

Knowledge about cleaning and maintenance of household water reservoirs in one of the oldest municipalities of Brazil

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ABSTRACT

Much of the population does not have access to treated and piped water in the world, and the users themselves are responsible for its harvesting and storage, collecting from any available source, frequently without treatment, or any kind of protection against contamination. Considering that water can be contaminated during storage in the household reservoir, this study sought to evaluate the knowledge of the population about the maintenance of water reservoirs in São Mateus, one of the oldest cities in Brazil, located in the state of Espírito Santo. The information was collected through an interview with residents of 22 districts of the municipality. It was observed that all interviewees were aware of the need to clean the water tank. However, in 14.29% (n=10) of the households, cleaning was not performed. Regarding the cleaning period of the water tank, 61.43% (n=43) of the residents stated that six months was the correct period for cleaning, with 55.71% (n=39) of the residents effectively performing the cleaning in that period. The obtained data show that the knowledge of the population about the correct maintenance of household reservoirs is still unsatisfactory. This leads to a decrease in the quality of stored water and increases the spread of waterborne diseases.

Keywords: Water Contamination. Household Reservoir. Storage.

INTRODUCTION

Much of the population does not have access to treated and piped water in the world, and the users themselves are responsible for its harvesting and storage, collecting from any available source, frequently without treatment, or any kind of protection against contamination. It is worth noting that even urban and rural areas, which have a supply network, are not free of some kind of contamination due to deficiencies in the treatment process, the vulnerability of the distribution system, or due to a low-quality source (SOBSEY *et al.*, 2003).

In nineteenth-century Brazil, the exponential growth of the population in cities led to the need to improve and expand the water supply network, hitherto carried out through springs, fountains, and watering holes. Due to this improvement in the network, there was a need to use water boxes for storage in households (OLIVEIRA, 2004; ANA, 2007). A study conducted by Freitas *et al.* (2001) showed that, due to the lack of adequate maintenance, water could be contaminated in the household reservoir itself.

In the reservoir, impurities from various sources, such as the distribution network itself, may suffer sedimentation, resulting in changes in pH, color, and turbidity. These changes caused by the organic matter deposited in the bottom of water tanks decrease the oxygen content and residual chlorine, creating conditions for bacterial growth, thus reducing water quality (JULIÃO, 2011).

The fact that water is a scarce resource causes its quality to generate an increasing concern since it is used for several purposes and the low quality of this resource can trigger

disease outbreaks (WHO, 2013) that directly reflect on the life quality of the population (OKURA & SIQUEIRA, 2005). According to the World Health Organization, waterborne pathogenic microorganisms are responsible for about 80% of diseases occurring in developing countries (COELHO et al., 2007).

In this context, the objective of this study was to evaluate the knowledge of the population in the city of São Mateus, state of Espírito Santo (ES) about the processes of hygiene and disinfection of their household water reservoirs.

METHODOLOGY

Study Site

The study was conducted in the municipality of São Mateus, one of the oldest municipalities in Brazil, whose date of foundation dates back to 1544. Brazilian Institute of Geography and Statistics (IBGE) estimates, the municipality had a population of 130,611 inhabitants in 2019 (IBGE, 2019).

Interview

The information was collected during 5 months of 2017 (between May and September) through an interview with 70 residents chosen at random. The interviews were conducted at the time of collecting water samples for a study by Nunes (2018) and the sample number was defined following the National Guideline for Sampling of Water Quality Surveillance for Human Consumption of the Ministry of Health (BRASIL, 2016a). During the interview, a questionnaire with 35 multiple-choice questions about socioeconomic aspects and residents' knowledge about the correct maintenance of household reservoirs was applied. In this interview, the following issues were discussed: gender; age; the level of education; family income; knowledge about the health-disease process; material of the household reservoir; reservoir cover; knowledge about the correct period for sanitizing reservoirs; the period in which the reservoirs were cleaned; products and materials used to clean the reservoirs.

Tabulation of results and graphics construction was performed using the software Microsoft Excel 2016[®] and GraphPad Prism 7[®].

Ethical Aspects

The project was submitted and approved by the ethics committee from Universidade Federal do Espírito Santo - project number 1,998,738.

RESULTS AND DISCUSSION

Interviews were carried out with 70 residents selected in the districts of the municipality of São Mateus, about socio-economic aspects to determine the profile of the residents and their knowledge about cleaning and maintenance of household reservoirs. Of the interviewees, 57.14% (n=40) were females, with 78.64% of the total interviewees aged over 40 years.

The data on the family income of the houses visited show that 22.85% (n=16) of the families have a monthly income of up to one minimum salary (R\$ 937.00), and the majority of families (37.14%) (n=26) have an income between 1 and 3 minimum salaries (Table 1).

Table 1. Income range of the families interviewed.

Family income bracket	%	(n)
Less than 1 minimum salary	5.72	4
1 minimum salary*	17.14	12
From 1 to 3 minimum salaries	37.14	26
From 3 to 5 minimum salaries	25.71	18
From 5 to 10 minimum salaries	7.14	5
Above 10 minimum salaries	2.86	2
Not known	4.29	3

***Minimum salary equivalent to R\$ 937,00 in the year 2017.**

Concerning the educational background of the interviewees, there was a predominance of residents with a high school education (34.29%) (n=24), and the education level of the population was relatively low since only 20.00% (n=14) had a university degree and 7.14% (n=5) reported never having studied (Table 2).

Table 2. Level of education of the interviewees.

Level of education	%	(n)
Elementary school I	21.43	15
Elementary school II	17.14	12
High school	34.29	24
University degree	20.00	14
Never studied	7.14	5

Lack of study may reflect the poor knowledge of health-disease processes. Here, 90,00% (n=63) of the study participants reported never having had any kind of parasitic infection during their lifetimes, about half (48.57%) (n=34) reported not being aware of how the disease is transmitted. Similarly, Barros et al. (2011) stated that the perception of the health-disease process depends on the degree of understanding of signs and symptoms, access to medical services and diagnostic tests, and the population with the lowest level of education and income have more restricted access to information and quality health services.

Regarding the structure of households, all had at least one bathroom, 81.43% (n=57) of them located exclusively in their interior. The drainage of these toilets is worrisome, since the sewage system serves less than half (44.29%) (n=31) of the visited residences, while the rest of the houses use septic tanks not connected to the sewerage system (50.00%) (n=35) or discharges the sewage directly into the river (1.43%) (n=1). Also, in 4.28% (n=3) of the households, the residents did not know how to respond to bathroom drainage.

Concerning water tanks, there was at least one in all the visited households, with 97.14% (n=68) of the interviewees stating that they had covers. This result is very relevant, since uncovered reservoirs expose stored water to weathering and external contaminants, leaving the population that consumes it vulnerable to diseases. Wright et al. (2004) stated that adequate and protected reservoir storage greatly reduces the contamination of the water stored there, reinforcing the importance of the use of water tanks with lids and in good maintenance conditions.

Another important point for the correct water storage is the material used in the construction of the household reservoirs. In this study, 82.86% (n=58) of respondents answered that the water tank was made of polyethylene while, in 10% (n=7), it was made of asbestos. In

two households, there were two tanks, one of polyethylene and another of asbestos.

There is currently a predominance of polyethylene reservoirs in households at the expense of asbestos. According to the manufacturer, water tanks made of polyethylene and polypropylene are more used once they are lighter and more durable, besides having smooth internal walls, which facilitates their cleaning and maintenance. Besides, in the state of São Paulo, law nº 12.684 of 2007 recommends that the asbestos water tanks be replaced, as they contain toxic fibers harmful to health (SÃO PAULO, 2007). Therefore, the use of tanks made with suitable materials can bring benefits to the quality of the water stored in households, as they avoid the accumulation of dirt on their internal walls and, consequently, their contamination.

When questioned about the cleaning of the water tank, all respondents (n=70) stated that they were aware of this need; however, in 14.29% (n=10) of the households, cleaning was not performed. Among the residents who did not clean it, 80% (n=8) used difficult to access as a justification. The results of this study are similar to those found by Julião (2011), whose majority (86%) stated that they were aware of the need to clean the water tank. However, not everyone has this habit, as evidenced in a study by Campos et al. (2003) in the city of Araraquara - SP, where 40.5% of the study population did not clean their reservoirs due to the difficult access. Thus, it is possible to infer that the failure to perform the cleaning of household reservoirs is associated with the lack of interest on the part of the population (DARCI BOM, 2002) due to the difficult access to the water tanks, since most are located under the roof, discouraging the adoption of this practice.

Concerning the knowledge of the population of São Mateus about the adequate frequency for the maintenance of reservoirs, 61.43% (n=43) of the participants indicated the correct period for cleaning, which is six months as recommend by National Sanitary Surveillance Agency (BRASIL, 2016b) (Figure 1).

Regarding the cleaning of the reservoirs, 55.71% (n=39) of the respondents stated that they had cleaned their tank within the six months, but 22.86% (n=16) of study participants did not know how to report when cleaning was last performed (Figure 2).

KNOWLEDGE ABOUT CLEANING PERIOD

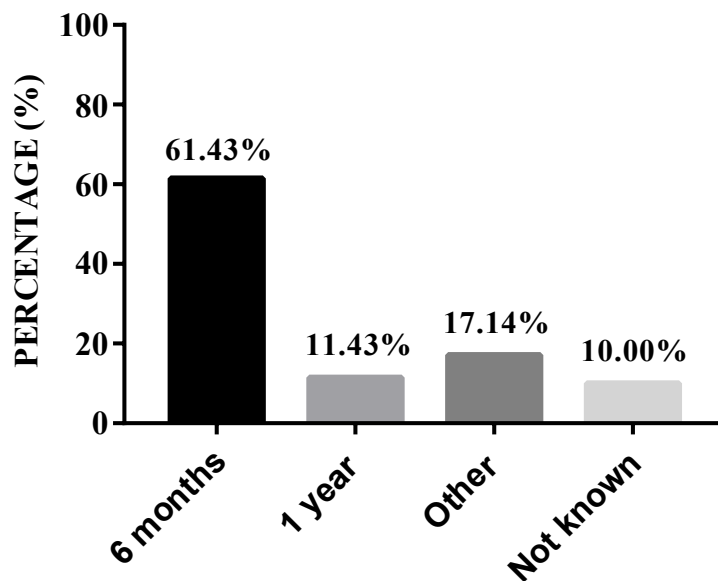


Figure 1. Knowledge of the population about the correct period to perform the cleaning of household reservoirs.

CLEANING PERIOD OF WATER TANKS

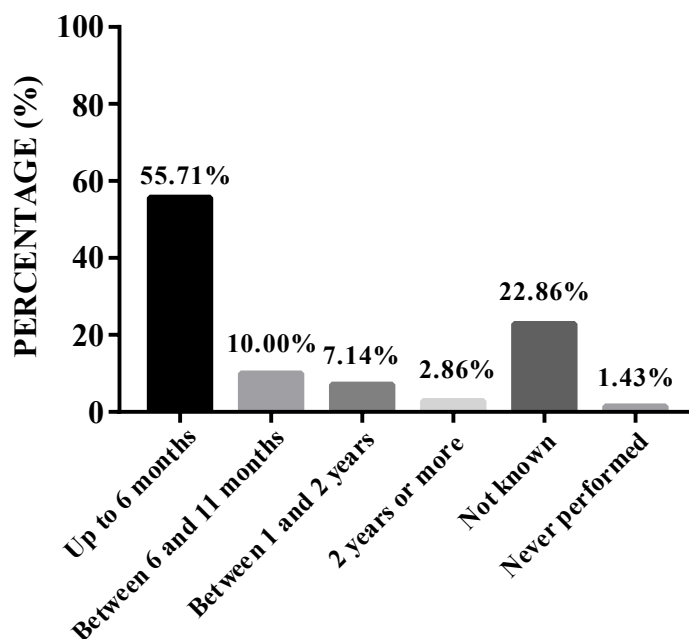


Figure 2. Frequency of cleaning periods of household reservoirs by the residents.

In this context, and according to the recommendations of the National Health Foundation (BRASIL, 2006), cleaning within an appropriate period avoids the accumulation of

sediments and the consequent formation of the biofilm that is adhered to the inner walls of the water tank. which can generate a contamination source (BRASIL, 2006).

Still, regarding the cleaning period, the most critical results were observed by Darci Bom (2002) and Julião (2011), whose cleaning of the reservoirs was carried out in an adequate period in only 23% and 12% of the households, respectively. There is certain negligence of the population in the municipality of São Mateus about the correct period to carry out the cleaning of the water tank since 63% know the correct cleaning period. The results are not ideal, which can cause serious damage to the quality of stored water.

It is important to mention that another factor investigated was which products and materials are most suitable for cleaning the water tanks. A total of 62.86% (n=44) correctly indicated water, bleach, and fiber brush, recommended by the manufacturer as more suitable for this process (Figure 3). The remainder answered not knowing or indicated products unsuitable for water tank maintenance.

MATERIALS AND CLEANING PRODUCTS

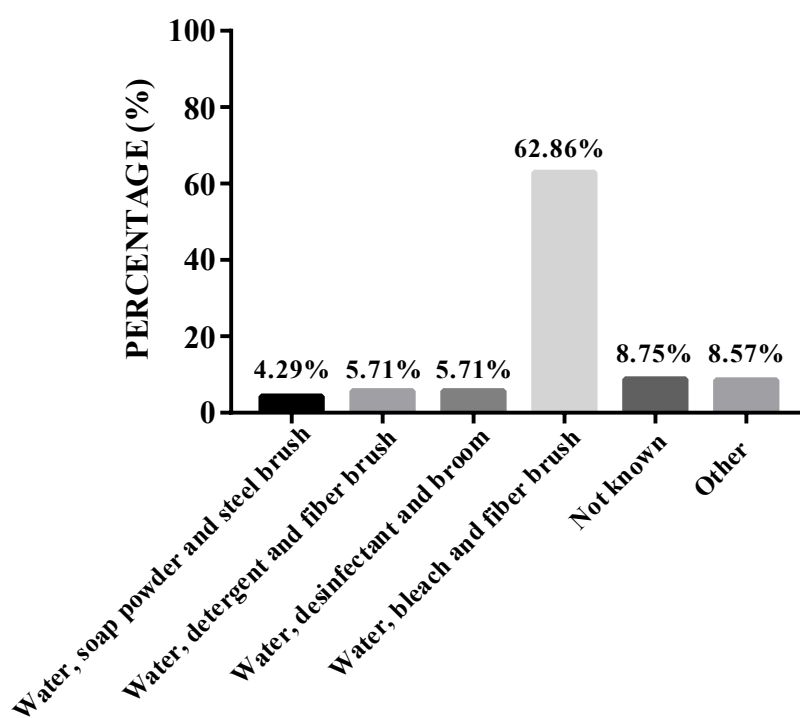


Figure 3. Materials and products used to clean household reservoirs.

In addition to performing cleaning at the appropriate period, using appropriate products and materials is essential for the quality of the stored water. The use of detergents, disinfectants, soap, and steel brushes can cause corrosion of the water tank, allowing impurities and residue

fixation, with consequent growth of microorganisms, besides causing various health problems such as allergies, eczema, and asthma, as reported by Corrêa (2005) and in the National Guideline for Sampling of Water Quality Surveillance for Human Consumption (BRASIL, 2016a).

CONCLUSIONS

The results indicate that, although the most of interviewees are aware of the need to clean the reservoirs, we still have a problem with the frequency with which this cleaning is carried out. Improper maintenance can lead to the accumulation of impurities in the water tanks and, consequently, the contamination of water that arrives from the public supply network. Therefore, educational actions and public policies for access to water and adequate sewage are necessary to avoid the spread of waterborne diseases.

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