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Microbial contamination pathway from land to water: A case study of a water reservoir in Nigeria

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Abstract

This study was carried out to identify major sources of microbial contamination, track transport routes, assess contamination levels and evaluate health risk to local communities. It studied the flow of pathogens from human activities into freshwater bodies. Demonstrates how land decisions influence disease emergence thereby impacting public health. Microbial analysis (bacterial, coliforms, fecal bacteria, and fungi counts) and water quality parameters (pH, conductivity, temperature, and dissolved oxygen) were analysed in triplicates following standard methodologies. Results revealed mean total bacterial counts of 1.27 ± 1.0 CFU/mL, with the highest values recorded in May (2.55×10^2 CFU/mL). Fecal coliforms were absent throughout the study period, aligning with WHO guidelines for zero tolerance of fecal contamination in water reservoirs. Mean total coliform bacteria (0.2 ± 0.1 CFU/mL) were detected intermittently. Fungal counts peaked at 1.6×10^2 CFU/mL in May.

Water quality parameters showed notable variations: mean temperature was 26.64°C; conductivity ranged from 193.9 S/cm to 258 S/cm; pH fluctuated between 6.58 and 10.1; and dissolved oxygen levels varied between 3.6 mg/L and 6.1 mg/L. Dissolved oxygen levels were adequate to support fish health despite seasonal variations. The correlation analysis revealed significant relationships between microbial load and certain water quality parameters: Higher temperatures corresponded with increased bacterial activity. Reduced dissolved oxygen levels coincided with higher fungal counts during warmer months. Major sources identified were waste dumps, poor land use and latrines. They were transported through runoffs, drainage and seepage systems. These findings indicate that the water quality and microbial loads in the reservoirs are within habitable ranges for aquatic organisms but can pose a threat to human use. Better waste disposal systems and proper land use is hereby necessary to avoid health risk to neighbouring communities.

Keywords: Bacteria, microbial load, Nigeria, water quality