



THE MENACE OF RABIES: UNDERSTANDING THE VIRUS AND STAYING SAFE-A CASE REPORT

Paediatrics

Dr. Tibu John Joyse	Post Graduate, Department of Paediatrics, Sri Siddhartha Medical College, Tumkur, Karnataka
Dr. Arun Kumar G	Assistant Professor, Department of Paediatrics, Sri Siddhartha Medical College, Tumkur, Karnataka
Dr. Kumar G V	Professor and Head, Department of Paediatrics, Sri Siddhartha Medical College, Tumkur, Karnataka
Dr. Ramya	Post Graduate, Department of Pathology, Sri Siddhartha Medical College, Tumkur, Karnataka

ABSTRACT

Rabies is a vaccine-preventable, acute progressive encephalomyelitis caused by infection with viruses of the *Lyssavirus* and affects the central nervous system. Once clinical symptoms appear, rabies is virtually 100% fatal. It spreads to people and animals via saliva, usually through bites, scratches, or direct contact with mucosa (e.g. eyes, mouth or open wounds). Children between the age of 5 and 14 years are frequent victims.

KEYWORDS

INTRODUCTION

Rabies is a vaccine-preventable, zoonotic, viral disease affecting the central nervous system. Once clinical symptoms appear, rabies is virtually 100% fatal. In up to 99% of cases, domestic dogs are responsible for rabies virus transmission to humans. Yet, rabies can affect both domestic and wild animals. It spreads to people and animals via saliva, usually through bites, scratches or direct contact with mucosa (e.g. eyes, mouth or open wounds). Children between the age of 5 and 14 years are frequent victims¹

We report the clinical and radiological findings of a 1 year-8 month-old female who succumbed to the virus.

Case Report

The patient, a 1 year- 8 month- old female who was apparently normal was bitten by a stray dog on the left axilla 10 days back at Sasalu village in Tumkur, Karnataka according to the history given by her grandmother. The wounds were shallow with a small amount of bleeding. The wounds were washed with water but no immediate medical attention was sought. 9 days later the parents took her to a government hospital and got a dose of rabies post exposure prophylaxis.

The child started to develop fever, intermittent type, with spikes at night associated with chills, no rashes and abnormal movements were noted. There was a history of cough and running nose for 4 days.

A history of decreased fluid intake and increased aggression was also noted.

The child was brought to our emergency with the above-mentioned complaints and a history of 4 episodes of vomiting, blood tinged, small quantity, non-projectile

At the time of admission, patient was unconscious, with GCS of 9 On examination; Generalized hypotonia was noted with reduced reflexes. Meningeal signs of irritation were also noted.

Physical examination revealed a temperature of 100.8 °F, pulse rate 140 beats/min; respirations rate 68 breaths/min, and blood pressure 90/50 mmHg, saturation of 70% at room air, healed wounds were noted the around the left axilla. The main laboratory findings were as follows: WBC 27800 cells; raised CRP levels.

According to the clinical symptoms, intracranial infection was suspected, and rabies was highly suspected (excitation stage).

The patient was intubated for airway protection and transferred to paediatric intensive care unit (PICU) for further treatment with the informed consent from the parents.

MRI Brain revealed features suggestive of Brainstem Encephalitis and cord myelitis

The child suffered cardiac and respiratory arrest and died after attempts at resuscitation proved unsuccessful.

DISCUSSION

Rabies virus causes fatal encephalomyelitis in humans. It is one of 12 species of the *Lyssavirus* genus. The other species, mainly of bats, are rabies-related lyssaviruses that may be equally pathogenic. Rabies infection should be entirely preventable. However, when effective treatment is unavailable, unaffordable, delayed or incomplete, virus inoculated into a bite wound can ascend intraneuronally to the brain resulting in fatal encephalomyelitis⁴

Recorded cases of rabies are extremely different from the predicted burden, and cases are rarely reported. One of the neglected tropical diseases (NTD) that mostly affects vulnerable, impoverished, and already marginalized groups is rabies. Effective rabies vaccines and immunoglobulins are available for humans, but those in need of them frequently cannot easily obtain or obtain them.¹

According to WHO, India accounts for 36% of the global deaths due to rabies. India also accounts for 65% of the deaths due to rabies in the South-East Asia region.² Survival from rabies is rarely seen, with fewer than 20 adequately documented cases reported worldwide^{3,7}

After infection, the rhabdovirus targets the central nerves as it moves through the peripheral nervous system, causing encephalomyelitis. The initial signs of a viral illness in humans resemble those of any other nonspecific illness (fever, malaise, headache). After that, these mild symptoms could intensify into agitation, anxiety, and finally open delirium. Within the first several days following a rabid bite, tingling at the bite site is one extremely common symptom. Remarkably, the virus returns to the peripheral nervous system (PNS) after having propagated from peripheral nerves to the central nervous system (CNS), specifically targeting highly innervated regions (such as salivary glands). The "frothing" is caused by hypersalivation; individuals may experience severe spasms in their pharynx at the sound, taste, or sight of water. We term this "hydrophobia." The infection eventually causes the entire neurological system to collapse completely, which results in an abrupt death. Animals typically pass away in 10 days, but the incubation time after vaccination might extend up to six years, with an average of a few months. The location of exposure, the degree of the wound, and the viral load all influence the time of onset. In the end, the virus damages the central nervous system, with the brainstem typically suffering more severe effects. The inflammatory response triggers the toxic effects, which are accompanied by functional alterations that are not fully understood. The virus may ultimately impact neurotransmission, and both viral-

dependent and cell-dependent pathways may lead to apoptosis. Once clinical signs are observed, rabies is always lethal.^{5,10}

According to autopsy investigations, the brain is typically enlarged, bloated, and experiencing an acute inflammatory process. In the majority of cases, neuronal death is not present. The cytoplasm of the nerve will include virion deposits, which can be seen by immunochemical staining. Negri bodies are often seen on light microscopy but only in about two-thirds of cases.⁵

A rabies patient who has had a known bite from a rabid animal may have a clear-cut history. Unfortunately, because there could be several possible routes of infection and a lengthy incubation period, obtaining a history suggesting rabies may be difficult.⁵

After vaccination, rabies progresses through five stages: incubation, prodrome, severe neurologic disease, coma, and death.⁵

The time between an inoculation and the emergence of symptoms is known as the incubation period, and it can vary from a few days to several years.⁵

The prodrome phase is characterized by vague symptoms akin to flu-like conditions, including fevers, myalgias, and gastrointestinal problems.⁵

During the third stage of rabies, neurological symptoms manifest. These fall into one of three groups: paralytic (sometimes called "dumb"), encephalitic (often called "furious"), or a rare non-classic type.⁵

The most prevalent type, encephalitic, manifests in about 85% of cases. These patients may have hydrophobia or aerophobia, which is the condition in which ingesting liquids triggers spasms (hydrophobia). During the encephalitic type, there may be agitation, alterations in mentation, autonomic dysfunction, enhanced deep tendon reflexes, nuchal rigidity, and positive Babinski sign. Exam results pertaining to areas other than the neurological system may include fever, tachypnea, and tachycardia. This quickly develops into hyperactivity⁵

The paralytic form of rabies is less common and noted to occur less than 20% of the time. Since irritability is absent and hydrophobia is often linked with Guillain-Barre syndrome, these patients may be misdiagnosed with the condition. The main symptom is weakness, although other symptoms include bladder dysfunction, persistent fevers, and changed mentation.⁵

The last type of rabies is thought to be non-classic, uncommon, and typically accompanied by seizures along with more severe motor and sensory symptoms.⁵

The coma stage, or stage 4, of rabies often starts 10 days after stage 3. Patients may experience flaccid paralysis, protracted apnea episodes, and persistent hydrophobia. Following the onset of stage 4, without supportive care due to cardiopulmonary failure, most patients experience death within two to three days. Even with supportive therapy, virtually zero patients survive rabies.⁵

Without a clear-cut rabid bite history, rabies is often a diagnosis of exclusion. In early stages, it may manifest similar to influenza, Coxsackie, enterovirus, and herpes. Later stages of rabies can resemble the symptoms of tetanus, botulism, delirium tremens, diphtheria, illnesses carried by ticks, and Guillain Barre. Doctors frequently analyze cultures, electrolytes, CBCs, CT scans, chest x-rays, and MRIs without realizing that rabies is the cause. The diagnosis may remain difficult until it is too late if the virus is not isolated in a rabies-specific viral culture, discovered via polymerase chain reaction (PCR) in saliva, has a positive antibody titer, or is isolated in cerebrospinal fluid (CSF). It might not be necessary to give post-exposure prophylaxis if the biting animal can be put down and examined. Public health might be able to help with the animal testing.⁵

Rabies is a neglected tropical disease of poor and vulnerable populations, with deaths due to rabies often not reported. Rabies is nearly always fatal once symptoms appear. Although 100% preventable, over 59,000 people, mostly in under-served areas, in over 150 countries, die of rabies every year as human vaccines and immunoglobulin are not readily available or accessible⁶

Numerous methods, including CSF, blood, saliva, tears, and tissue samples (neck, immunofluorescent stain), can be used to diagnose rabies. Pleocytosis may be visible via CSF analysis, which could lead to the virus's identification. No single test can definitively rule out or confirm rabies, according to the Centers for Disease Control and Prevention. Ultimately, because the condition is uncommon, a high degree of suspicion is needed in developed nations. It might not be necessary to give post-exposure prophylaxis if the biting animal can be put down and examined. Public health might be able to help with the animal testing.^{5,11,12,13}

Categories of contact and recommended post-exposure prophylaxis (PEP) ¹	
Categories of contact with suspect rabid animal	Post-exposure prophylaxis measures
Category I - touching or feeding animals, animal licks on intact skin (no exposure)	Washing of exposed skin surfaces, no PEP
Category II - nibbling of uncovered skin, minor scratches or abrasions without bleeding (exposure)	Wound washing and immediate vaccination
Category III - single or multiple transdermal bites or scratches, contamination of mucous membrane or broken skin with saliva from animal licks, exposures due to direct contact with bats (severe exposure)	Wound washing, immediate vaccination and administration of rabies immunoglobulin/ monoclonal antibodies

Category II and III exposures require PEP.

WHO recommends administering rabies vaccines intradermally, as this reduces the amount of necessary vaccine and therefore the cost by 60–80% without compromising any safety or efficacy¹

Every year, more than 29 million people worldwide receive PEP. This is estimated to prevent hundreds of thousands of rabies deaths annually. Globally, the economic burden of dog-mediated rabies is estimated at US\$ 8.6 billion per year, in addition to uncalculated psychological trauma for individuals and communities.¹

Dog rabies can be eliminated by mass vaccination and contraception for stray dogs. This is the best and most economical way of preventing human rabies in the long term^{4,9}

A key lesson is that in instances where broken skin or mucous membranes have been exposed to saliva-contaminated blood of an individual who has been bitten by an animal, he/she should receive timely wound management and immediate administration of rabies vaccine and/or human rabies immunoglobulin⁸

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