Human exposure to potential rabies virus transmitters in Olinda, State of Pernambuco, between 2002 and 2006

Exposição humana a potenciais transmissores do vírus rábico em Olinda, Estado de Pernambuco, entre 2002 e 2006

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ABSTRACT

The aim of the present study was to evaluate the data on human exposure to potential rabies virus transmitters in Olinda, State of Pernambuco, Brazil. Data from 7,062 patients who underwent antirabies prophylactic treatment in Olinda between 2002 and 2006 were analyzed. As expected, dogs and cats were involved in most of the cases; i.e. 82.3 and 16.3%, respectively. Attacks by nonhuman primates, bats and other species (unspecified) were also reported. Among the 7,062 patients who underwent antirabies treatment, 582 patients abandoned the treatment, either by indication from the health unit (195) or by their own decision (387). In conclusion, this study has indicated that prophylaxis for human rabies in this urban area will require a multifaceted approach, including health education, post-exposure prophylaxis, systematic vaccination for dogs and cats, and possibly selective control over wild animals such as hematophagous bats.

Key-words: *Rabies. Epidemiology. Prophylaxis. **Control.***

RESUMO

O objetivo deste estudo foi avaliar os dados sobre a exposição humana a potenciais transmissores do vírus rábico em Olinda, Pernambuco, Brasil. Foram analisados dados de 7.062 pacientes submetidos ao tratamento anti-rábico em Olinda entre 2002 e 2006. Como esperado, cães e gatos estiveram envolvidos na maioria dos casos; isto é, 82,3 e 16,3%, respectivamente. Ataques por primatas não-humanos, morcegos e outras espécies (não especificadas) também foram relatadas. Dos 7.062 pacientes submetidos ao tratamento anti-rábico, 582 abandonaram o tratamento, seja por indicação da unidade de saúde (195) ou por decisão própria (387). Concluindo, esse estudo indica que a profilaxia da raiva humana nessa área urbana irá requer uma abordagem multifacetada, incluindo educação em saúde, profilaxia pós-exposição, vacinação sistemática de cães e gatos e, eventualmente, o controle seletivo de animais silvestres, tais como morcegos hematófagos.

Palavras-chaves: *Raiva. Epidemiologia. Profilaxia. **Controle.***

It is well known that human-induced climate change and land-use activities might influence the emergence or reemergence of many communicable diseases, such as malaria, leishmaniasis, trypanosomiasis and dengue[14 17]. Scientific advances such as vaccine development can also lead to remarkable changes in the epidemiology of certain infectious diseases, as is the case with human rabies. The availability of an effective vaccine and great efforts by public health authorities worldwide have made it possible to bring dog and cat-transmitted human rabies under control in several countries, and even to eradicate it. On the other hand, human pressure on the environment and close contact between humans and wild animals, which has become increasingly frequent, are causing a dramatic change in the epidemiology of human rabies in most areas where the disease remains endemic[3 7 13 21 22 23].

Recent analyses of the epidemiological situation of rabies in the Americas have revealed that the incidence of canine and human rabies has undergone a significant reduction, particularly over the last two decades[3 16 22]. The incidence of human rabies cases in this region dropped from 216 in 1993 to 39 in 2002. Likewise, while 6,716 cases of rabies in dogs were reported in 1993, 1,311 were recorded in 2002[3]. An analysis of the trend in rabies cases from 1982 to 2003 revealed a reduction in the number of human cases from 355 to 35[22]. The success of human rabies control can be attributed to two main strategies: vaccination of dogs and cats and human rabies post-exposure prophylaxis[3 22]. Systematic rabies

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vaccination campaigns have been carried out every year, or even every six months, in most of the countries where human rabies is endemic. Out of approximately one million people exposed to potential rabies virus transmitters who seek care from the health system every year, around 30% receive prophylactic treatment against rabies[3].

Following this trend, the number of human rabies cases transmitted by dogs in Brazil underwent a notable reduction over the last two decades. Conversely, cases of human rabies transmitted by wild animals, e.g. hematophagous bats and marmosets, has undergone a relatively increase over recent years[3 7 8 20]. In the State of Pernambuco, cases of human rabies are relatively rare nowadays, although cases of animal rabies have frequently been recorded[15]. Cases of acts of aggression by bats on humans in the municipality of Recife have recently been reported, thus indicating the risk of occurrences of human rabies transmitted by bats in Pernambuco. The aim of the present study was to evaluate the data on human exposure to potential rabies virus transmitters in the municipality of Olinda, where cases of acts of aggression by bats on pet dogs have recently been reported[5].

MATERIAL AND METHODS

Study area. This study was carried out in the municipality of Olinda (8º00'48"S 34º50'42"W), which is located in the metropolitan region of Recife, on the coast of the State of Pernambuco, in northeastern Brazil (Figure 1). Olinda has a population of approximately 368,000 inhabitants, unequally spread over a territory of approximately 40.8 square kilometers. In 1982, the historic central area of Olinda was declared by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as Historical and Cultural Heritage of Mankind. The city's climate is tropical, with a mean annual temperature of 27ºC, annual relative humidity of 80% and annual precipitation of between 1,000 and 2,000mm.

The municipality of Olinda has conducted systematic, six-monthly mass rabies vaccination campaigns targeting dogs and cats. If at any time a case of animal rabies is recorded, focal vaccination of dogs and cats is carried out. Nowadays, cases of animal rabies are only rarely being reported.

Data source and procedures. Information on human rabies post-exposure prophylaxis in Olinda, from 2002 to 2006, was obtained from the National Disease Surveillance Data System (SINAN) of the Brazilian Ministry of Health. For this study, the following information was selected: type of aggression (locality, severity and circumstance); type of animal involved; patient's sex, age group and district of origin.

A thematic map depicting the spatial distribution of the antirabies treatment in Olinda throughout the study period was constructed using the TabWin software (DATASUS, Brazil), version 3.2.

RESULTS

From 2002 to 2006, a total of 7,062 patients underwent antirabies prophylactic treatment in Olinda following exposure to a potential rabies virus vector. The animals involved in these cases included dogs, cats, nonhuman primates (e.g. marmosets) and bats. Dogs were responsible for 5,809 (82.3%) cases of acts of aggression, followed by cats (16.3%), nonhuman primates (0.4%), bats (0.2%), and others (0.3%). Information on the animals involved was missing or unknown in 36 (0.5%) cases of aggression (Table 1).

There were 2,734 acts of aggression on lower limbs, 1,446 on upper limbs, 593 on the trunk, and 620 on the head/neck. In 5,332 cases the lesions were deep and in 5,037 cases the lesions were multiple. Regarding the circumstances in which the aggression occurred, 5,696 patients were exposed during leisure time,

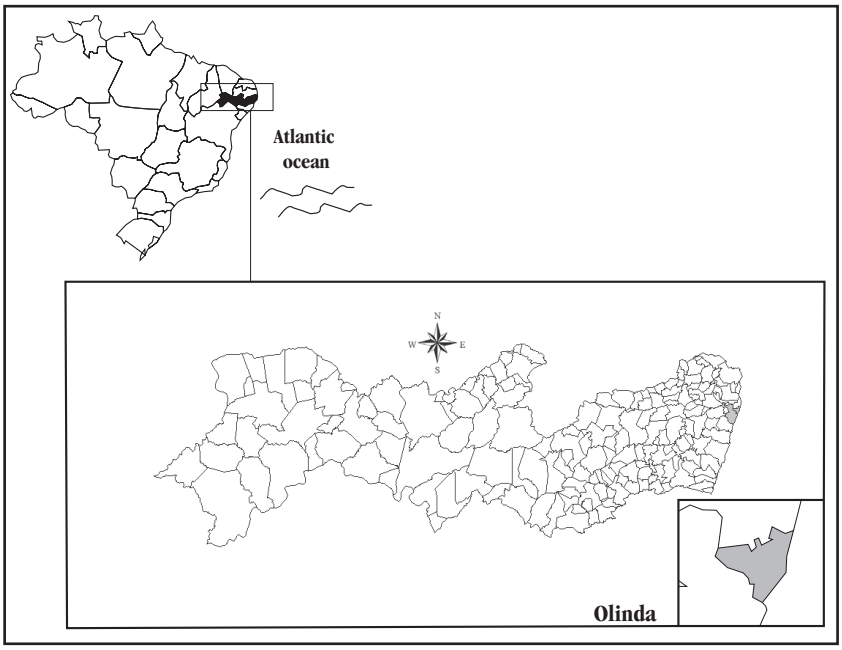

Figure 1 - Location of the study area in the State of Pernambuco, northeastern, Brazil.

Table 1 - Human exposure to potential rabies virus transmitters in Olinda, State of Pernambuco, Brazil, from 2002 to 2006.

	Individuals exposed	
Animal type	nº	%
Dogs	5,809	82.3
Cats	1,149	16.3
Nonhuman primates	30	0.4
Bats	16	0.2
Others	22	0.3
Unknown/missing data	36	0.5
Total	7,062	100

553 were attacked by an aggressive animal, and 119 by an animal with changed behavior. Information on the circumstances in which the aggression occurred was lacking in 694 cases.

The ages of the individuals exposed to potential rabies virus transmitters ranged widely: from < 1 to > 80 years old. Children aged 5-9 years were proportionally more affected than was any other age group (Table 2). More patients were males (3,643), although the difference between males and females was negligible.

Out of the 7,062 individuals who underwent rabies post-exposure prophylaxis, 582 abandoned the treatment, either by indication from the health unit (195) or by their own decision (387).

Table 2 - Human exposure to potential rabies virus transmitters in Olinda, State of Pernambuco, Brazil, from 2002 to 2006.

Age group	Number	Percentage
<1	41	0.6
1-4	648	9.2
5-9	1,200	17.0
10-14	897	12.7
15-19	522	7.4
20-29	868	12.3
30-39	682	9.7
40-49	743	10.5
50-59	653	9.2
60-69	442	6.3
70-79	261	3.7
≥80	103	1.5
Unknown/missing data	2	<0.1
Total	7,062	100

Regarding the district of origin, most individuals were from Rio Doce (836), Ouro Preto (731), Jardim Atlântico (482), Peixinhos (447), Águas Compridas (356) and Jardim Brasil (314). Together, these districts recorded 44.8% of the cases. The spatial and temporal distributions of acts of animal aggression recorded in Olinda during the study period are shown in Figure 2 and Figure 3, respectively.

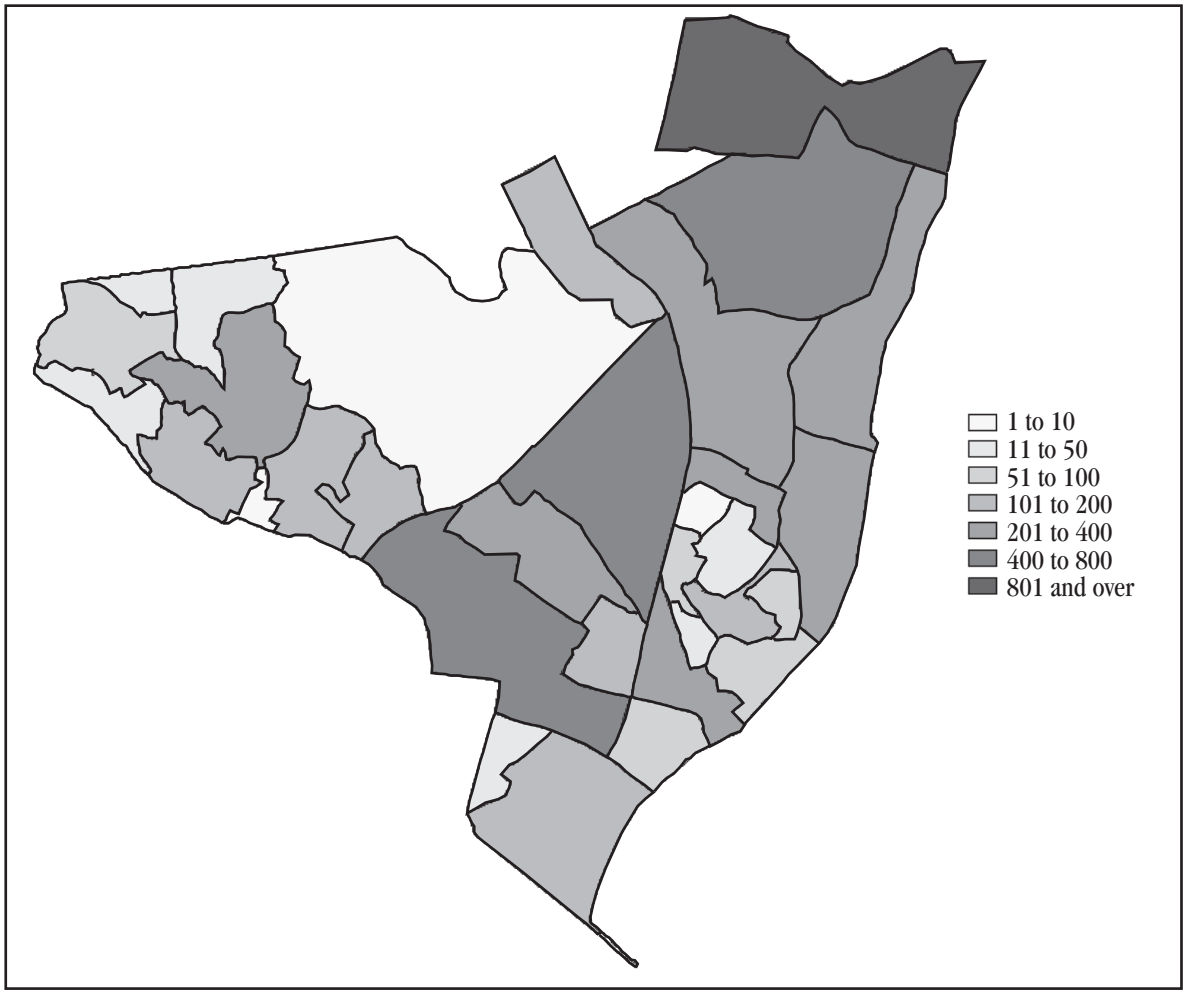

Figure 2 - Spatial distribution of cases of human exposure to potential rabies virus transmitters in Olinda, State of Pernambuco, Brazil, from 2002 to 2006.

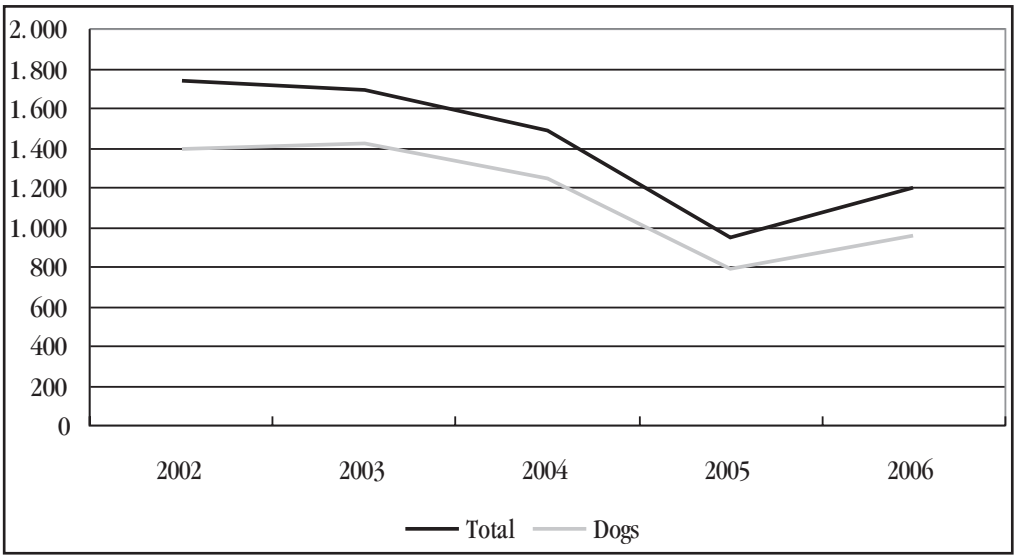

Figure 3 - Temporal distribution of cases of human exposure to potential rabies virus transmitters in Olinda, State of Pernambuco, Brazil, from 2002 to 2006.

DISCUSSION

Historically, dogs and cats have been implicated as the main transmitters of human rabies not only in Brazil, but also in most other countries where the disease is still occurring. Over the last two decades, the incidence of human rabies transmitted by wild animals like raccoons, skunks, foxes and bats has increased, particularly in Latin America, where hematophagous bats have surpassed dogs in relation to transmitting the rabies virus to humans[3 7 8 13 20 22].

Bats are considered to be the natural reservoirs for the rabies virus[6 25]. There has been an increasing risk of human exposure to both hematophagous and non-hematophagous bats in the Americas[3 4]. Attacks of vampire bats on humans have been linked to factors such as gold mining, livestock movements and deforestation[13]. In outbreaks of human rabies transmitted by vampire bats in the Amazon region of Brazil and Peru, human-made environmental modifications to bat habitats, (e.g. the transformation of wildlife areas into suburban areas), were noted as possible risk factors for the incidence of the disease[3]. A number of cases of human rabies transmitted by hematophagous bats have been reported in Brazil[1 10 11 20] and elsewhere[12 24]. Acts of aggression by bats on dogs have also been reported. It is not rare to see vampire bats feeding on domestic animals, particularly dogs, in urban areas[5]. Since dogs are often close to people, vampire bat attacks on these animals should be taken as an indicator of the risk of possible attacks on humans. Indeed, the control of rabies in wild animal species, particularly bats, is obviously more complex than in domestic animals. Wild animals have different behaviors and live in a wide, diverse range of wild environments. Moreover, wild species are often listed as protected animals[23].

Nonhuman primates are potential sources of rabies virus. Marmosets (*Callithrix jacchus*) have been associated with human rabies transmission in Brazil[2 7]. It is very likely that the proximity of marmosets to urban settlements and the common practice of keeping them as pets are major contributory factors towards the risk of human exposure to these potential rabies virus transmitters. This practice is illegal in Brazil and should be strongly discouraged.

Studies on human rabies post-exposure prophylaxis have revealed that the WHO recommendations (for more details, see[25]) are frequently neglected or ignored[9 16 18 19]. This can increase the risk of rabies considerably and result in unfavorable outcomes. Adherence to the WHO-recommended guidelines ensures protection against rabies[25]. Analyzing the cases of human rabies reported in the United States from 1980 to 1998, researchers at the Centers for Disease Control and Prevention observed that none of the 32 patients received post-exposure prophylaxis before the onset of clinical disease[16]. This highlights the importance of rapid post-exposure prophylaxis for individuals exposed to potential rabies virus transmitters.

The increasing risk of human rabies transmitted by wild animals is an emerging challenge to public health worldwide. This situation is likely to require a multifaceted strategy for disease control and prevention, particularly in areas where the risk of human rabies transmitted by wild animals is high. This integrated approach should include much more than human rabies post-exposure prophylaxis, dog population management and mass immunization.

Community awareness constitutes one of the biggest deficiencies in most rabies control programs. Information on control and prevention measures regarding rabies is generally lacking or limited. In certain areas, the control of rabies in wildlife is also warranted and this includes population management and mass immunization of the principal wildlife hosts[5]. Human pre-exposure prophylaxis should be considered, especially for people at high risk of exposure to potential rabies virus transmitters, e.g. individuals working in rabies diagnostic or research laboratories, wildlife and animal control officers, veterinarians, animal handlers and cave explorers. Pre-exposure prophylaxis should also possibly be offered to individuals living in or traveling to high-risk areas[25].

The prophylactic procedures against rabies for children and adults that have been adopted in Olinda follow the WHO recommendations[25]. A total of 5,909 vaccine doses and 331 rabies immunoglobulin injections were given to people exposed to potential rabies virus transmitters in Olinda, from 2002 to 2006 (results not shown). Considering the whole study period, cases of human exposure to potential rabies virus transmitters were notified in all districts of Olinda. The temporal distribution of the cases showed a slight increase in 2005 after a decreasing trend that started in 2002 (Figure 3). The possible reasons for this temporal distribution pattern should be the subject of future studies. Likewise, it is important to further investigate why so many patients have abandoned treatment in Olinda. Studies to address these questions are highly recommended.

The local public health authorities in Olinda should continue to focus their efforts on the systematic vaccination of dogs and cats, prompt and complete human rabies post-exposure prophylaxis, responsible animal ownership, and stray dog and cat population management. Studies on the antigenic rabies virus variants circulating among dogs, cats and other animals, particularly bats, should be encouraged, in order to improve our understanding of the dynamic of rabies virus transmission in Olinda. Likewise, the localization and monitoring of all hematophagous bat populations living in this municipality are warranted.

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