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Influence of Water Physicochemical Properties and Vegetation Type on the Distribution of Schistosomiasis Intermediate Host Snails in Nelson Mandela Bay

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Abstract : Schistosomiasis is an infectious water-borne disease that holds substantial medical and veterinary importance and is transmitted by Schistosoma flatworms. The transmission and spread of the disease are geographically and temporally confined to water bodies (rivers, lakes, lagoons, dams, etc.) inhabited by its obligate intermediate host snails and human water contact. Human infection with the parasite occurs via skin penetration subsequent to exposure to water infested with schistosome cercariae. Environmental factors play a crucial role in the spread of the disease, as the survival of intermediate host snails is dependent on favourable conditions. These factors include physical and chemical components of water, including pH, salinity, temperature, electrical conductivity, dissolved oxygen, turbidity, water hardness, total dissolved solids, and velocity, as well as biological factors such as predator-prey interactions, competition, food availability, and the presence and density of aquatic vegetation. This study evaluated the physicochemical properties of the water bodies, vegetation type, distribution, and habitat presence of the snail intermediate host. A quantitative cross-sectional research design approach was employed in this study. Eight sampling sites were selected based on their proximity to residential areas. Snails and water physicochemical properties were collected over different seasons for 9 months. A simple dip method was used for surface water samples and measurements were done using multiparameter meters. Snails captured using a 300 µm mesh scoop net and predominant plant species were gathered and transported to experts for identification. Vegetation composition and cover were visually estimated and recorded at each sampling point. Data was analysed using R software (version 4.3.1). A total of 844 freshwater snails were collected, with Physa genera accounting for 95.9% of the snails. Bulinus and Biomphalaria snails, which serve as intermediate hosts for the disease, accounted for (0.9%) and (0.6%) respectively. Indicator macrophytes such as Eicchornia crassipes, Stuckenia pectinate, Typha capensis, and floating macroalgae were found in several water bodies. A negative and weak correlation existed between the number of snails and physicochemical properties such as electrical conductivity (r=-0.240), dissolved oxygen (r=-0.185), hardness (r=-0.210), pH (r=-0.235), salinity (r=-0.242), temperature (r=-0.273), and total dissolved solids (r=-0.236). There was no correlation between the number of snails and turbidity (r=-0.070). Moreover, there was a negative and weak correlation between snails and vegetation coverage (r=-0.127). Findings indicated that snail abundance marginally declined with rising physicochemical concentrations, and the majority of snails were located in regions with less vegetation cover. The reduction in Bulinus and Biomphalaria snail populations may also be attributed to other factors, such as competition among the snails. Snails of the Physa genus were abundant due to their noteworthy resilience in difficult environments. These snails have the potential to function as biological control agents in areas where the disease is endemic, as they outcompete other snails, including schistosomiasis intermediate host snails.

Keywords : intermediate host snails, physicochemical properties, schistosomiasis, vegetation type
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