



# Brain Eating Amoeba (PAM) A Rare Disease: Systematic Review

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## Abstract

Amoebas are single celled organism. The Brain Eating Amoeba is a species found in the year of 1965. Its formal name is Naegleria Fowleri. It is usually resides in contaminated water when it enters human body through the nose and it will causes the rare and deadly infection and inflammation in the brain and it destroys the brain tissue by eating it. Usually doctors call this as primary amebic meningoencephalitis (PAM). Symptoms include fever, headache, stiff neck, vomiting, and loss of appetite, seizure and coma. Accurate diagnosis is not yet possible but spinal tapping, physical examination will be helpful and treatment includes usually symptomatic based and survival rate is only 3% in the world among the PAM cases. As per the recent report related to the Brain Eating Amoeba Infections spreading in Kerala state significantly in 2025 and few lost their life due to the rare disease The Brain Eating Amoeba and this has mortality rate 97% in different parts of the world.

**Keywords:** Brain Eating, Amoeba, Rare Disease, coma, Meningoencephalitis & Mortality rate.

## Introduction

### WHY IT IS CALLED AS BRAIN EATING AMOEBAS?

When N.Fowleri enter the brain and wraps itself around the neurons and glial cells and digest them (phagocytosis) and releases enzymes that dissolve cell membranes and connection between cells, This will further triggers oxidative stress and cell lysis, as well as an extreme inflammatory response from immune cells.

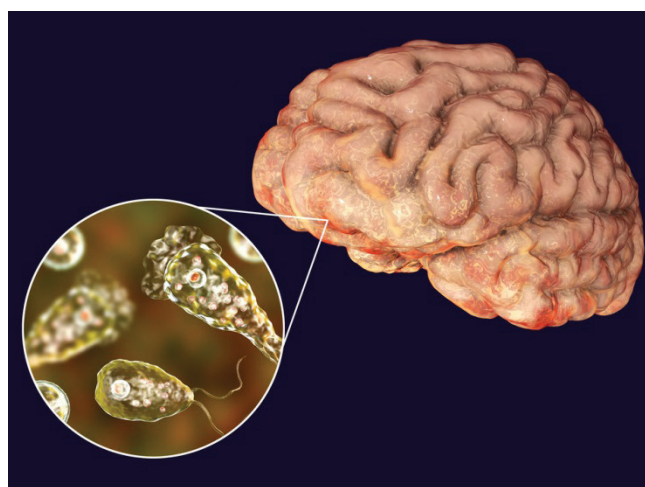


Image 01: Shows the amoeba & the brain Photo Credit: Google

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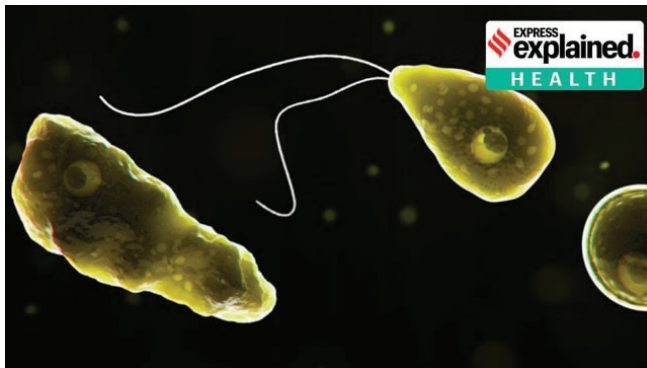
### Where Are The Brain Eating Amoeba Found?

- Warm lakes
- Mud paddles

- Slow flowering rivers
- Untreated water
- Soil including indoor dust
- Water parks
- Thermally polluted water
- Aquariums

#### **HOW DOES IT ENTER HUMAN BODY?**

Infected water goes into the nose from there, the amoeba reaches to the brain, but can't be infected by swallowing infected water, this may usually happens during swimming / diving, water skiing in infected water/ contaminated water.



*Image 02: Naegleria Fowleri enters the body through the nose, usually when people are swimming. -Wikimedia Commons*

#### **SIGNS AND SYMPTOMS:**

##### **In early stage:**

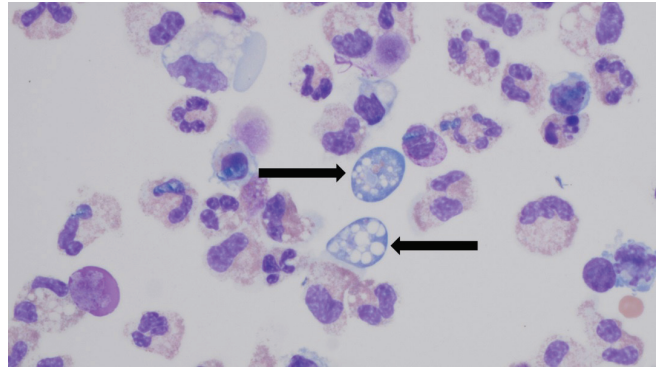
- Headache
- Fever
- Nausea
- Vomiting

##### **LATER STAGE:**

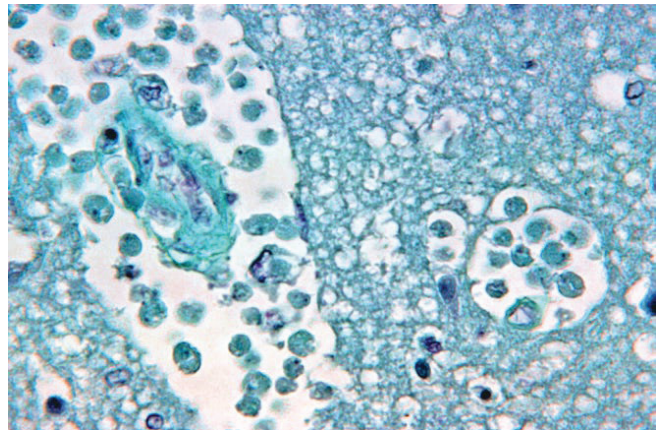
- confusion
- Seizures
- Coma
- Stiff neck
- hallucinations

#### **DIAGNOSIS:**

- Spinal tap/CSF Analysis
- Complete physical examination
- Mental status examination



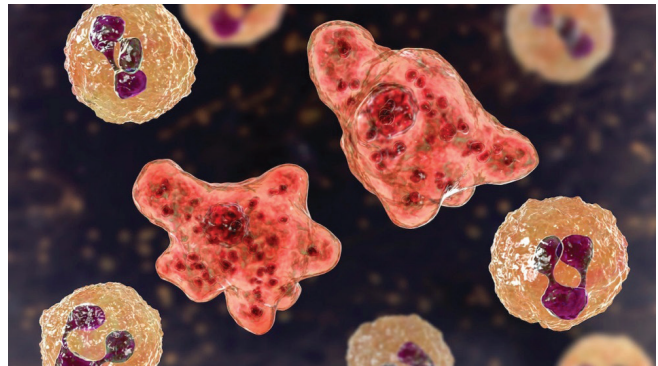
*Image 03: Naegleria fowleri infects people by traveling up the nose and to the brain (shown here) where it consumes brain tissue. Photo credit: Dr. James Roberts, Children's Healthcare of Atlanta*



*Image 04: a handout photomicrograph image shows the brain tissue specimen Naegleria fowleri, a type of Brain Eating Amoeba Photo credit: CDC Via Reuters.*

#### **PROGNOSIS:**

Usually it had a very poor prognosis rate and patient may die within 10 to 15 days after infection and prognosis rate is approximately 3% only.



*Image: 05 , The amoeba is most active in the months that the water temperature stays above 77F – July, August and September, according to health officials. (iStock)*

### **LITERATURE RELATED TO THE BRAIN EATING AMOEBA:**

The organism has been detected in every country except Antarctica. Worldwide, between 1965 and 2018, a total of 381 PAM cases were reported in international literature and to the CDC, and the number of reported cases increased by 1.6 % each year from 1965 to 2016. Previous literature has concluded that, as the officially reported cases of **N. fowleri** are an underestimation, quantifying the true burden of the disease stands to be difficult.

The diagnosis should be suspected in cases of meningitis or meningoencephalitis with a history of recent freshwater exposure. CSF analysis shows low to normal glucose levels, elevated protein and polymorphonuclear cells, and high CSF pressures, which may reach as high as 600 mmHg.

### **STATISTICS OF THE DISEASE IN INDIA:**

The first case of Brain Eating Amoeba disease/PAM was reported in the year of 1971 and the first case was reported in Kerala was in the year of 2016. From 2016-2023 there were eight cases reported and last year 2024 36 cases reported in Kerala and nine deaths.

#### **Prevention and Control measures:**

- Adequate chlorination of the swimming pools other water pool, small lakes and wells.
- Prevent the peoples moving into the contaminated water
- Try not getting water into your nose in lake/pond/well.
- Use measures while entering into the pond/lake.
- Identify the symptoms in early stage of infection if possible.

**According to Dr. Sebti provides six tips to protect you and stay safe.**

### **HOW TO PROTECT YOURSELF**

1. Avoid swimming in lakes, rivers and hot springs with water that looks scummy or cloudy, which can be a sign of the presence of brain-eating amoebas.
2. Wear nose clips when swimming in warm freshwater. "Because brain-eating amoebas enter the body through the nose, blocking that entry point can protect you against this threat," says Dr. Sebti. "Nose clips can also prevent other types of infections and irritations from bacteria and chemicals present in the water.
3. **Do not dig around in the sediment of a warm freshwater.** "Brain-eating amoeba can lurk in the sediment, so avoid digging around this area with your hands or feet," says Dr. Sebti.

4. **Always shower after swimming.** It's important to shower after swimming in warm freshwater to reduce the risk of infection from different types of microorganisms, including brain-eating amoebas.
5. **If possible, avoid submerging your head underwater.** "Submerging your head in warm freshwater can increase your risk of contracting PAM.
6. **Check local advisories before heading out to swimming spots.** Stay informed about potential risks and dangers in the area where you are headed".

### **TREATMENT:**

- It is based on the symptoms rises
- A combination of medications
- Miltefosine
- Amphotericin B
- Rifampin
- Fluconazole
- Azithromycin

## **Conclusion**

The brain eating amoeba disease is a rare one and it's become a global public health concern and it is recently reported many cases across the globe with deadly symptoms and high mortality rate (97%). There are many research activities are ongoing for the accurate treatment including vaccine for the rare disease but yet may require to wait for few more years. In such situation prevention and control have to be done with awareness programmes at the rural/urban areas across the cases reported countries or a part of the world.

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