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Short Communication

A status report on glanders in Madhya Pradesh, India: a re-emerging zoonotic disease

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ABSTRACT

Glanders, a zoonotic disease caused by *Burkholderia mallei*, has resurfaced as a significant health concern in Madhya Pradesh, India. This status report aims to provide a comprehensive overview of the current status of glanders, exploring its epidemiology, clinical implications, and socio-economic impact in the region. The data was collected in the state of Madhya Pradesh comprising of seven divisions and 52 districts with a population of 8.74 crores (projected data from census 2011). The data available in Interated Disease Surveillance Program (IDSP) cell of Directorate Health Services (Madhya Pradesh) was collected from the year 2017-2021. 17 positive cases were reported in six districts in the year 2018, and 11 cases were reported in six districts in the year 2019. Subsequently, in the year 2020, a total of 3 cases were reported from a single district, and 4 cases were reported from 4 districts in the year 2021. Early detection of disease in susceptible animals, strict quarantine measures, testing and safe destruction of infected carcasses, adequate compensation to animal owners, disinfection of infected premises, and public awareness of glanders and their zoonotic implications through veterinary extension services can be some of the effective countermeasures against glanders.

Keywords: Glanders, Re-emerging, Zoonotic, Madhya Pradesh, Public health

INTRODUCTION

Glanders is a highly contagious zoonotic illness that mostly affects horses, mules, and donkeys caused by the Gram-negative bacillus *Burkholderia mallei*. Other animals, such as dogs, cats, pigs, goats, and even humans, can contract it. Burkholderia mallei is a host-adapted intracellular bacterium capable of limited survival in the environment, unlike its evolutionary cousin, Burkholderia pseudomallei, which can exist for long periods of time outside a host. Though humans are considered unintentional hosts, the potential to be aerosolized, along with a low infectivity dosage, has rekindled interest in Glanders.

History of Glanders

Hippocrates initially identified glanders as a horse ailment about 450 BC.[1] The bacillus (now known as *Burkholderia mallei*) was identified from a horse dying of glanders in 1882, establishing its bacterial aetiology by Loeffler and Schutz in Germany. The word "melis" stems from the Greek word "melis", which means "serious sickness," and its Latin equivalent is "malleus".[2] Africa, Asia, the Middle East, and Central and South America are all home to Glanders.[3] Through monitoring, eradication of infected animals, and import restrictions, it has been eliminated from North America, Australia, and much of Europe (Figure 1).

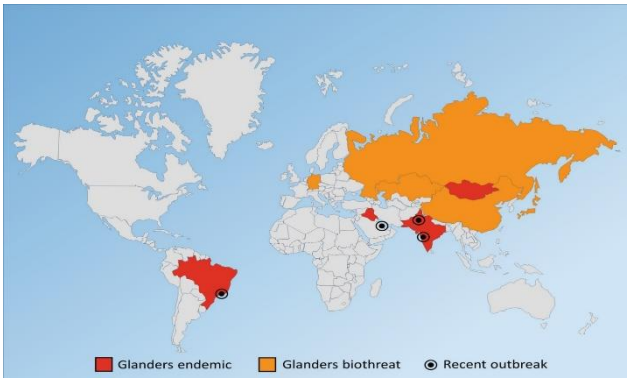

Figure 1: Geographical distribution of Glanders.[4]

Glanders in wars

Burkholderia mallei is a perfect biological warfare/bioterrorism agent due to its deadly nature, and there have been multiple accounts of it being used in this manner. During world war I, the Germans are said to have purposefully distributed glanders to infect a significant number of Russian horses and mules on the Eastern front.[5] Human Glander cases in Russia surged following world war I, possibly as a result of Burkholderia mallei dissemination. The Japanese are suspected of infecting horses, people, and prisoners of war with glanders at the Pinfang Institute in China during WWII. During the 1940s, the United States investigated Burkholderia mallei as a biological warfare agent, but it did not appear to be weaponized.[6]

Dr. William was appointed as a veterinary doctor by the East India Company in 1808, and he was the first person in India to identify glanders. Several outbreaks have been reported in the Royal Artillery in Bombay. During the Indo-China War in 1962, the disease was reintroduced when a significant number of horses were imported without sufficient testing and screening.[7]

Lab diagnosis

Burkholderia mallei may be isolated from lesions, lymph nodes, and nasal or other respiratory exudates and used to diagnose glanders. This bacterium is seldom seen in human blood. When an animal is in the early stages of sickness or is sub clinically infected, bacterial detection might be challenging.[8]

Humans are unintentional hosts, and the illness is mainly spread via work. Despite the fact that the bacterium is responsive to a variety of antibiotics in vitro, therapy is difficult and requires a longer course of antibiotics when diagnosed early. There is no human vaccination available.[9] Cases of glanders were previously documented in Bombay, India, between 1950 and 1956. In several parts of India, sporadic cases and outbreaks have been documented.[10]

Glanders is a skin and mucous membrane disease characterized by ulcerating nodular lesions. Fever, malaise, sadness, cough, anorexia, and weight loss are all common symptoms. Burkholderia mallei can infect the mucous membranes, gastrointestinal system, and integument of its host. Its virulence mechanisms and pathology are not yet totally known.[11]

The Glanders and Farcy law 1899

In this Act, unless there is anything repugnant in the Farcy or any other dangerous epidemic disease among horses, which the Governor-General in Council may by notification in the Gazette of India, specify in this behalf, either generally or in respect of any local area.

The provisions in this act relating to horses shall apply also to asses and mules. If the veterinary practitioner certifies in writing that the horse is diseased, the Inspector shall cause the same to be immediately destroyed.[11]

Transmission of Glanders

Animals

The most common way to get infected is to eat the organism. Inhalation of the organism, according to experimental research, is less likely to result in typical instances of the disease. It is possible, although unlikely, to get the illness through the skin or mucous membranes. If animals share food or watering facilities, transmission is aided. Burkholderia mallei is easily transmitted by fomites.

Humans

Burkholderia mallei spread to humans by contact with infected animals' tissues or bodily fluids. Cuts or abrasions in the skin, as well as mucosal surfaces like the conjunctiva and nose, allow germs to enter the body. Inhaling contaminated aerosol dust can cause illness.

Transmission of glanders from animals to humans and humans to humans is extremely unusual.

Incubation period

Animals

The Glander's incubation time in the lifespan of equines varies from a few days to several months (2-6 weeks).

Humans

The acute type of illness in humans has 1–14 days is a normal incubation time, although the disease's chronic form has a 12-week incubation period. A cutaneous infection that is limited to one area is called a localized infection within one to five days, you will receive a response.[12]

Prevention and control of transmission

Transmission to humans can be avoided by controlling the disease in animals, avoiding contact with infected animals, and by taking precautionary hygiene measures. Prevention of the disease in humans involves the identification and elimination of the infection in the animal population.

Disinfection of surroundings of dead or infected animals should be done as *Burkholderia mallei* is highly susceptible to common disinfectants like benzalkonium chloride, iodine, Mercury chloride in alcohol, 1% sodium hypochlorite, and 70% ethanol. It is less susceptible to phenolic disinfectants.[13]

Animal glanders reported in India

According to the legends, Glanders was initially discovered in cart horses in India in 1881. In 1913, there were confirmed occurrences of *B. mallei* infection in Indian equines. In the early 1980s, a full assessment of glanders prevalence and epidemiology in military and civilian farms in India was published. The disease resurfaced unexpectedly in 2006, and it continues to infect equids in numerous parts of the nation.

In the year 2006-07, the states of Maharashtra, Punjab, Uttar Pradesh, Uttarakhand, in 2007-08 Andhra Pradesh Haryana, Himachal Pradesh, Uttarakhand, in 2009-10 Chhattisgarh, in 2010-11 Himachal Pradesh, Uttar Pradesh, in 2011-12 Uttar Pradesh, in 2012-13 Uttar Pradesh, in 2013-14 Chhattisgarh, Himachal Pradesh, Uttar Pradesh, in 2014-15 Himachal Pradesh, Uttar Pradesh, Jammu and Kashmir, in 2015-16 Jammu and Kashmir, Punjab, Uttar Pradesh, Uttarakhand, Gujarat, and in 2016-17 Haryana, Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh, Uttarakhand, Gujarat, and Madhya Pradesh were the states that found Glanders cases.[14]

METHODS

The data was collected in the state of Madhya Pradesh comprising of seven divisions and 52 districts with a population of 8.74 crores (projected data from census 2011).[15] The data available in Integrated Disease Surveillance Program (IDSP) cell of Directorate Health Services (Madhya Pradesh) was collected from the year 2017-2021. This data was analyzed for temporo-spatial distribution. Microsoft Excel was used to conduct a retrospective descriptive data analysis. Geographical details were collected from Department of land survey and the occurrence of glanders was plotted on the map. Tables and graphs were used to depict the yearly pattern of glanders.

Status of Glanders in Madhya Pradesh

In Madhya Pradesh, the positive cases of Glanders were reported only in horses. As per the available data from the state IDSP unit, 11 horses confirmed positive cases were reported from three districts in the year 2017. After 8 horses in Gwalior were found to have been dead and lab confirmed them to be infected by glanders, collector in charge during that period, Dr. Sanjay Goel issued order prohibiting movement of animals belonging to the equine species from the place where they are kept to any other place within or outside the he municipal area and also prohibited the holding of races, fairs, exhibitions, games and gathering of such animals in the municipal area of Gwalior. Hundreds of blood samples were sent to the National Research Centre on equines, Hisar, for investigations. Mass culling of the horses were also done to prevent infection. Such prompt action led to early identification of suspected cases and since then Gwalior has not reported any cases of glanders till current date.

17 positive cases were reported in six districts in the year 2018, and 11 cases were reported in six districts in the year 2019. Subsequently, in the year 2020, a total of 3 cases were reported from a single district, and 4 cases were reported from 4 districts in the year 2021.

Table 1: Districts wise distribution in Glanders in Madhya Pradesh.

S. no.	District	Number of positive cases	Year
1	Gwalior	8	2017
2	Ujjain	1	2017
3	Jabalpur	2	2017
4	Bhopal	7	2018
5	Betul	5	2018
6	Hoshangabad	1	2018
7	Narsinghpur	1	2018
8	Khandwa	2	2018
9	Bhind	1	2018
10	Bhopal	5	2019
11	Harda	1	2019
12	Sehore	1	2019
13	Raisen	1	2019
14	Khargone	2	2019
15	Tikamgarh	1	2019
16	Indore	3	2020
17	Ujjain	1	2021
18	Bhopal	1	2021
19	Betul	1	2021
20	Ashok Nagar	1	2021

Madhya Pradesh has been divided into seven health divisions. According to the available data of Glanders disease, Bhopal division is at top having maximum number of cases i.e. 23 cases whereas Rewa division accounted for nil cases of the same. Division wise distribution of cases is Bhopal-23, Indore-07, Ujjain-02, Gwalior-10, Jabalpur- 03 and Sagar-01, and Rewa nil. As depicted in Figure 2, Glanders cases are found to be distributed in centrally located divisions.

Figure 2: Glanders affected districts in Madhya Pradesh (created with paintmaps.com).

After the identification of first Glander case in 2017 in Madhya Pradesh, the state has been continuously witnessing the Glanders cases in each consecutive year. In the year 2017, a total of 11 cases were identified and then 17 cases in year 2018, 11 cases in 2019, 03 cases in 2020 and 04 cases were identified in the year 2021 as depicted in Figure 3.

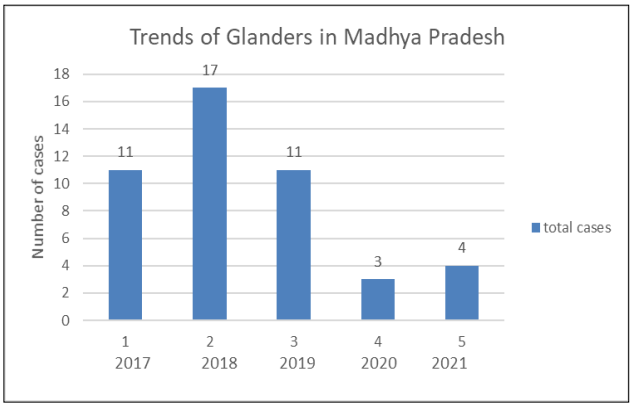

Figure 3: Trends of Glanders in Madhya Pradesh over five years.

DISCUSSION

Glanders is an uncommon illness with few human cases reported. *B. mallei* is a Gram-negative, aerobic, spore-forming, nonmotile, facultative intracellular bacterium that causes this illness.

The first instance of animal glanders in Madhya Pradesh was reported in 2017 in horses from the districts of Gwalior, Ujjain, and Jabalpur with zero human cases reported. Glanders is likely under-reported and under-recognized. Given the high death rate associated with untreated glanders, a history of occupational or contact exposure, as well as the development of sepsis, numerous abscesses, and pneumonia, should precipitate the diagnosis of B. mallei infection.[16] There is some evidence that antibiotics are effective in the treatment of human glanders, but no FDA-approved medication is currently available. The current treatment option comprises a combined antibiotic regimen that is frequently only used for a short period of time. A combined antibiotic regimen is now the sole therapeutic option, and it is typically only partially successful. The treatment is lengthy and includes both intravenous (IV) and oral eradication medications. Imipenem, meropenem, or ceftazidime, with or without TMP-SMX, should be given intravenously for a minimum of 10 days. TMP-SMX with or without doxycycline is an oral antibiotic that can last anywhere from 12 weeks to 12 months.[17]

CONCLUSION

The only known natural reservoir of *B. mallei* is horses, donkeys, and mules. Despite the fact that glanders has been eliminated in most countries, it has resurfaced as a re-emerging illness in the form of multiple recent outbreaks. Pre-symptomatic or carrier animals can infect the healthy equine population and play an important role in the transmission of the infectious agent.

Early detection of disease in susceptible animals, strict quarantine measures, testing and safe destruction of infected carcasses, adequate compensation to animal owners, disinfection of infected premises, and public awareness of glanders and their zoonotic implications through veterinary extension services can be some of the effective countermeasures against glanders.

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