



## Spatial and temporal distribution of faecal indicators and multidrug resistant bacteria in a multiple-use freshwater lake: the case of Lake Hawassa, Ethiopia

Deresse Daka  
Hawassa University, Ethiopia

### Abstract

Aquatic environments close to cities are frequently used as sources for water and at the same time overloaded with a variety of pollutants either through direct or indirect discharges of untreated wastes and sewage. This condition is also worsened by the indiscriminate disposal of untreated wastes and sewage vigorously into used water. Sewage contaminated waters are known to carry microorganisms, some of which are pathogenic to humans. The aim of this study was to assess the extent of temporal and spatial levels of microbial pollution and sources of pollution in Lake Hawassa.

A cross-sectional study was conducted at Lake Hawassa, which was sampled twice during 2017. A total of 26 samples of lake water were collected from 14 stations using a boat. Entry points of incoming streams, waste receiving sites, and areas upstream of anthropogenic impact, recreational and bathing sites were considered. Microbiological characterisation was performed using selective media and basic biochemical tests. Antibiotic sensitivity was tested with different antibiotics using the Kirby-Bauer agar disk diffusion method.

All samples were positive for pathogenic bacteria, including Gram-positive and Gram-negative bacteria. Enterobacteriaceae were the most common bacteria identified from the samples, including *Escherichia coli*, *Salmonella* spp, *Shigella* spp, *Proteus* spp and Gram-positive bacteria, such as *Staphylococcus aureus*. The pre-dominant bacteria found in the samples include *E. coli*, which constituted 22/26 (84.6%) of the total samples, followed by *Salmonella* and *Shigella* spp. All bacterial isolates were resistant to penicillin and ampicillin. The *Salmonella* spp were sensitive only to norfloxacin and gentamicin.

A spatial variation with the occurrence of bacterial isolates has been observed. High concentrations and many different species were found in areas of human activities and in areas receiving direct pollutants from the city. This study revealed that multidrug resistant (MDR) pathogenic bacteria are found in Lake Hawassa. There is a possibility of outbreak of diseases associated with the isolated antibiotic-resistant pathogens for which the antibiotic resistance genes are transportable within aquatic bacterial communities. We recommend that the city administration take care of the municipal wastewater or effluents from healthcare facilities that enter the lake. It is also recommended that the government take steps to control anthropogenic activities near the water body.

### Biography

Deresse Daka is Medical Microbiologist graduated from Addis Ababa University, 2011. He has More than 40 publications with good quality and now he is Associate professor of Medical Microbiology and immunology. He is teaching Medical microbiology for Medical students, Health officers, Nurses, Medical laboratory students.

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