

Brain-Eating Amoeba Cases in Kerala

The alert in Kozhikode, Kerala, was issued after three cases of primary amoebic meningoencephalitis (PAM) (including one death) were reported in August. The health department is investigating the source, suspected to be contaminated freshwater, and has intensified screening and awareness programs. The state has seen a significant increase in PAM cases in 2025, with many deaths occurring in recent weeks, though early diagnosis and treatment with drugs like miltefosine have led to a higher survival rate compared to the past.

Kozhikode outbreak highlights

- **Three cases in one week:** In mid-August 2025, three cases of PAM were identified within a week in Kozhikode district.
- **A young victim died:** A nine-year-old girl from Thamarassery died on August 14, 2025, shortly after being admitted to Kozhikode Government Medical College.
- **Infections in infants and youth:** The other two cases included a young person from Annassery and a three-month-old infant from Omassery. Both were hospitalized at the Kozhikode Government Medical College. By early September, the three-month-old was among two more people who died at the medical college, bringing the death toll in the district to three in one month.
- **Water sources under investigation:** Health officials collected water samples from local sources, including the infant's well, where the amoeba was detected. Investigations are underway to determine the specific source of infection, suspected to be contaminated stagnant freshwater.

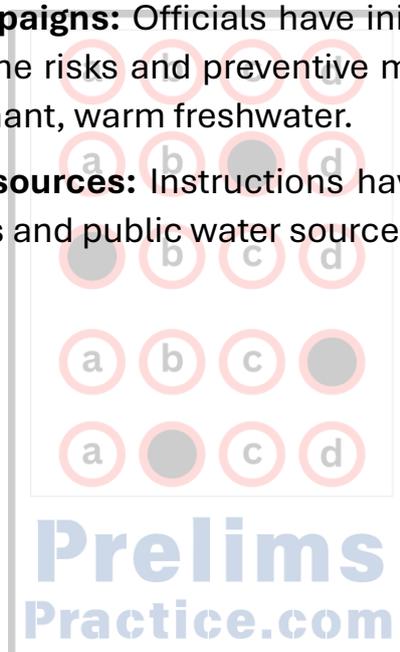
Wider context of the Kerala outbreak

- **State-level health alert:** A broader health alert was issued for Kerala due to a significant rise in PAM cases across multiple districts.
- **Case and death toll rising:** As of mid-September 2025, the state had recorded over 60 cases and at least 17 deaths this year. This marks a worrying increase compared to previous years.
- **Environmental factors and climate change:** The rise in cases has been linked to factors like increasing temperatures, which favour the amoeba's growth in warm freshwater. Authorities believe climate change may be playing a role.

- **Improved detection:** While cases are rising, some experts suggest that better detection methods and awareness by health officials are also contributing to the higher reported numbers.
- **Improved treatment and survival:** Despite the high fatality rate, Kerala's health authorities have developed special treatment protocols. The state has seen a higher survival rate than the global average, with one teenage boy becoming the first Indian survivor in 2024.

Public health response

- **Intensified surveillance:** The health department has ramped up screening and surveillance, particularly for individuals presenting with fever and other symptoms in affected districts.
- **Public awareness campaigns:** Officials have initiated awareness campaigns to educate the public on the risks and preventive measures. People are advised to avoid swimming in stagnant, warm freshwater.
- **Chlorination of water sources:** Instructions have been issued for the cleaning and chlorination of wells and public water sources to prevent contamination.



Explanation of Exam Oriented Key Terms

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Primary amoebic meningoencephalitis (PAM)

Causative agent and characteristics

- **Cause:** PAM is a rare and severe brain infection caused by the free-living amoeba, *Naegleria fowleri*. It is often referred to as the "brain-eating amoeba".
- **Habitat:** This thermophilic (heat-loving) amoeba is commonly found in warm freshwater bodies such as lakes, ponds, rivers, and hot springs. It can also survive in inadequately chlorinated swimming pools or tap water.
- **Ubiquitous:** The amoeba exists naturally in soil and freshwater environments worldwide, and exposure to it is common.
- **Life Cycle:** The life cycle of *N. fowleri* includes a cyst, a motile flagellate, and a reproducing trophozoite stage. The trophozoite is the infective form that causes PAM.

Mode of transmission

- **Entry via nose:** Infection occurs when water containing the amoeba enters the body through the nose. This can happen during recreational water activities like swimming, diving, or wakeboarding.
- **Migration to the brain:** From the nasal passages, the amoeba travels along the olfactory nerve and through the cribriform plate to the brain.
- **Brain tissue destruction:** Once in the brain, it causes extensive inflammation, tissue destruction, and swelling.
- **No infection from drinking water:** PAM cannot be contracted by swallowing contaminated water.
- **Non-communicable:** The infection does not spread from person to person.
- **Vulnerable groups:** PAM is most common in healthy children and young adults, likely due to their higher frequency of recreational water activities.

Symptoms and progression

- **Early symptoms (1–12 days post-exposure):** The initial symptoms resemble those of bacterial meningitis and include headache, fever, nausea, and vomiting.

- **Later symptoms:** As the disease progresses rapidly, it can lead to a stiff neck, confusion, lack of attention, loss of balance, seizures, and hallucinations.
- **Rapid fatality:** The disease is rapidly progressive and almost always fatal, with death occurring within 1 to 18 days after symptoms begin.

High fatality rate and diagnosis

- **Extremely high mortality:** PAM has an extremely high mortality rate, often exceeding 97%. The Centers for Disease Control and Prevention (CDC) has recorded only a handful of survivors globally.
- **Diagnostic difficulty:** Diagnosing PAM is challenging due to its rarity and non-specific early symptoms. Early signs can be confused with more common illnesses like bacterial meningitis.

Confirmation: A definitive diagnosis requires specialized laboratory tests on cerebrospinal fluid (CSF) or brain tissue, such as a Polymerase Chain Reaction (PCR) test.

Treatment and prevention

- **Treatment complexity:** There is no standard, highly effective treatment for PAM. Treatments involve a combination of drugs, including amphotericin B, azithromycin, fluconazole, rifampin, and miltefosine. Early diagnosis and aggressive treatment are crucial for any chance of survival.
- **Prevention is key:** Due to the high fatality rate and lack of effective treatment, prevention is paramount. Measures include:
 - Avoiding swimming in warm freshwater during peak summer months.
 - Wearing nose clips or holding the nose shut when diving or jumping into freshwater.
 - Using only distilled, sterile, or boiled tap water for nasal irrigation (e.g., using a Neti pot).
 - Properly maintaining and chlorinating swimming pools.

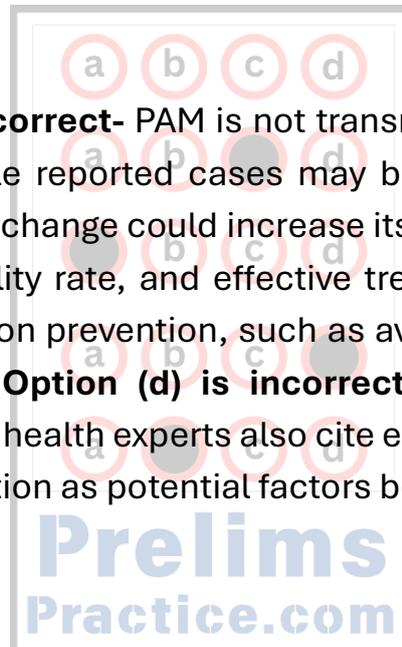
Practice Questions:

In the context of the recent primary amoebic meningoencephalitis (PAM) alert, which of the following statements correctly reflects the nature of the disease?

- a) The high mortality rate makes person-to-person transmission the main concern for public health
- b) The disease is limited to a small, contained geographical area and poses no risk to other regions
- c) Prevention focuses on avoiding contact with stagnant, untreated warm water, as there is no specific cure
- d) Recent increases in cases are solely due to improved testing and not related to any environmental factors

Answer: c

Explanation: **Option (a) is incorrect-** PAM is not transmissible from person to person. **Option (b) is incorrect-** While reported cases may be concentrated, the amoeba is found worldwide, and climate change could increase its geographic range. **Option (c) is correct-** PAM has a high fatality rate, and effective treatment is limited. The focus of health advisories is therefore on prevention, such as avoiding swimming in stagnant or untreated warm freshwater. **Option (d) is incorrect-** While improved testing may contribute to reporting, public health experts also cite environmental changes like rising temperatures and water pollution as potential factors behind increased cases.



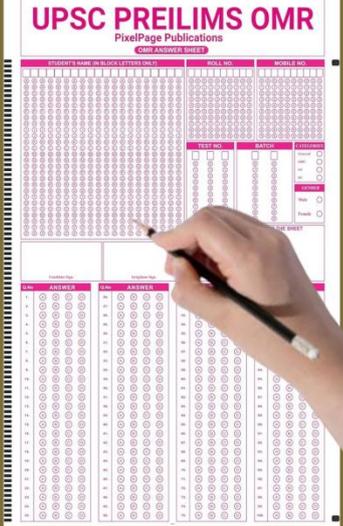
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