Evolving Approaches to Amoebic Fever Therapy: A Clinical Review

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Abstracts:

Primary Amoebic Meningoencephalitis (PAM) is a rare but rapidly fatal central nervous system infection caused by *Naegleria fowleri*. The disease occurs when contaminated freshwater enters the nose and the amoeba migrates to the brain. Recent data show a sharp rise in cases in Kerala, reaching 153 cases and 33 deaths in 2025. Symptoms begin within 2–14 days and progress quickly from headache and fever to seizures, coma, and death. Diagnosis requires CSF analysis, microscopy, PCR, and neuroimaging. Early treatment with Amphotericin B, Miltefosine, azithromycin, rifampicin, and supportive ICU care improves survival. Nursing care includes monitoring neurological status, managing medications, ensuring hydration, and providing seizure precautions. Prevention focuses on avoiding contaminated freshwater, using safe water for nasal rinsing, and maintaining proper chlorination of water sources. Public awareness and surveillance are crucial in reducing PAM incidence.

Key wards : Primary Amoebic Meningoencephalitis (PAM), Naegleria Fowleri, Acute meningoencephalitis

Introduction

Primary Amoebic Meningoencephalitis (PAM) is a rare but highly fatal central nervous system infection caused by Naegleria fowleri, transmitted when contaminated freshwater enters the nose and the amoeba migrates to the brain, producing symptoms similar to acute bacterial meningitis. Free-living amoebae found in soil and freshwater environments—Naegleria, Acanthamoeba, Sappinia, and Balamuthia—are capable of causing severe human disease, mainly involving the central nervous system, with Acanthamoeba also responsible for keratitis and disseminated infections.

Key Words ; Meningoencephalitis,Infection ,Naegleria , Infections.

Definition

Primary Amoebic Meningoencephalitis is a rare, acute, and rapidly fatal infection of the brain and meninges caused by the free-living amoeba Naegleria fowleri

Incidences

The first case of was amoebic meningoencephalitis recorded in the State in 2016, and to 2023, incidents were intermittent and death was total. In 2024, amoebic meningoencephalitis cases abruptly rose to 39, albeit with just eight fatalities. This year so far, there have been 71 cases of amoebic meningoencephalitis – 24 cases identified in September alone — and 19 deaths. Surge of amoebic meningoencephalitis in Kerala: 65 cases and 12 deaths in October, bringing the 2025 total to 153 cases and 33 deaths

Earlier this week, another 14-year-old boy died from the infection. In addition, a five-year-old girl from Malappuram died on May 21, and a 13-year-old girl from Kannur passed away on June 25.

Mode of Transmission

The most common way to obtain this type of amoeba is by inhaling polluted water. After that, the amoeba moves to your brain. This usually occurs when swimming, diving, or doing other water-related activities in tainted water. In exceedingly rare cases, the infected water can be warm tap water or swimming pool water that isn't chlorinated enough

Incubation period

The Naegleria fowleri amoeba, which causes primary amoebic meningoencephalitis (PAM), typically takes up to 14 days to incubate following exposure to contaminated water.

The typical or median time for the first symptoms to occur is around 5 days after infection.

Causes

- Naegleria fowleri
- Acanthamoeba species and Balamuthia mandrill Aris are two more amoebas that can cause Granulomatous Amoebic Encephalitis (GAE).
- Contaminated water

Clinical Manifestation

- Severe frontal headache
- High fever
- Chills
- Nausea and vomiting
- Stiff neck
- Changes in taste and smell (an early, more specific symptom)
- Lethargy and irritability

Late-Stage (Rapidly Progressing) Symptoms:

As the infection causes extensive inflammation and damage to brain tissue (hemorrhagic-necrotizing meningoencephalitis)

symptoms escalate rapidly:

- Confusion
- Hallucinations
- Seizures
- Altered mental status and decreased consciousness
- Cranial nerve abnormalities
- Loss of balance
- Photophobia (light sensitivity)
- Coma and respiratory failure, often due to rapid cerebral edema and increased intracranial pressure
- Positive Brudzinski sign
- Positive Kernig sign

Diagnostic Evaluation

- History collection
- Physical examination
- CSF (Cerebrospinal Fluid) Analysis

Typical CSF Findings

- High opening pressure
- Turbid or purulent CSF
- High neutrophil count
- Low glucose
- Elevated protein
- Direct Microscopy
- CSF Culture
- PCR (Polymerase Chain Reaction
- Blood Investigations
- Neuroimaging
- CT Scan (Brain)
- MRI Brain
- Other Diagnostic Approaches

- Nasal Swab or Tissue Biopsy
- CSF Antigen or Antibody Assays
- Immunohistochemistry

Management

1.Pharmacological management

- Amphotericin B: This is a primary drug used to fight the infection, administered both intravenously (IV) and/or intrathecally (directly into the spinal fluid).
- Miltefosine: This drug is often given to all patients with primary amebic meningoencephalitis (PAM) in combination with other medications. It is most effective when treatment begins within 24 to 48 hours of symptom onset.
- Rifampin Frequently used with amphotericin B.
- Azithromycin: Another medication that can be part of the treatment regimen.
- Antifungals like fluconazole, voriconazole, or ketoconazole.
- Antibiotics like minocycline.
- Experimental drugs like posaconazole
- Dexamethasone
- Nitroxoline
- pentamidine
- sulfadiazine
- flucytosine
- oral trimethoprim/sulfamethoxazole

2.Combination Therapy (Common Regimen)

A frequently used evidence-based combination:

- IV Amphotericin B
- Oral/IV Azithromycin
- Oral Miltefosine
- IV Fluconazole
- IV/Oral Rifampicin
- Corticosteroids to reduce brain swelling
- Supportive ICU management

3. Supportive Management (ICU Care)

A. Fluid & Electrolyte Balance

- Strict input-output monitoring
- Avoid fluid overload
- Correct sodium/potassium abnormalities

B. Temperature Control

- Treat fever aggressively
- Cooling measures in ICU

C. Nutritional Support

- High-calorie diet (enteral if possible)

D. Monitoring

- Neurological status (GCS)
- Repeated imaging (CT/MRI)
- Kidney function (Amphotericin B nephrotoxicity)

Nursing Management

Assessment

- Monitor vital signs, LOC
- Watch for signs of raised ICP
- Observe for seizures
- Strict aseptic precautions during LP & IV therapy

Interventions
- Administer medications on time (Amphotericin B requires monitoring)
- Maintain hydration carefully
- Position patient with head elevated
- Provide oxygen therapy
- Seizure precaution
- Maintain fluid balance chart
- Provide emotional support to family
- Documentation and reporting

Prevention

1.Water-Related Prevention

The *Naegleria fowleri* amoeba thrives in warm fresh water.
- Avoid water getting up the nose during activities in warm fresh water (lakes, rivers, ponds, untreated pools, or hot springs).
  - Hold your nose shut or use a nose clip when jumping, diving, or putting your head under water.
  - Keep your head above water in hot springs and other naturally hot (geothermal) water.
  - Avoid water-related activities in warm fresh water during periods of high-water temperature and low water levels, as this is when the amoeba is most active.
- Do not dig in or stir up sediment in shallow fresh water, as the amoeba is more likely to be found in the mud and dirt at the bottom.
- Ensure proper maintenance of swimming pools, spas, and water parks. They should be adequately chlorinated and cleaned to kill the amoeba.
- Empty and clean small wading pools (like children's inflatable pools) daily, allowing them to dry in the sun.
- Keep sprinklers and hoses away from the nose, especially for children. Flush stagnant water from hoses before use.

2.Nasal Rinsing Prevention

Infections can also occur when people use contaminated water for nasal or sinus rinsing.
- Only use safe water for nasal irrigation devices (like Neti pots) or when rinsing sinuses. Safe water includes:
  - Distilled water
  - Sterile water
  - Tap water that has been boiled for at least 1 minute and then allowed to cool. (Boil for 3 minutes at elevations above 6,500 feet.)
- Do NOT use untreated tap water directly from the faucet for nasal rinsing

3 **Public Health Education**

In outbreak/prone areas (like Kerala):
- Chlorination of wells, ponds, water sources
- Avoid swimming in warm stagnant water
- Use nose clips when diving/swimming
- Avoid letting water enter nose
- Community awareness programs
- Surveillance for encephalitis case

Patient Education(generally)

Measures to prevent primary amoebic meningoencephalitis due to *Naegleria* include the following:
- Avoid diving and jumping into stagnant freshwater.
- Consider using nose plugs for unavoidable exposures or pinching your nose shut when diving or swimming in freshwater.
- Keep your head above water when swimming in freshwater, hot springs, and other untreated thermal bodies of water.
- When participating in water-related activities, avoid digging, or stirring up the sediment.
- Use boiled, filtered, or sterile water for nasal or sinus irrigation, not tap water.

Measures to prevent GAE and keratitis due to *Acanthamoeba* include:
- Replace contacts as prescribed.

- Remove lenses before activity involving contact with water.

Wash hands with soap before handling contact lenses and clean

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