Antibiotic Sensitivity of Soil Leachates and Soil Heavy Metal Status: A Case Study from Gohagoda Municipal Solid Waste Dumpsite, Sri Lanka

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Open dumping is prevalent in developing countries as a primary method of waste disposal without proper environmental safeguards. In Sri Lanka, Gohagoda Municipal Solid Waste Dumpsite is one of the hotbeds for the accumulation of pollutants, which is margined by the River Mahaweli, the main freshwater source for the downstream communities. There is a high chance of contaminating river water with dumpsite leachates, with pollutants like heavy metals, and antibiotic-resistant or less sensitive bacteria. This study aimed to investigate the bacterial abundance, antibiotic sensitivity, and heavy metal status of the Gohagoda dumpsite using soil and leachate samples. Soil samples were collected along four transects, at three distances away from the edge of the dumpsite (0, 10, and 50 m) and at two depths (0-20 and 20-50 cm) at each location. Leachates drawn from soil were used in determining bacterial abundance and antibiotic sensitivity, while soil samples were used for the heavy metal analysis. Bacterial abundance showed a significant difference among transects (p = 0.0012), with the highest abundance in the second nearest transect to the river. Antibiotic sensitivity was investigated using Amikacin (30 µg), Amoxicillin-clavulanate (20/10 µg), Ciprofloxacin (5 µg), Levofloxacin (5 µg), and Gentamicin (10 µg). For Amikacin, significantly reduced sensitivity was observed with an increase in depth (p=0.0185). For Amoxicillin, Ciprofloxacin, and Levofloxacin, sensitivity showed a significant variation among transects ($p<0.05$), with the least antibiotic sensitivity in the transect nearest to the river. Soil analyses revealed higher Manganese (Mn) levels, based on European Union standards, which may cause health implications like neurological defects upon groundwater contamination. High bacterial abundance and the least antibiotic sensitivity of bacteria in transects closer to the river indicates a major public health risk due to this dumpsite. This highlights the importance of more comprehensive studies to guide authorities in managing solid waste properly.

Keywords: Open Dumping, Leachates, Bacterial Abundance, Antibiotic Sensitivity, Heavy Metals