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Prevalence and Diagnostic Evaluation of Schistosomiasis in School-Going Children in Nelson Mandela Bay Municipality: Insights from Urinalysis and Point-of-Care Testing

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Abstract : Schistosomiasis, caused by Schistosoma (S.) haematobium and Schistosoma (S.) mansoni parasites poses a significant public health challenge in low-income regions. Diagnosis typically relies on identifying specific urine biomarkers such as haematuria, protein, and leukocytes for S. haematobium, while the Point-of-Care Circulating Cathodic Antigen (POC-CCA) assay is employed for detecting S. mansoni. Urinalysis and the POC-CCA assay are favoured for their rapid, non-invasive nature and cost-effectiveness. However, traditional diagnostic methods such as Kato-Katz and urine filtration lack sensitivity in low-transmission areas, which can lead to underreporting of cases and hinder effective disease control efforts. Therefore, in this study, urinalysis and the POC-CCA assay was utilised to diagnose schistosomiasis effectively among school-going children in Nelson Mandela Bay Municipality. This was a cross-sectional study with a total of 759 children, aged 5 to 14 years, who provided urine samples. Urinalysis was performed using urinary dipstick tests, which measure multiple parameters, including haematuria, protein, leukocytes, bilirubin, urobilinogen, ketones, pH, specific gravity and other biomarkers. Urinalysis was performed by dipping the strip into the urine sample and observing colour changes on specific reagent pads. The POC-CCA test was conducted by applying a drop of urine onto a cassette containing CCA-specific antibodies, and the presence of a visible test line indicated a positive result for S. mansoni infection. Descriptive statistics were used to summarize urine parameters, and Pearson correlation coefficients (r) were calculated to analyze associations among urine parameters using R software (version 4.3.1). Among the 759 children, the prevalence of S. haematobium using haematuria as a diagnostic marker was 33.6%. Additionally, leukocytes were detected in 21.3% of the samples, and protein was present in 15%. The prevalence of positive POC-CCA test results for S. mansoni was 3.7%. Urine parameters exhibited low to moderate associations, suggesting complex interrelationships. For instance, specific gravity and pH showed a negative correlation (r = -0.37), indicating that higher specific gravity was associated with lower pH. Weak correlations were observed between haematuria and pH (r = -0.10), bilirubin and ketones (r = 0.14), protein and bilirubin (r = 0.13), and urobilinogen and pH (r = 0.12). A mild positive correlation was found between leukocytes and blood (r = 0.23), reflecting some association between these inflammation markers. In conclusion, the study identified a significant prevalence of schistosomiasis among school-going children in Nelson Mandela Bay Municipality, with S. haematobium detected through haematuria and S. mansoni identified using the POC-CCA assay. The detection of leukocytes and protein in urine samples serves as critical biomarkers for schistosomiasis infections, reinforcing the presence of schistosomiasis in the study area when considered alongside haematuria. These urine parameters are indicative of inflammatory responses associated with schistosomiasis, underscoring the necessity for effective diagnostic methodologies. Such findings highlight the importance of comprehensive diagnostic assessments to accurately identify and monitor schistosomiasis prevalence and its associated health impacts. The significant burden of schistosomiasis in this population highlights the urgent need to develop targeted control interventions to effectively reduce its prevalence in the study area.

Keywords : schistosomiasis, urinalysis, haematuria, POC-CCA
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