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Epidemiological profile of rabies post-exposure prophylaxis in the state of Sergipe, Brazil, from the year 2016 to 2020

Perfil epidemiológico da profilaxia pós-exposição da raiva no estado de Sergipe, Brasil, no ano de 2016 a 2020

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The study aimed to describe the epidemiological profile of human anti-rabies treatments in the state of Sergipe, during the years 2016 to 2020. A descriptive, retrospective, cross-sectional and quantitative epidemiological study was carried out. The variables were collected according to the investigation form of human anti-rabies consultations, on the website of the Ministry of Health, SINAN. The data obtained were expressed in absolute and relative frequency. During the period from 2016 to 2020, 24,526 notifications of anti-rabies treatment in humans were registered in the state of Sergipe. Regarding the profile of the notified patients, the majority were male, aged between 30 and 59 years and with incomplete primary education. Many notifications came from the urban area and the bite was the most frequent exposure. Thus, it is observed that it is necessary, health education on forms of prevention and control of rabies in the state.
Keywords: *Lyssavirus*, public health, zoonoses.

O estudo teve por objetivo descrever o perfil epidemiológico dos atendimentos antirrábicos humanos no estado de Sergipe, durante os anos de 2016 a 2020. Foi realizado um estudo epidemiológico do tipo descritivo, retrospectivo, transversal e quantitativo. As variáveis foram coletadas conforme a ficha de investigação dos atendimentos antirrábicos humanos, no site do Ministério da Saúde, o SINAN. Os dados obtidos foram expressos em frequência absoluta e relativa. Durante o período de 2016 a 2020, foram registrados no estado de Sergipe 24.526 notificações de atendimentos antirrábicos em humanos. Com relação ao perfil dos pacientes notificados, a maioria do gênero masculino, faixa etária entre 30 a 59 anos e ensino fundamental incompleto. Muitas notificações foram provenientes da zona urbana e a mordedura foi a exposição mais frequente. Assim, observa-se que é necessário, educação em saúde sobre as formas de prevenção e controle da raiva no estado.
Palavras-chave*: Lyssavirus*, saúde pública, zoonoses.

1. INTRODUCTION

Rabies, which is a zoonosis having a strong impact on public health, is caused by a Lyssavirus of the Rhabdoviridae family. This disease has a high mortality rate of nearly 100%. Rabies virus is inoculated in the saliva through bites, scratches, or licks of infected animals [1].

In 1973, the National Rabies Prophylaxis Program (Programa Nacional da Profilaxia da Raiva – PNPR) was created for the control and prevention of human rabies through agencies such as the Ministry of Agriculture and Food Supply (Ministério da Agricultura Pecuária e Abastecimento – MAPA), the Ministry of Health (Ministério da Saúde – MS), and the Pan American (PAHO) and World (WHO) Health Organizations. This program focuses on disease prevention and health promotion, aiming at vaccination and animal control, human pre-exposure prophylaxis, and health education initiatives throughout the country [2].

In 2014, Ministerial Decree 1,271 of June 6, 2014 was published in Brazil, which stated that cases of suspected human rabies should be mandatorily, immediately, and individually notified [3]. Two years later, the ministerial decree 204 published in February, 2016 stated that accidents with animals that could transmit rabies should be mandatorily and immediately notified [4].

Rabies is considered a public health concern in Brazil, and rabies post-exposure prophylaxis is among the three most reported medical treatments for notifiable diseases [5]. Rabies accident cases are notified using the Rabies Post-exposure Risk Assessment Form (Ficha de Investigação de Atendimento Antirrábico), which is filled out in the Notifiable Diseases Information System (Sistema de Informação de Agravos de Notificação – SINAN) [6].

Brazil has recorded 40 human rabies cases between 2010 and 2021. In the state of Sergipe, no human rabies cases have been recorded since the last 16 years. The data available from SINAN show the occurrence of one case in the year 2001 and another in 2005 [7]. Sergipe lacks epidemiological studies on rabies and its post-exposure prophylaxis. Therefore, this study aimed to describe the epidemiological profile of rabies post-exposure prophylaxis in the state of Sergipe from the year 2016 to 2020.

2. MATERIAL AND METHODS

2.1 Study area description

The state of Sergipe has 75 municipalities, with a total land area of 21,938.184 km² and with a population density of 94.35 inhabitants/km². Sergipe, which borders the states of Alagoas and Bahia, and is considered the smallest state of the northeast region and Brazil, with a population of 2,068,017 inhabitants in the last census conducted in 2010 and with a Human Development Index (HDI) of 0.665, according to the last census conducted in 2010 census. The capital of Sergipe is the The city of Aracaju is the capital of Sergipe [8].

2.2 Study design

A descriptive, retrospective, cross-sectional, quantitative epidemiological study was conducted [9]. Data on rabies post-exposure prophylaxis notifications in the state of Sergipe from 2016 to 2020 were provided by the Sergipe State Health Secretariat (Secretaria de Estado da Saúde de Sergipe – SES/SE).

Information on the study variables was collected obtained from the rabies post-exposure risk assessment forms available from the MS website, SINAN, analyzing the municipality of residence, age group, gender, education level, area of residence, type of wound, aggressor animal species and health status, availability for observation, treatment, treatment discontinuation, and reason for treatment discontinuation.

2.3 Data analysis

The data were collected on January 10, 2022, and analyzed by pairing variables selected from the database using the software program Microsoft Excel®. The data were plotted in graphs, outlined in the tables, and expressed as absolute and relative frequencies.

2.4. Ethical considerations

The work does not require approval from the ethics committee, as it is public domain data.

3. RESULTS AND DISCUSSION

A total of from 2016 to 2020, 24,526 notifications of rabies post-exposure prophylaxis notifications were recorded in the state of Sergipe from the year 2016 to 2020 and the highest number of notifications was reached noted in 2019.

In 2019, 1,048 animal rabies cases were recorded in Brazil, of which 26.14% of which were recorded in the northeast region [7], which may could be associated with the increased number of notifications in the state of Sergipe during that year because owing to the alarming data leave resulting in high alert within the population on alert.

In 2019, a case of human rabies, transmitted by a cat, was reported in Santa Catarina, and in 2020, two cases of human rabies, both of which were transmitted by wild animals, were reported in the states of Rio de Janeiro and Paraíba [7].

According to Araújo et al. (2020) [10] the increase in the number of rabies post-exposure prophylaxis notifications in large cities may could be related to the increase in the population of domestic animals, such as cats and dogs, and to their close link to association with humans.

Based on the analysis of sociodemographic variables (Table 1), A total of 51.73% of the notified patients were men according to the analysis of the sociodemographic variables (Table 1), which corroborated withing the findings of the study conducted by Benedetti et al. (2020) [11] in the state of Roraima, who which characterized the sociodemographic profile of the rabies post-exposure prophylaxis from 2007 to 2019 and found no gender differences in the cases, with men accounting for 58% of the notified patients.

Table 1: Sociodemographic profile of rabies post-exposure prophylaxis in the state of Sergipe from the year 2016 to 2020.

VARIABLES	Absolute Frequency (N)	Relative Frequency (%)
Sex		
Male	12,689	51.73
Female	11,837	48.27
Age group		
< 1 year	292	1.19
1–14 years	6,720	27.40
15–29 years	5,075	20.69
30–59 years	9,137	37.26
> 60 years	3,302	13.46
Education level		
Illiterate	457	1.86
Incomplete primary education	4,819	19.64
Complete primary education	975	3.99
Incomplete secondary education	1,293	5.27
Complete secondary education	2,197	8.95
Incomplete higher education	773	3.16
Complete higher education	810	3.30
Not applicable	3,514	14.33
No answer/Blank	9,688	39.50
Area of Residence		
Urban	18,064	73.65
Rural	5,106	20.82
Suburban	168	0.69
No answer/Blank	1,188	4.84

By Based on the age group, 37.26% patients aged 30 to 59 years, in contrast to the profile found by Carvalho and Silva (2007) [12] in a Primary Healthcare Unit (Unidade Básica de Saúde – UBS) in the municipality of São Luís do Maranhão, where a higher number of rabies post-exposure prophylaxis notifications were recorded among zchildren aged 5 to 9 years. By

Based on the education level, 19.64% patients had incomplete primary education. Menezes et al. (2016) [13] noted that some social factors, such as social classstatus, age group and education level, may could affect health knowledge and practices.

The results showed revealed that most of the notifications werederived from urban areas (73.65%). This problem may which could have an impact on public health in that since the increase in the population of free-ranging urban dogs and cats (whether stray or feral) and their free access to public roads are risk factors for the occurrence of aggressions in urban environments, in addition to increasing the possibility of the transmission of zoonotic diseases, such as rabies [2].

Aggressions remain underreported in rural areas, most likely because people who live individuals living in those areas seldom seek care for various reasons, such as difficulties in getting to the city, problems in accessing healthcare services or even lack of guidance on the dangers of the disease [14].

By According to the type of exposure, bites were the most frequent, accounting for 82.94% of the notifications during the study period, followed by scratches, with (12.95%). Bites were the most frequent type of exposure, accounting for 82% of the cases evaluated by Garcia et al. (2017) [15] in the municipality of Eldorado do Sul, in the state of Rio Grande do Sul, Brazil.

The rabies virus is found in the saliva of the infected animal and is mainly transmitted through bites [5]. However, many people still associate rabies transmission only with bites, in contrast to other types of exposure, such as licking and scratching, possibly due owing to the higher number of bite records as a associated as a type of exposure [16].

Data on the aggressor animal species and health status and on whether this the animal was available for observation were have been described in this study, as outlined in Table 2.

Table 2: Characterization of the aggressor animal species of rabies post-exposure prophylaxis notifications in the state of Sergipe from the year 2016 to 2020.

VARIABLES	Absolute Frequency (N)	Relative Frequency (%)
Aggressor animal species		
Dog	18,102	73.80
Cat	5,245	21.39
Chiroptera (bat)	146	0.59
Primates (monkey)	142	0.57
Fox	58	0.26
Domestic herbivore	24	0.10
Others	809	3.29
No answer/Blank	-	-
Animal health status		
Healthy	13,549	55.25
Suspected Rabies	5.724	23.33
Rabies	108	0.45
Dead/Disappeared	2,719	11.08
No answer/Blank	2,426	9.89
Availability for observation		
Yes	15,750	64.21
No	3,340	13.61
No answer/Blank	5,436	22.18

Considering the species of the aggressor animal, dogs and cats accounted for 73.8% and 21.395 of the cases, followed by cats, with 21.39% respectively. As reported in the study by Andrade et al. (2023) [17], the analysis of rabies post-exposure prophylaxis records in the state of São Paulo showed revealed that dogs were involved in most of the aggressions.

Based on the animal health status, 55.25% of the animals were clinically healthy at the time of the aggression, and 23.33% were suspected of having rabies. Of these animals, 64.21% were available for observation. MS recommends, in cases of accidents, that the animals remain under

observation for ten days after following the exposure in cases of accidents, assessing whether the animal manifests clinical signs or dies; if the aggressor animal is healthy during the observation period, the case must should be closed, and if the victim is undergoing post-exposure treatment, the case should be suspended [7].

According to Uzunović et al. (2019) [18], the increasing number of dog and cat aggressions is related to associated with the increasing number of free-ranging urban animals and to their closeness to humans. Aggressions of these animals raise public health concerns because since they can cause injuries in humans, such as: physical injuries, infections with pathogens, and zoonotic diseases [19].

Dogs have been considered the main rabies vectors in urban areas, and the bats primarily accounts for the maintenance and spread of the disease in the wild;, but however, Mota et al. (2016) [20] stated that the epidemiological profile of the transmission of this disease has changed in Brazil and that cases of transmission by bats in urban areas have significantly increased significantly.

In Sergipe, dogs accounted for the highest number of rabies post-exposure prophylaxis notifications. Moreover, until November, of 2021, 16 cases of dogs and cats with the bat variant of rabies were recorded in Brazil [7]. Thus, dogs and cats must should be vaccinated annually to prevent rabies in both companion animals and humans [21]. The data collected about the wound, type of wound, and wound site are outlined in Table 3.

Table 3: Characterization of the wounds, type of wounds, and wound sites reported in the rabies post-exposure prophylaxis notifications in the state of Sergipe from the year 2016 to 2020.

VARIABLES	Absolute Frequency (N)	Relative Frequency (%)
Wound		
Single	14,127	57.60
Multiple	8,436	34.39
Without wound	513	2.09
No answer/Blank	1,450	5.92
Type of wound		
Deep	10,040	40.94
Superficial	11,234	45.80
Lacerating	1,408	5.74
No answer/Blank	1,844	7.52
Wound site		
Mucosa	546	2.22
Head	2,056	8.36
Hands	8,802	35.00
Torso	1,250	5.08
Lower limbs	8,350	34.04
Upper limbs	4,000	15.30

The results showed revealed 57.6% and 45.8% single wounds and and 45.8% superficial wounds, respectively. By In contrast, Azevedo et al. (2021) [22] found that most wounds were single or deep wounds in the municipality of Jataí and, Goiás. According to Veloso et al. (2011) [23], the higher number of reports of deep injuries demonstrates reveals that the search pursuit for care is greater in cases of more serious accidents.

The most frequent wound sites were hands (35%) and lower limbs (34.04%), as found demonstrated by Silva et al. (2013) [24]. These body regions have a higher risk of a rabies-inducing attack because since they are easily accessible by the aggressor species, and the hands are most often used by the victims to defend themselves.

Table 4 outlines the data on the treatment indicated to patients, treatment discontinuation, and reasons for treatment discontinuation.

Table 4. Data on the treatment reported in the rabies post-exposure prophylaxis notifications in the state of Sergipe from the year 2016 to 2020.

VARIABLES	Absolute Frequency (N)	Relative Frequency (%)
Treatment indicated to the patient		
Pre-exposure	758	3.09
Treatment waiver	536	2.18
Observation of the animal (if dog or cat)	2,179	8.88
Observation + vaccine	11,182	45.59
Vaccine	5,408	22.07
Serum + vaccine	3,385	13.80
Post-exposure prophylaxis	158	0.64
No answer/Blank	920	3.75
Treatment discontinuation		
Yes	1,430	5.83
No	11,076	45.17
No answer/Blank	12,020	49.00
Reason for treatment discontinuation		
Indicated by the Unit	257	1.04
Dropout	1,134	4.62
Transfer	39	0.15
No answer/Blank	23,096	94.19

Among the treatments indicated to patients, 45.59% of the cases were underwent observation plus post-exposure vaccine. These results are similar to the data reported for the state of Roraima, where 14,046 (40.7%) patients were indicated for observation plus vaccine [11]. When filling out the notification form, the possibility of observing the aggressor species is essential information that must should be collected, and correctly accurately filling out of this form prevents the misuse of immunobiologicals and indicatinges the correct precise prophylactic treatment [25].

Vaccination was the recommended prophylactic approach in 22.07% of the cases. The post-exposure rabies vaccine is an effective approach to eliminate the rabies virus from the urban transmission cycle [6]. The healthcare professionals' knowledge about concerning the correct appropriate treatment in rabies post-exposure prophylaxis avoids unnecessary expenses to the public healthcare system and improves public health [26].

Considering the occurrence of treatment discontinuation, 5.83% patients discontinued treatment, and while this information was ignored in 49% of the records. Considering the reason for treatment discontinuation, only 4.64% cases of treatment discontinuation were due attributed to dropout, but however, this fact may could be underreported because since the reason for treatment discontinuation was not described in almost nearly 50% of the notification forms. In a study conducted by Frias et al. (2012) [27] in Jaboticabal - São Paulo (SP), 80.4% of the cases of treatment interruption resulted from dropout.

The lack of data on the notification form makes it difficult to characterizinge the epidemiological profile of those involved and to promotinge rabies prevention actions challenging [28]. Rabies post-exposure prophylaxis notifications remains underreported as since most of the cases are not filed on in SINAN. These cases may be associated with several factors such as education level, wound severity, access to healthcare services, and difficulties challenges in notifying the occurrence [29].

Underreporting of human anti-rabies treatments can occur due to various factors, including a lack of public awareness about the importance of seeking medical care after suspected exposures, especially in rural or hard-to-reach areas. The absence of immediate symptoms after contact with potentially infected animals can also lead to negligence in seeking medical assistance. Additionally, failures in epidemiological surveillance systems—such as inadequate records, difficulties in data collection and transmission, and a lack of integration between health services—contribute to underreporting. Socioeconomic barriers, such as the cost of transportation and the scarcity of nearby health units, also hinder access to appropriate care [30].

The implications of this underreporting for public health are significant. Without accurate data, it is difficult to plan and implement effective strategies for rabies prevention and control, such as vaccination campaigns and educational initiatives. This can lead to an increased risk of outbreaks, compromising public safety. Underreporting also limits the ability to identify areas of greater vulnerability, hindering the proper allocation of resources and the development of more assertive public policies. Furthermore, unregistered cases may result in the omission of necessary prophylactic measures, increasing the risk of progression to fatal outcomes, given that rabies is an almost always fatal disease once symptoms begin.

According to Azevedo et al. (2018) [31], it is recommended to improve multidisciplinary surveillance actions in human anti-rabies care through continuous capacity building and training of healthcare professionals. Furthermore, there is a need to enhance case monitoring and notification procedures, ensuring the complete filling out of the SINAN forms. Other measures include promoting public education, with an emphasis on informing the population about the first aid steps to take in the event of an accident, observing animals whenever possible, actively seeking healthcare services, and fully adhering to the prophylactic regimen.

4. CONCLUSION

In conclusion, as presented in the forms, health education on rabies prevention and control should be provided to the population of Sergipe, in addition to the guidelines for healthcare professionals on filling out rabies post-exposure prophylaxis notification forms.

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