Occurrence of Pathogenic *Aspergillus* species in Drinking Water from Restaurants in Kathmandu, Nepal

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Introduction

• *Aspergillus* is a ubiquitously distributed opportunistic fungus that causes a wide range of infections in both immunocompetent and immunocompromised hosts.

• *Aspergillus fumigatus* is the global leading cause of invasive aspergillosis associated with high morbidity and mortality.

• *A. flavus* also causes invasive aspergillosis and is known to produce aflatoxins.

• *Aspergillus* species and other fungi are accounted as a significant cause of water contamination due to their ability to survive after filtration in distribution networks and during storage even when they have been treated with chlorine.

• The presence of *Aspergillus* in drinking water can lead to invasive infections, allergy and toxic responses, particularly in immunocompromised patients.

• In this study, we investigated the occurrence of pathogenic *Aspergillus* species in drinking water from restaurants in Kathmandu, Nepal.

Methods

• A total of 120 drinking water samples were collected between March to June 2017 from restaurants in the centre of Kathmandu and processed using a membrane filter (MF) technique according to standard methods of American Public Health Association (2005).

• A volume of 100 mL water was filtered through a sterile membrane filter with 0.45 µm pore size and 47 mm diameter.

• The membranes were placed on Sabouraud dextrose agar plates with chloramphenicol (50 mg/L) and incubated at 37°C for up to 7 days and examined daily for any visible growth of pathogenic fungi.

• Pathogenic *Aspergillus* species as well as different types of other fungi were enumerated and identified to species complex level by macroscopic and microscopic morphology.

• Microscopy, germ-tube test and biochemical tests were also performed for identification of yeasts.

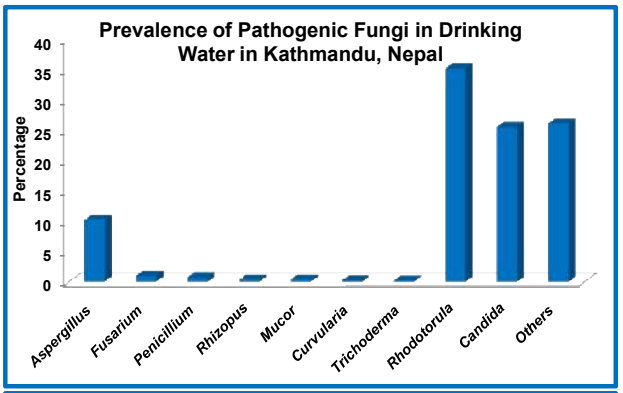
Results

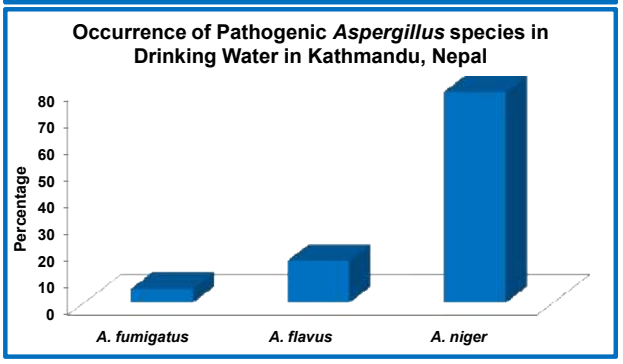
• All treated drinking water samples were positive for the growth of pathogenic fungi.

• *Aspergillus* species were recovered from 63% of water samples from restaurants but yeasts (83.7%) were more predominant than filamentous fungi (16.3%).

• Total count of *Aspergillus* species ranged from 1 to 38 colony forming units (cfu)/100 mL, with an average of 5 cfu/100 mL.

• The most abundant genera of filamentous fungi identified were *Aspergillus* (10.2%) but *Fusarium* (1.0%), *Penicillium* (0.8%), *Rhizopus* (0.4%), *Mucor* (0.4%), *Curvularia* (0.3%) and *Trichoderma* (0.2%) were also isolated.





•The genera *Rhodotorula* (35.1%) and *Candida* (25.5%) were detected in a high frequency.

•Among *Aspergillus* isolates, *A. fumigatus* (5.3%), *A. flavus* (15.8%) and *A. niger* (78.9%) were recovered from drinking water samples.

Conclusion

• Pathogenic *Aspergillus* species were the most frequently isolated filamentous fungi in treated drinking water sources in Kathmandu.

• The occurrence of opportunistic fungal pathogens in drinking water is a potential threat to human health and indicated increased risk of *Aspergillus* infections.

• Awareness of drinking water quality and water safety and the availability of improved drinking water treatment systems should be emphasized to maintain microbial drinking water safety.

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