

Microbiological and physico-chemical assessment of the quality of domestic water sources in selected rural communities of the Eastern Cape Province, South Africa

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Abstract

The domestic raw water sources in Nkonkobe and Gogogo were characterised by using both microbiological and standard physical methods to investigate the quality of the water at the sampling sites. For microbiological analysis, indicator bacteria namely, heterotrophic bacteria, total and faecal coliforms and for physical parameters, pH, turbidity and temperature were assessed to check whether the distributed water as well as the water from dams, and rivers was safe for drinking and other domestic uses. The water quality parameters of concern were microbial contamination and turbidity. Almost all the indicator bacteria counts and turbidity values were above the South African recommended limits. Both Nkonkobe and Gogogo raw water sources had a poor water quality. The water was unfit for human consumption without prior treatment. The quality of the water source depended on local conditions. This indicated that poor sanitation and hygiene conditions and lack of, or little environmental awareness among the people in rural areas, could be considered as the major causes of source water contamination.

Keywords: water quality, coliform bacteria, heterotrophic plate count, rural communities, pH, turbidity, and temperature.

Introduction

The lack of safe drinking water and adequate sanitation measures lead to a number of diseases such as cholera, dysentery, salmonellosis and typhoid, and every year millions of lives are claimed in developing countries. Diarrhoea is the major cause for the death of more than 2 million people per year world-wide, mostly children under the age of five. It is a symptom of infection or the result of a combination of a variety of enteric pathogens (ANON, 2000).

Water-borne pathogens infect around 250 million people each year resulting in 10 to 20 million deaths world-wide. In South Africa alone more than 7 million people (approximately 17% of the population) do not have access to potable water supply and nearly 21 million (about 54% of the population) lack basic sanitation (DWAF, 1996). This highlights the potential of infection due to water-borne pathogens.

The evaluation of potable water supplies for coliform bacteria is important in determining the sanitary quality of drinking water. High levels of coliform counts indicate a contaminated source, inadequate treatment or post-treatment deficiencies (Mathew et al., 1984). Many developing regions suffer from either chronic shortages of freshwater or the readily accessible water resources are heavily polluted (Lehloesa and Muyima, 2000). Microbiological health risks remain associated with many aspects of water use, including drinking water in developing countries (Craun, 1986), irrigation reuse of treated wastewater and recreational water contact (Grabow, 1991). It has been reported that drinking water supplies have a long history of association with a wide spectrum of microbial infections (Grabow et al., 2000). Therefore, the primary

goal of water quality management from a health perspective is to ensure that consumers are not exposed to doses of pathogens that are likely to cause disease. Protection of water sources and treatment of water supplies have greatly reduced the incidence of these diseases in developed countries (Craun, 1986; Grabow et al., 2000).

One of the difficulties in evaluating the impact of drinking water supply on health is the lack of local demographic statistics, particularly in rural communities. Therefore, it is important to know the incidences of diseases occurring in rural areas due to polluted water. This will provide an opportunity to compare the incidence of water-borne diseases between communities that have drinking water and those that do not.

Detection of bacteria, potentially toxic substances and other contaminants in water usually requires laboratory-conducted tests. There are various methods for the detection of the degree of water contamination (*Standard Methods*, 1998). Detection and enumeration of indicator organisms, is the basic microbiological technique, used in water quality monitoring (*Standard Methods*, 1998). The coliform group of bacteria can be defined as the principal indicators of purity of water for domestic, industrial and other uses.

Major factors affecting the microbiological quality of surface water are discharges from sewage works and runoff from informal settlements. High total and faecal coliform counts in water are usually manifested in the form of diarrhoea, fever and other secondary complications (Fatoki et al., 2001).

In South Africa nearly 80% of the population rely on surface water as the main source of water (Venter, 2001). This relatively high percentage of the population that is without proper water supply services indicates that many of the people still utilize untreated surface water for domestic purposes. Most of these people are poor and rely on State intervention for improved water supply. Pegram and collaborators (Pegram et al., 1998) showed

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