Vital Surveillances

Epidemic Characteristics of Human Rabies — China, 2016–2020

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ABSTRACT

Introduction: The epidemiological characteristics of human rabies in China in 2016–2020 were analyzed in order to provide the scientific basis for the formulation of the prevention and control policy of rabies at next stage.

Methods: The data of China's National Notifiable Disease Reporting System (NNDRS) from 2016 to 2020 were collected and analyzed by using a descriptive epidemiology method.

Results: A total of 2,074 cases of human rabies were reported from 2016–2020 in China, there were year over year decreases in total number of cases. Human rabies appeared throughout the year, among which the highest in incidence happened from August to October, while March and December months were months in which the epidemic was weakest.

Conclusion: Though decreases were observed for human rabies in China, further steps should be taken to maintain these results. Management should be strengthened and the immunity of dogs should be prioritized to control this situation from the source. In addition, all reported cases should be monitored and reported to achieve the accurate prevention and control.

INTRODUCTION

Rabies is a fatal infectious disease that has comorbidity of human beings and animals and the mortality is nearly 100%. In each year, there were about 59,000 human deaths worldwide. In China, the latest epidemic peak was in 2007, totalling 3,300 cases (*1*). After this, the situation has been in a constant decrease state. In this paper, a statistical analysis for 2016–2020 data for human rabies and the research of five-year epidemic characteristics were made to provide the foundation for further accurate prevention and control and subsequent policy preparation.

METHODS

The data is from China's National Notifiable Disease Reporting System (NNDRS), and the adopted data includes the reported incidence, mortality, occupation, and other various indexes of all provincial-level administrative divisions (PLADs) in the mainland of China.

All statistical analyses were performed using Microsoft Excel (version 2019, Microsoft Corporation, Redmond, Washington, USA) and the geographic distribution map was drawn using ArcGIS (version 10.3, Environmental Systems Research Institute, Inc., Redlands, California, USA).

RESULTS

From 2016 to 2020, there were 2,074 reported human rabies cases in the NNDRS, and the number of cases decreased year over year; the reported incidence rate also decreased from 0.047/100,000 population in 2016 to 0.014/100,000 in 2020 (Figure 1).

Currently, human rabies mainly affects China in the southern and central regions, having a trend of gradually spreading over the north. From 2016 to 2020, the number of PLADs with reported cases in China gradually reduced from 28 PLADs in 2016 to 21 PLADs in 2020. The top 5 PLADs with total cases for 5 years were successively Hunan (327 cases), Henan (240 cases), Guangxi (160 cases), Guizhou (139 cases), and Hubei (138 cases), accounting for 48% in total cases reported in the nation. There were no reported cases in Jilin and Liaoning. The epidemic situation within most PLADs and regions was consistent with national trends, i.e., having a trend of decreasing year over year; while in Hunan, Jiangsu, Anhui, and Sichuan, etc., the trends were less stable. In Hunan, the trends in 2017 and 2018 constantly rose and in 2019, the number of cases was significantly reduced. However, in 2020, the number of cases increased again. The trends in Jiangsu and Sichuan were the same as in Hunan, i.e., in 2020, the number of cases slightly increased. In Guangxi, Guizhou, Hubei, and Yunnan, etc., the number of cases greatly decreased in 2020 of over 50% less than that of the previous year.

The onset of human rabies appeared throughout the

year. According to the count of each month in 2016–2020, the months of August, September, and October had the highest incidence, while March and December had the lowest incidence (Figure 2).

The number of human rabies cases in 2016–2020 primarily affected farmers (73%), among which students, homemakers and unemployed, and scattered children comprised 8%, 5%, and 5%, respectively. The male-to-female ratio of cases was 2.39 : 1; the incidence rate of the 40–70 years old group was higher, accounting for 69% of the total number of cases (Figure 3).
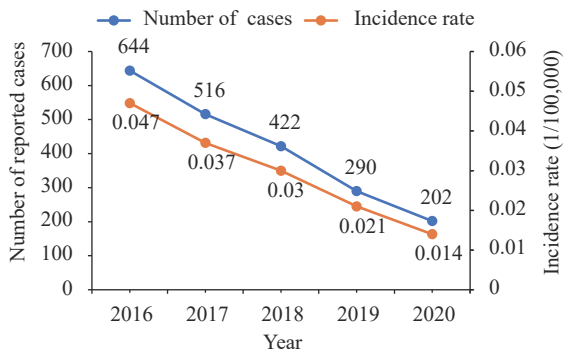

FIGURE 1. The number of reported human rabies cases and incidence rate in China, 2016–2020.
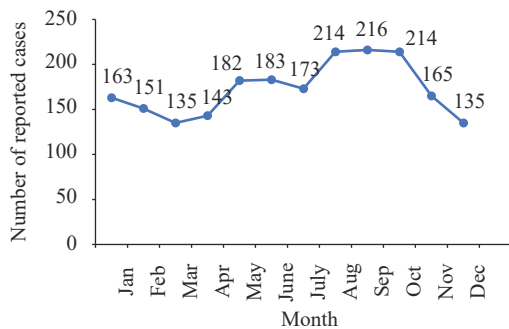

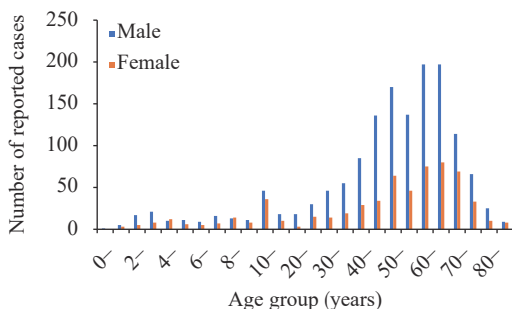FIGURE 2. Total number of reported human rabies cases in each month in China, 2016–2020.

FIGURE 3. Age and sex distribution of human rabies incidence reported in China, 2016–2020.

DISCUSSION

From 2016 to 2020, the number of human rabies cases in China constantly and stably decreased from 644 cases in 2016 to 202 cases in 2020, which was mainly attributed to China's implementation of continuous monitoring and active prevention and control.

The spatial distribution of cases in China gradually narrowed from 28 PLADs in 2016 to 21 PLADs in 2020. However, some PLADs without new human rabies cases for several years began to have new reports, such as in Xinjiang, which had no reported cases for 4 years but had 1 in 2016, and in Heilongjiang, which had no reported cases from 2014–2018 but had 1 in 2019. For regions with sporadic cases, rabies awareness should be promoted and the public kept vigilant.

For some portion of PLADs, the epidemic situation was properly controlled, and the number of cases constantly decreased or has been reduced to zero. The number of cases in Henan and Shandong reduced year by year. In Shandong, the number of human rabies cases in 2020 reached zero, and the number of cases in Guangxi, Guangdong, Yunnan, and Shanxi has stably decreased for roughly 10 years, which was likely due to strict local policies. Yunnan, for example, had strict management of dogs with the policy of "management, immunity, and elimination", which achieved good results (1). Hunan, Henan, Guangxi, Guizhou, Hubei, Jiangsu, and Anhui stably maintained approximately 10 cases occurred each year from 2016 to 2020 and Sichuan maintained 20 cases for 5 years. Human rabies mostly affected the southern and central regions of China, which was distributed roughly the same as reported in previous studies (2–4). Since 2007, reported cases of human rabies in Hunan, Henan, and Guangxi generally decreased, but in the most recent 5 years, these PLADs were still the top 3 most affected PLADs, which indicated that progress was slow. For high-incidence PLADs and regions with the slow decreasing number of cases, rabies prevention should be prioritized by enhancing health education, awareness, and multisectoral cooperation, as well as the adaptation of relevant policies and measures to local conditions.

Due to rabies comorbidity, reducing opportunities for contact and exposure of hosts to an infectee is pivotal to prevention. Children and middle-aged and elderly men in rural areas are high-risk groups and need to be prioritized as they have lower awareness of self-protective measures, awareness of rabies and related

medical knowledge, and awareness of seeking prompt medical treatment post exposure (*2*–*3*,*5*). Therefore, we will strengthen the publicity and education in rural areas, especially in the summer and autumn seasons with high incidence. Governmental departments should enhance the management of dogs and properly capture and treat stray dogs to improve the immunity rate. Meanwhile, the provincial range of reimbursement on NCMS should be expanded to prompt the exposed crowd to timely and correctly accept prevention and disposal measures and better promote the prevention and control work of rabies.

In China, the main animal causing the injury is dog (*3*–*4*). The management and immunity of dogs are radial measures of eliminating the epidemic situation. With the good effect on control of rabies, Europe and America, Japan, and the Republic of Korea and other developed countries implemented the dog-object large-scale inoculation movement to eliminate rabies of dogs. In 2015, the World Health Organization (WHO) proposed that in 2030, the target of eliminating dog-to-human rabies by reaching 0 global cases, while the core strategy of elimination lies in comprehensively carrying out the large-scale dog immunity. Currently, the immunity rate of dogs is still low (*2*–*3*), the average immunization rate of dogs in national rabies monitoring points is about 30%, which is still of great difference with 70% of the targeted immunity rate. The management of dogs, especially in rural areas, centers on free-range farming, and the proportion of tying and confining of dogs is relatively low (*6*). Therefore, actively promoting vaccination for livestock, enhancing the management of dogs, strengthening the management regulations of dogs will contribute to the further reduction of the number of exposed outpatients and deaths. With the strengthening of publicity and education, people's self-protection awareness has been constantly intensified and the number of outpatients after exposure of rabies has been constantly increased, showing that the prevention has been enhanced to exactly reduce the number of cases. However, if the radical prevention is not made from the immunity of dogs, the economic and medical burden of individuals and society will still be increased in the long run.

In summary, the epidemic situation of national human rabies from 2016 to 2020 decreased year by year and the number of PLADs in incidence gradually reduced. In 2020, the number of cases was near a record low and sporadic. With the elimination of human rabies in China, we have reached the last critical stages towards elimination. However, in order to further reduce cases, we should enhance the management of dogs. All PLADs should, considering local conditions, speed up the introduction of specific measures for dog epidemic prevention and management, identify the collection and management units of dogs and stray dogs in rural areas, improve the immunization rate of dogs, and control the epidemic from the source. Local governments should launch new monitoring schemes as soon as possible and strengthen the joint cooperation of multiple departments to realize the entire coverage of monitoring all the reported cases, accurate prevention and control, and to reduce the occurrence of human rabies, achieving the target of zero death of human rabies by 2030.

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