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Letter to editor

Naegleria fowleri - The brain-eating amoeba: an emerging threat in Pakistan

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To the Editor,

Naegleria fowleri is a pathogenic amoeba that causes primary amoebic meningoencephalitis (PAM) (1). It is globally distributed and found in moist soil and fresh, warm water. It enters the nose, usually while swimming or diving in warm freshwater lakes and more commonly in our setup during ritual ablution. Then it ascends via the olfactory nerve and enters the CNS, where it begins destroying the brain, thus named "brain-eating amoeba" (2). Symptoms of headache, nausea, vomiting, fever, stiff neck, and seizures appear within five days. Because there is no effective treatment, it has a 98% mortality rate, death usually occurs within 3-7 days due to increased intracranial pressure and edema followed by cerebral herniation (2).

In 2008 Pakistan reported the first case of PAM, and within a decade, the reported cases surpassed those in the USA (3). On May 2nd, 2022, a 59-year-old man from Karachi's Kemari district was reported dead due to PAM (4). Another death was reported at the end of June followed by the death of two patients in July 2022 (5). According to officials, there is a higher rate of unreported deaths in Pakistan due to limited healthcare facilities and lack of awareness (3). The available data shows that six deaths were reported in 2017, one in 2018, followed by fifteen in 2019. In 2020, no deaths were reported. However, six deaths were reported in 2021 (5,6). The total number of cases reported in 2022 till October 5 are four (5). Figure 1 depicts the number of deaths reported in Pakistan.

N. fowleri infection is linked to recreational water activities; in Pakistan, only two patients had a history of recreational water activity (1,6). The saline water of Karachi is unsuitable for its survival. Researchers hypothesize that different strains of *N. fowleri* exist in Pakistan, or that they have developed resistance to saline water (6). According to Virginia Commonwealth University researchers, nasal irrigation as a part of ablution is one of the leading causes of PAM-related deaths in Pakistan, a Muslim-majority country (1). The majority of deaths reported in Karachi occurred between April and September, with the highest rates of death reported in July. The average temperature for the month was 35-39°C, ideal temperature range for the growth of *N. Fowleri* (1). Due to climate change and global warming, Pakistan is experiencing an increase in temperature rise, particularly in Karachi (6). The chlorination level in Karachi's municipal water supply was found to be lower than the WHO-recommended level of 0.5 ppm which can aid in its spread (3). Pakistan is having a dengue epidemic, following catastrophic floods where healthcare delivery is far from satisfactory, any other outbreak would place enormous strain on the country. The general public should be made aware and encouraged to use boiled or sterilized water for ablution, gargling or brushing, to avoid swimming or bathing in unchlorinated water, to clean and disinfect their overhead and underground water tanks and reservoirs twice a year (1). Because the illness is fatal with no effective cure, the best course of action is to avoid it in the first place (2).

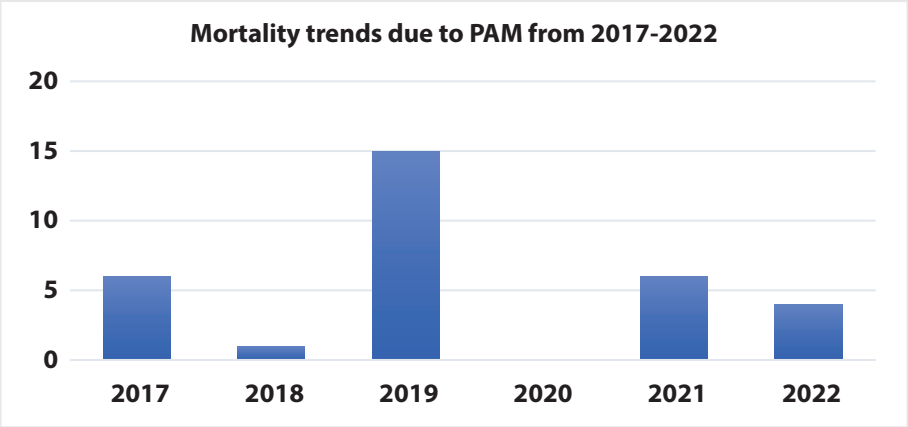

Figure 1. PAM-related deaths reported in Pakistan, from 2017–2022.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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