

Microbiological, physico-chemical and management parameters impinging on the efficiency of small water treatment plants in the Limpopo and Mpumalanga Provinces of South Africa

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Abstract

In the wake of the growing dependence on small water treatment plants (SWTPs) in providing quality water to rural areas and the global burden of water borne diseases, this study sought to examine the efficiency of 55 SWTPs located in rural or peri-urban areas of Limpopo and Mpumalanga Provinces in order to gauge the safety of water supply for human consumption. The microbiological and physical parameters of raw water, treated water and water in the distribution systems were examined using standard methods. Management issues impacting on quality of water supply were determined by use of questionnaires and focus group discussions. Results obtained showed that the pH, turbidity, temperature and conductivity of the raw water in SWTPs studied in both provinces ranged between 6.46 to 9.05 pH units, 0.19 to 8.0 NTU, 15.4°C to 31.40°C and 44.40.4 µS to 108 µS respectively. Water quality compliance at point of use (treated water) according to the Department of Water Affairs and Forestry of South Africa guidelines in SWTPs studied in both provinces were 85% for faecal coliforms and 69% for total coliforms. In the distribution systems, TCCs, FCCs and HPCs were within recommended limits except for few SWTPs suggesting a possibility of inadequate treatment and this may represent post-treatment contamination and possible risk of infection from these water supply sources. Physical parameters were generally within the recommended ranges. In terms of administrative issues, some plant operators did not have adequate knowledge of the functioning of the SWTPs and most were unable to calculate chlorine dosage, determine flow rates or undertake repairs of basic equipment. Poor working conditions, frequent stock depletion of chemicals, lack of maintenance culture, lack of emergency preparedness and poor communication were also cited.

The study has revealed that the microbiological quality of raw water was very poor but that water treatment was efficient in the majority of SWTPs studied in both provinces. Regular monitoring of microbial and physico-chemical parameters of water quality served by the different SWTPs to the population is recommended to gauge their safety for human consumption. Issues such as enhanced incentives and periodic training of plant operators, improved communication and conditions of service, periodic stock inventory and entrenchment of maintenance culture may be necessary to ensure sustained and efficient water distribution systems.

Key words: water treatment plants, water quality, Limpopo, Mpumalanga, RSA provinces and management