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Centers for Disease Control

National Institute of Health, Islamabad

Ministry of National Health Services, Regulations & Coordination

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National Focal Point for International Health Regulations

10th June, 2024

Subject: **Advisory for the Prevention and Control of Primary Amebic Meningoencephalitis (PAM)/Naegleriasis**

Introduction:

The Primary Amoebic Meningoencephalitis (PAM) also called Naegleriasis is an infectious disease of the central nervous system caused by the free-living amoeba *Naegleria fowleri*. A rare but is almost invariably fatal disease that was very first detected in Australia in 1965. Deaths related to PAM have regularly been reported from tertiary care hospitals of Karachi during summers since 2008.

High temperatures associated with poor chlorinated water during early summer pose a risk of *Naegleria Fowleri* infection especially in areas where the cases have been reported previously. To mitigate the risks associated with the hot season ahead, it is imperative to undertake immediate and long term preventive measures in mega cities particularly Karachi. Vigilant surveillance is also imperative to pick the suspected cases for early disease confirmation and ensuring aggressive measures to interrupt further transmission.

Objectives:

The objective of this advisory is to alert the public health authorities, water and sanitation agencies and other relevant stakeholders to undertake necessary steps for prevention and control of PAM across Pakistan especially areas where cases are being reported every year.

Background:

N. fowleri (also known as brain eating amoeba) is a single-celled, thermophilic, free-living pathogen found widely in freshwater environments i.e. warm bodies of fresh water, such as lakes, rivers, hot springs and even in soil. Despite lower incidence, the PAM disease is also widely distributed in tropical areas and mostly occurs during hot summer months. Most cases of PAM arise from freshwater sources (lakes, pools) but an increasing number are now linked to drinking water systems.

The infection results from water containing *N. fowleri* entering the nasal cavity, followed by migration of the amoebae to the brain via the olfactory nerve. Within the brain, *N. fowleri* causes extensive inflammation, hemorrhage, and necrosis, leading to death in 3 to 7 days.

Clinical presentation:

Incubation period ranges from 02 to 15 days with median 07 days, The Clinical features of PAM are quite similar to meningitis with initial presentation of sudden onset of frontal or temporal headache, high grade fever, nuchal rigidity, anorexia, vomiting, irritability and restlessness. Other symptoms such as photophobia, neurological abnormalities, including altered mental status, ataxia, cranial nerve palsy, hallucinations, delirium and coma usually occur late in the clinical course leading to death in 3-8 days.

Diagnosis:

The diagnosis is based on history, clinical examination, signs and symptoms. CSF sample may be collected for microscopy and advanced referral testing. Because of the rarity of the infection and difficulty in initial detection, about 75% of case diagnoses are made after the death of the patient.

Laboratory confirmation:

PAM infection can be confirmed through the below mentioned laboratory procedures:

Laboratory test	Findings
Direct Visualization	<i>Naegleria fowleri</i> organisms in cerebrospinal fluid (CSF), biopsy, or tissue specimens. Wet mount On CSP should be requested specifically
Antigen Detection	<i>Naegleria fowleri</i> antigen in CSF, biopsy, or tissue specimens through immunohistochemistry or indirect immunofluorescence
Polymerase Chain Reaction (PCR)	Amplification of DNA from the amoebae in CSF or tissue
Amoeba Culture	The amoebae can be grown in culture to increase the likelihood of detecting the amoeba by direct visualization or PCR

Suspected environmental water can be tested by using above mentioned laboratory procedures for detection of *Naegleria fowleri*.

Case Management:

- Suspected cases should immediately be reported to health authorities for respective measures.
- Rapid diagnosis and intensive supportive care may provide the likelihood of survival. In few such documented cases, the combination of 3 drugs; **Amphotericin B** (IV/Intrathecal), Rifampicin (Oral 10 mg/ Kg/day) and **Fluconazole** (IV/ oral 10 mg/ kg/ day) was used along with **steroids**.
- Azithromycin has both in vitro and in vivo efficacy against *Naegleria fowleri* and may be tried as an adjunct to Amphotericin B. Recently, Miltefosine has also shown some in vitro amoeba- killing activity against free-living amoebae, including *Naegleria fowleri*.

Prevention & Control measures:

- *Naegleria fowleri* cannot survive in clean, cool and chlorinated water. Chlorine kills *Naegleria fowleri* and is the most effective way to disinfect swimming pools and reticulated water systems.
- Community education and raising awareness assumes significance in known endemic areas. Key recommended messages may include:
 - Avoid jumping or diving into warm fresh water or thermal pools and keeping the head above water in spas, thermal pools and warm fresh water.
 - Empty and clean small collapsible wading pools daily.
 - Ensure swimming pools and spas are adequately chlorinated and well maintained.
 - If using un-chlorinated water, don't allow water to go up in nose when bathing, showering or washing the face.
- Potentially contaminated water should not be used for any form of nasal irrigation or nasal lavage.

Advise for water utilities:

- Water supplies at risk including reticulated raw and drinking water, lakes, dams, bores, tanks, reservoirs, pipelines, and swimming pools that are poorly maintained, under or unchlorinated.
- Proper design, management and cleaning of assets (e.g. pipes and storage tanks) is required to minimize the sediment (which may harbour *Naegleria* cysts) and reduce water stagnation (which may lead to loss of disinfectant residual).

Chlorination:

- Water supplies at risk of *N. fowleri* must ensure adequate primary disinfection and

maintain a chlorine residual of at least 0.5 mg/L at all times, in all parts of the distribution system.

- Regularly monitor the water temperature and chlorine residual throughout the distribution system. Periodic testing for *Naegleria fowleri* can be carried out in at risk systems.

Disease Surveillance and Notification:

Surveillance and notification of PAM infection should be enhanced with the dissemination of standard case definitions and diagnostics to areas of transmission and areas at risk.

Risk Communications:

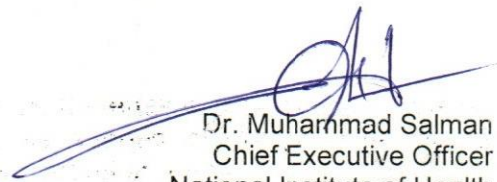
Symptoms of *N. fowleri* infection are clinically similar to viral & bacterial meningitis and these conditions are much more common than amoebic meningoencephalitis. Making clinicians aware about the disease may therefore, improve case detection and provide insight into human or environmental determinants of infection and allow improved assessment of treatment effectiveness.

Health Education:

Awareness and education in the affected areas must also be undertaken to educate people on requisite preventive measures. Households should also be warned of the potential risk, if adequate disinfection cannot be maintained throughout the distribution system

The situation may please be continuously monitored and updates along with the action taken be kindly communicated to the NIH regularly on phone no. +92-51-9255237, Fax: +92-51-9255575, E-mail: eic.nih@gmail.com.

The above 'Advisory' may please be circulated widely to all concerned.



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Distribution Overleaf

Distribution List:

1. Secretary, Health Department, Government of the Punjab, Lahore
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48. Medical Superintendent, Railway Hospital, Rawalpindi
49. Medical Superintendent, IHITC, Islamabad
50. Officer In-charge, Provincial Disease Surveillance & Response Unit (PDSRU) at Provincial Health Directorates, Lahore, Hyderabad, Peshawar, Quetta, Gilgit and Muzaffarabad
51. All Deputy Commissioners with the request to direct all concerned departments at district level.
52. Provincial Coordinator, EPI, Punjab, Sindh, KPK, Balochistan, GB and AJK

C.c:

1. Chief Secretary, Govt of Punjab, Sindh, KPK, Balochistan, GB and AJK.
2. Surgeon General Pakistan Army, GHQ Rawalpindi
3. Chief Commissioner, ICT Administration Islamabad
4. WHO Country Representative, Islamabad
5. SPS to Federal Minister of Health, M/o NHR&C, Islamabad
6. SPS to Secretary, M/o NHR&C, Islamabad
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