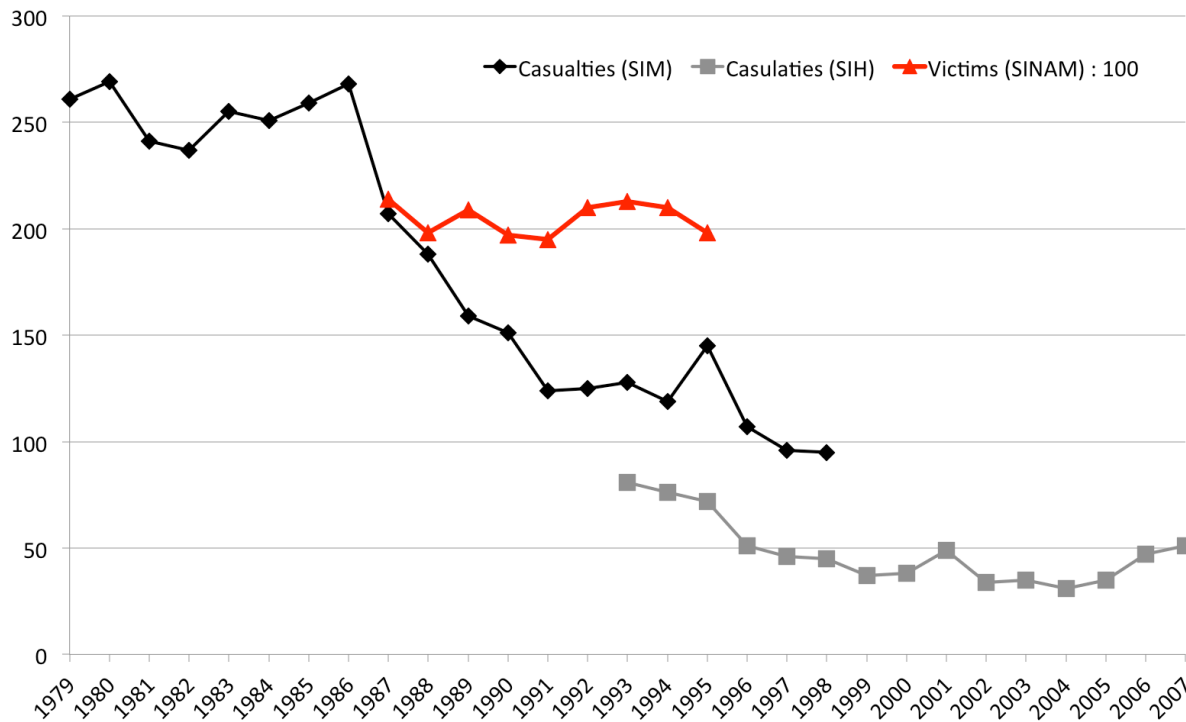


Figure 2. Total number of snakebites reported and the number of deaths in the period between 1979 and 2007, in different databases from the Unified Health System (SIM, SIH & SINAM).

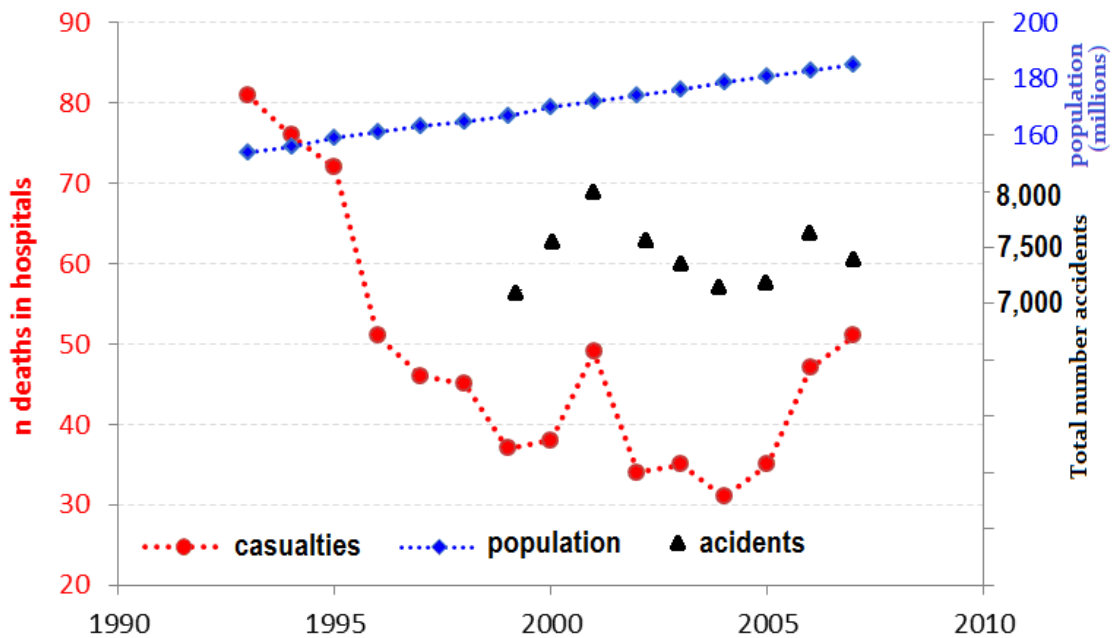


Figure 3. Trends of deaths in hospitals due to snakebites in Brazil, 1993- 2007, with consolidated data from SIH-SUS, which show a curve inflection in 1996 followed by a ten-year stability (red line). The blue line shows the population growth in the same period.

The stability in the period from 1997 to 2007, with a trend to reduction in the number of deaths, may be caused by several factors acting together. The first one, associated with the

notification and information system, results from the fact that in 1998 SIH-SUS replaced the International Classification of Disease (ICD) 9 for ICD 10, which “generated alterations in the records of principal and secondary diagnosis” (Bochner & Struchiner, 2003 p.774). This means that this is a secure basis for the purposes of this study. The other factor refers to the establishment of a better diagnosis prior to the transportation of the victim to a medical center, based on clinical manifestations, which leads to “a better classification of the accidents, sorting out those caused by non-venomous snakes and which, therefore, do not need serology and hospitalization” (Bochner & Struchiner, 2003, p.774). In spite of all the difficulties faced by the public health system in Brazil, a gradual improvement in the treatment provided to the serious cases cannot be disregarded.

However, in addition to all these factors addressed by the medical literature, another one, if taken into account, could explain not only the stability and the decrease trend, but also the abrupt fall in the number of deaths in the period between 1995 and 1997. This possibly relates to the condition of the victim, who is no longer exposed to the application of tourniquets, punctures, etc., and consequently, arrives at the hospital in a situation less worsened. A better initial condition of the patient could be responsible for reducing the probability of death from complications caused by misleading first-aid procedures. In 1996, the unprecedented process carried out by the Ministry of Education to evaluate Textbooks received great attention from the media, which exhaustively broadcasted examples of mistakes, highlighting the wrong first-aid procedures recommended for snakebites.

Should this reasoning be correct, a significant reduction in the number of deaths would be expected, even after hospitalization, with the application of correct and standardized procedures, which did not vary during the period under analysis. The Hospital Information System (SIH-SUS) registers the deaths occurred after hospitalization, which ensures the consistency of data, since the death certificate is signed by a doctor and also because a previous hospitalization supposes a precise *causa mortis*. This data system recorded a decrease of 46% between the average in the years before the disclosure of the evaluation and the average in the subsequent years. This proposition is consistent with the hypothesis that the reduction in the number of deaths resulting from snakebites reported between 1995 and 1997, might have been due to some generalized change in the first-aid procedures provided to snakebite victims before transporting them to the hospital.

An opposite hypothesis could explain the abrupt fall of mortality by a sudden and relevant improvement in the health services, at least in relation to the serology. This hypothesis would lead to the assumption that the same significant reduction of mortality would be noted among patients with similar needs of medical assistance (which is not the actual case) if we look at the number of deaths resulting from spider bites, for example (Table 1). Even considering the reduced number of occurrences, the number of deaths from accidents involving spiders tends to increase. Accordingly, this fact only reinforces the hypothesis that changes in the pre-hospital assistance provided to snakebite victims may justify the significant fall in the number of deaths in the period between 1995 and 1997, and this change was a consistent one.

Another rival hypothesis to explain the decline of casualties resulting from snakebites would point to reduction of total accidents, following a possible decline of the rural population. However, the number of accidents did not decline; on the contrary, there was a tendency for these to increase up to the year 2001, when it reached 8,095 people, contrary to 7,075 cases in 1998 (Ministério da Saúde, 2012). In addition, it is noteworthy that population movement in

the country is opposed to the traditional urbanization tendency, due to the creation of many towns in relatively sparsely populated regions, without any noticed movement expressive of rural depopulation. In some areas in the North and Northeast regions, there was an expressive rural population growth in the 1990's, due to a phenomenon called "reverse migration." (Brito, 2006). There are around five million students on rural schools (MEC, 2011), and many urban schools are close to wild regions, even in huge cities, such as São Paulo.

Table 1. Deaths of hospital patients, directly resulting from snake and spider bites per year, Brazil. Period 1993-1999. Source: Ministry of Health – Hospital Information System of the Unified Health System (SIH/SUS)

Cause/Year	1993	1994	1995	1996	1997	1998	1999
Snakes	81	76	72	51	46	45	37
Spiders	11	5	3	8	9	8	23

During the period between 2001 and 2007 the total number of deaths of hospital patients, resulting from snakebites and the mortality rate (ratio between the number of deaths and the number of hospital admission authorizations made in the period, multiplied by 100) were relatively constant (Table 2), showing that the decrease in the number of deaths after 1996 cannot be understood as episodic or seasonal.

Table 2. Mortality Rate (R) and Number of Deaths (N) per year, Brazil. Cause Category (ICD 10): X20 Contact with venomous snakes and lizards. Period: 2000-2007. Source: Ministry of Health – Hospital Information System of the Unified Health System (SIH-SUS)

2001		2002		2003		2004		2005		2006		2007	
R	N	R	N	R	N	R	N	R	N	R	N	R	N
0.61	49	0.44	34	0.47	35	0.43	31	0.47	35	0.60	47	0.69	51

Final Comments: Role of scientific education

The reduction in the number of snakebite fatalities for victims who had access to health care services from 1997 to 2007 may be related to the reduction in complications and secondary infections arising from pre-hospital assistance, mainly those provided by the population in general and not by health professionals.

Such change may have resulted, among other factors, from the nation-wide repercussion of the first generation of textbooks presenting proper procedures for pre-hospital assistance and correcting, very explicitly, all those traditionally known mistakes. The big media reverberations (newspapers, TV and radio) of the first evaluation carried out on these books in 1996, certainly contributed to make people change the procedures. The alterations in the content and recommendations included in the textbooks published after 1996 were kept in the new editions and launchings, providing new grounds for the treatment of snake venom in Brazil.

The correct application of first-aid procedures is particularly favorable in bites of *Bothrops* snakes – which account for more than 90% of snakebites in Brazil. Although these snakebites present low morbidity, incorrect first-aid procedures such as local puncture, suction and the use of tourniquets are extremely harmful to the victim and because of these method's consequential complications occur. Providing the population with explanations about hazardous measures and the much more simple ways to assist the victims may have led to a major change in pre-hospital procedures and may be the reason for the significant reduction in the number of deaths, which was observed simultaneously with the corrections made to Science textbooks all over the country.

When the *Butantan Institute* was created, over 100 years ago, it was already known that treatment clarification to the people was a crucial aspect for the success of the serologic treatment of snakebites that was then initiated, on a pioneering initiative. At that time, a series of beliefs about antidotes for snakebites was part of the popular culture and even of different levels of charlatanism. It would not be possible to imagine that, almost one hundred years later, the government, itself, would disseminate wrong information about the matter, based on mistaken adaptations of practices borrowed from another country and, even more serious, that just a few people would be concerned about the inevitable negative consequences. Perhaps the fact that those mistakes victimized only simple, rural people, explains the lack of interest by the great public of the cities in steps to reduce snakebite mortality.

It is important to point out the need for research on other factors and determinants in order to investigate and explain the aforementioned decrease of snakebite deaths. However, the relationship between the change in the mortality rates for snakebite victims who have access to health care services and the changes in the first-aid procedures, resulting from the alterations in the Science textbooks (following the evaluation and its repercussion, in 1996) may be seen as a quite reasonable explanation for the fact.

The rigor of the information included in Textbooks, which, as pointed out above, influences and decisively determines the development of the curricula, as well as the mechanisms to evaluate the quality of these books are of vital importance for aspects of teachers' and students' lives that extend far beyond the classroom environment. In this sense, the scientific education, as well as the exact and pertinent information, plays such an important role in both, individual and collective health conditions that its impact can be noted even on the mortality rates.

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