ASSESSMENT OF STORAGE AND HANDLING PRACTICES ON QUALITY OF HOUSEHOLD DRINKING WATER

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ABSTRACT

Waterborne diseases constitute a major public health problem in India and consumption of contaminated water causes health risks to the public. Safe drinking water is essential to the health and well-being of human beings. Contamination in stored household drinking water is associated with the methods of water storage, handling practices, and domestic and personal hygiene practices. To find out the probable cause of the contamination of drinking water; a survey was conducted in 100 families and household drinking water quality (before and after use) was analyzed for its potability. The objective of the present study was to assess the contamination potentials of different house water handle portability rage practices. The study concluded that the storage container and their hygienic practices, number of family members, children in the family, and their socioeconomic status, education of housewives significantly affect the quality of drinking water in the houses.

KEYWORDS: household water, personal and domestic hygiene, potability of water.

INTRODUCTION

Household water storage remains a necessity in many communities worldwide, especially in developing countries. Water storage often using tanks/vessels is envisaged to be a source of water contamination, along with related user practices (Musa et al., 2021). Access to clean and safe water, good sanitation, and hygiene practices are necessary for a healthy population. The importance of education, sociocultural acceptance, and changing people's beliefs and behaviors achieved sustainability and affordability in the provision of safe water (Agensi et al., 2019). Provision of safe household water included the conditions and practices of water collection, storage, handling, and the choice of storage containers or vessels (Tambekar & Mahore, 2005; Chalchisa et al., 2017). Microbial contamination of collected and stored household water is caused not only by the collection and use but unsanitary methods to dispense water from household storage vessels, including contaminated hands and dippers, and inadequate cleaning of vessels, which lead to the accumulation of sediments and pathogens. Even though water is treated before supplies but may become contaminated after collection, either during transport or storage in the home (Duru et al., 2013; Agensi et al., 2019).

The reasons for the contamination of drinking water in the home may be due to personal and domestic inadequate and unsanitary storage conditions that allowed, for the introduction and proliferation of disease-causing microbes (Jagals et al., 2003). Personal and domestic hygienic practices indirectly depend on the education of the family members, as educated people are more conscious about their health and always try to maintain hygienic conditions in their homes which

prevents contamination in drinking water (Tambekar et al., 2016). Direct introduction of hands or fingers or dippers into stored water contaminants the water which suggested the importance of hand washing, and domestic and personal hygiene practices might have prevented the chance of infection in a community (Hutin et al., 2003; Nala et al., 2003).

Hence a study was conducted on the personal and domestic hygienic practices in houses that affect the quality of household drinking water. The factors such as the education of housewives, socioeconomic status of the family, personal and domestic hygiene, number of family members, water handling and withdrawal practices, etc were studied for keeping the water free from diseases-producing microorganisms.

MATERIALS AND METHODS

The study was conducted to observe the effect of handling and personal hygienic practices along with the education and socio-economic status, in houses on the quality of drinking water after storage in the container. For the study, 100 families were identified from the various colonies of Gondia city, and data was collected as per prepared questionnaires from respective houses. Two samples of drinking water, one before and the other after the use of water were collected from storage containers for the potability test of each house. A total of 200 drinking water samples were collected and Manja's H_2S test was performed for potability (Manja et al., 2001) by adding approximately 20 ml water sample into the medium contain bottle. These bottles were then incubated at room temperature for 24, 48, and 72 h to determine the extent of blacking in the bottle by producing hydrogen sulfide gas. The MPN was calculated by Multiple Tube Fermentation Technique (MTFT); nine multiple tube dilution techniques using double and single-strength Bromo-Cresol Purple MacConkey medium, by adding 10 ml, 1 ml, 0.1 ml water samples in appropriate test medium and incubated for 24 – 48 h at 37°C. The MPN Index was calculated from the MPN table and the index of water with more than 10 coliforms/dl was designated as polluted or unhealthy for drinking purposes or non-potable (APHA, 2017).

The data were collected using interview and observation methods. During interviewing the person about their information on the education of their spouse, the number of children, the income of a family, method of collection and storage of water (Figure 1), water handling practices, etc. were collected from the hundred households from where water samples were collected for analysis, by filling a prepared questionnaire. Collected data were analyzed by using SPSS software about the potability of drinking water.

RESULTS AND DISCUSSION

Waterborne diseases constitute a major public health burden in India and consumption of contaminated water causes health risks to the public, and the situation is alarming in rural areas. The most common and widespread health risk associated with drinking water is contamination, either directly or indirectly by the method of water storage, handling practices, domestic and personal hygiene practices (Packiyam et al., 2016). This study aimed to assess the contamination potentials of different house water handling and storage practices in Gondia and find out the probable cause of the contamination in drinking water. This type of survey was conducted, and household drinking water samples (before and after use) were analyzed for coliform contamination.

Figure 1. Different types of pots for water storage and dippers used for water withdrawal.

The water sample from 100 families was collected and analyzed for potability of the drinking water and found that, out of these, 82% were found to be potable and 18% non-potable. The water quality after use in those families using earthenware without a tap showed 90% potable while earthenware with a tap showed 100% portable. The water in stainless steel and plastic container showed 89 and 83% potable after use. The data showed water in the water filter was 100% potable (Figure 2).

The withdrawing utensil may be one of the causes which made the potable drinking water non-potable because while withdrawing water there was the chance of water getting contaminated with the fingers of a person or with contaminated dipper. Families, who were using a dipper without a handle for water withdrawal from the container, the water was 47% potable as compare to families either using the short handle (86% potability) or long handle dipper or tap for withdrawing water (100% potable). Long or short handle dipper or tap reduces the chances of contact of hands or fingers with the water and prevents secondary contamination in the stored water. Moreover, washing the hands before collecting or withdrawing water reduced the chances of contamination up to zero percent and kept the water potability 100% (Figure 2).

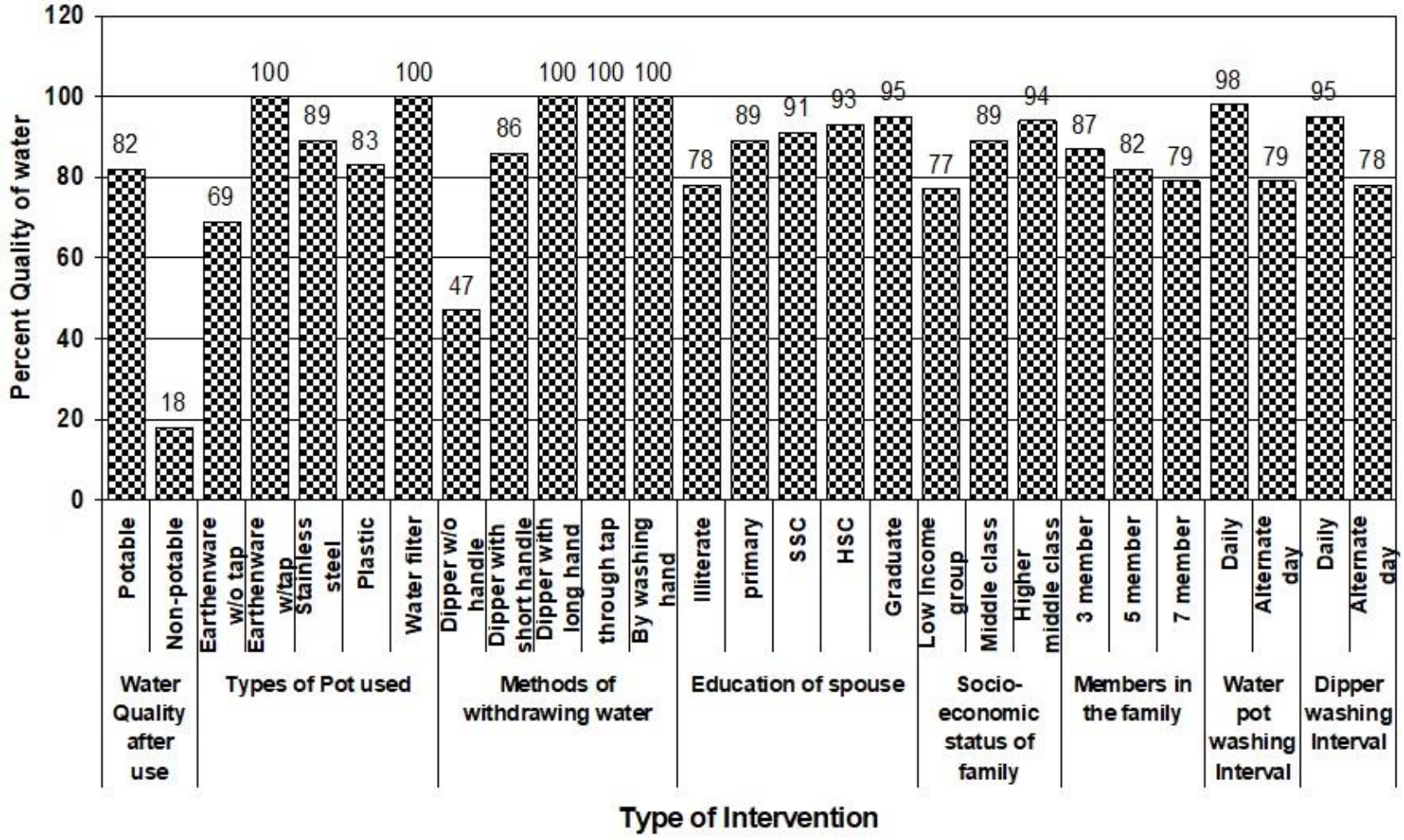

Figure 2. Quality of drinking water after use.

The socioeconomic condition of families is one factor that also plays an important role in contaminating the household drinking water (Gorter et al., 1998). The families from the lower income group kept the water up to 77% potable after use while middle-class families kept it 89% and the higher middle class kept it 94% potable. This indicates that the socio-economical status of the family also affects the hygienic practices of the family (Figure 2).

The education of spouses, the number of family members, and their hygienic practice also have a prominent role in making potable water into non-potable (Karn & Harada, 2002; WHO, 2005). The illiterate spouses kept the water potable up to 78% while the primary educated kept it 89%, and the SSC, HSC, and graduate kept it 91%, 93%, and 95% respectively. It indicates that the education of the housewife or family members plays a prominent role in personal and domestic hygiene which leads to good hygienic practices and the quality of household drinking water (Figure 2).

The quality of drinking water is inversely proportional to the number of family members. A family with more numbers contaminates the water highly as compared to a family with few members, as they used it often (Tambekar, 2017). This indicated that the more the family member more the contamination because the more the members in the family, the more times of use dipper or handling which results in more contamination. The families with 3 members, 5 members, and 7 members kept the water 87%, 82%, and 79% potable after use. This indicates that the number of children may affect the quality of drinking water because children may withdraw water unhygienically, such as without washing their hands or directly dipping their hands in the stored water, which makes water contaminated. Washing the water pot or dipper also affects the quality of drinking water indicating that a higher frequency of washing water containers or dippers is good quality or potability of the water (Figure 2).

The study recommended that long or short-handle dippers should be used for the withdrawal of water from the storage container. The education of the housewife also affects the storage, handling, and hygienic practices of drinking water. The re-educated housewives stored water more hygienically as they were more conscious about health as compared to illiterate housewives. Socioeconomic status also affects the hygienic conditions of the family and invariably affects the quality of water storage. The higher the monthly income higher the hygienic quality of drinking water in the houses. At the same time the family member or children, have poor quality water as everybody may not use proper hygienic procedures or wash their hands or dipper before withdrawing the water. Thus, the study indicated that the storage and handling practices, number of family members or children in the family, socio-economic status of the family, and hygienic practices significantly affect the quality of drinking water in the houses.

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