Changing consumer water-use patterns and their effect on microbiological water quality as a result of an engineering intervention

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Abstract

A previous study done during 1994-1995 in a section of a large, low socio-economic urban development with limited sanitary facilities and drinking-water provision indicated that the community was exposed to water-related health risks when consuming the water supplied. The study indicated that, although the public supplied water was of a good quality, the stored water, once fetched from the standpipes, deteriorated to a quality often not safe for human consumption. Based on the findings of this previous study, the local authority decided to install standpipes for each individual family in the area concerned and these were placed in the house yards. The closer proximity of the standpipes immediately altered the water-fetching and storing patterns of the community. The consequent study, on which this abstract is based, assessed the potential risk of infection posed to health by the altered water-use pattern. Weekly water samples were collected from standpipes outside as well as from containers kept inside houses of selected families. Total coliforms, faecal coliforms, heterotrophic plate counts, *Clostridium perfringens* and somatic coliphages were used as microbiological indicators. Although the improvement of water accessibility enhanced the microbiological quality of stored water, the results indicated that hygienic quality still deteriorated. This situation indicated that a suitable education and information programme to enhance the quality gains of such engineering interventions should accompany engineering improvement of water accessibility.

Introduction

The need to provide adequate water supplies to communities is a well-recognised central component of the South African Government's Reconstruction and Development Programme (African National Congress, 1994). Infection agents are regarded as the most important water quality aspect of water safety for supplied water for whatever purpose of human use (Grabow, 1996; Jagals and Lues, 1996). In developing countries, public health control over water supplied to the point of extraction by way of standpipes (pumps or taps) is often not sufficient to protect communities against water-borne infectious diseases (UNEP, 1991).

Even when a community is supplied with treated piped water, it does not necessarily mean that water-related hazards will be totally eliminated (Jagals et al., 1997). Additional aspects such as supplied water quality, domestic water storage as well as handling must be taken into consideration in any system of public water supply to ensure the consumer of safe drinking water at the point of consumption (Jagals et al., 1997).

A previous study done during 1994-1995 (Jagals et al., 1997) in a large low socio-economic urban with limited sanitary facilities and drinking-water provision, indicated that members from the involved community were exposed to microbiologically related environmental health risks when consuming water supplied by a public standpipe system.

This health risk occurred, not in the water extracted at the standpipe, but in the same volumes of water after being carried and stored at the dwellings in a variety of containers. The individual standpipes were on average 80 m away from the houses in the area, with some of the taps up to 300 m away. This implied some substantial distances over which water had to be transferred to the houses.

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The study indicated that although the supplied water at the standpipe tap was of good quality, the stored water at the dwellings deteriorated to a quality often not suitable for human consumption. The reasons for the deterioration varied from poor container hygiene and open containers subjected to environmental pollution, to the manner of handling of water by individuals in households (Jagals et al., 1997).

Based on the findings of the previous study, the local authority in the area decided to extend the system reticulation in the particular study area. A standpipe was installed for each individual family inside the boundaries of each plot of land on which a dwelling stood.

It was observed that the closer proximity of the standpipes immediately had an effect on the water-fetching and -storing profile of the members of the community. Families used more open-type buckets instead of screw-top closeable containers. The members also used more water and replenished the stored stock more often. It was also observed that the members stored less water than was previously the case.

This study was aimed at assessing the impacts of this engineering intervention on the microbiological water quality at the point of consumption. References in this study made to "before" and "after" the "engineering intervention" refers to the situation assessed during the previous (before) study of Jagals et al. (1997) while "after" refers to the situation assessed during this study.

Material and methods

Water quality parameters

The water quality parameters used to measure the environmental health risk during this study were the:

- *South Africa Water Quality Guidelines: Vol. 1; Domestic Water* (DWAF, 1996).
- Proposed *Water Quality Criteria in South Africa*, of the National Department of Health (Aucamp and Vivier, 1990).