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Microbiological Analysis and pH Determination of Drinking Water Samples from Public Schools in the Municipality of Recife/PE

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Water is considered a finite natural resource and one of the essential elements of life. It is used in various work activities such as agriculture, industry, livestock, public supply, energy generation, among others [15]. According to SPERLING (2006) [38], only 2.493% of the water on the planet is suitable for the consumption of humans and animals and 0.0007% of the water accessible for consumption is present in the atmosphere, rivers and lakes. It is estimated that more than one billion people worldwide do not have access to treated water, as its supply is not made on an equal basis due to population growth, economic activities and uneven distribution contrasted with different populations. between rural and urban areas [3, 21,33,].

Problems related to water shortages in the metropolitan regions of Brazilian states are increasingly present in everyday life, and can be attributed to factors involving administrative processes, such as the high cost of drinking water treatment, pollution of water tables, increased demand for water. consumption and climatic factors. In this sense, the use of water for poor quality consumption is an alternative for regions experiencing shortages and has a direct impact on the health of individuals, especially workers and students, as about 80% of the infectious and parasitic diseases that affect developing countries are due to poor quality water, directly impacting the individual's health [10,17,18,28,36,37,].

The water potability standards in Brazil are described in Ordinance GM / MS No. 2,914, of December 12, 2011, which portrays the main physical-chemical and microbiological quality control processes aimed at ensuring water safety and quality. for human consumption [5-8,42].

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In relation to water-borne infectious-parasitic diseases, their main route of transmission is via the oro-fecal route, that is, ingestion of water contaminated by excreta in drinks or food. According to PEIL et al (2015) [29], the main diseases resulting from contaminated water are typhoid fever, cholera, leptospirosis, giardiasis, enterobacteriosis, among others. In 2015, this type of disease was responsible for 2.35% of hospital admissions in Brazil, generating expenses for the Unified Health System (SUS) [28].

Among the diseases that affect individuals in the school phase, childhood diarrhea stands out for being responsible for hospitalizations and if left untreated, it can evolve to death. Childhood diarrhea is a serious public health problem in developing countries, such as Brazil, and is related to the lack of basic sanitation, ingestion of contaminated water and the precariousness of health services [35,40]. Vidal et al (2016) [43] comment that 88% of diarrhea cases are attributed to the consumption of contaminated water and children under five years of age are the most affected. The city of Recife, capital of the state of Pernambuco, has a large number of individuals in school, about 248,408 students are enrolled in the public school system. As a result, it is important to monitor and monitor the water used for consumption in schools. This work proposes to carry out microbiological analysis and pH determination of water for consumption in public schools located in the city of Recife/PE supplied by Pernambuco Sanitation Company (COMPESA).

METHODOLOGY

Description and location of the study

This is a qualitative-quantitative, descriptive and cross-sectional study, where collections and analyzes of water samples for human consumption were carried out in eight public elementary and high schools located in the city of Recife/PE and which were supplied by Pernambuco Sanitation Company (COMPESA). Regarding the geography of the municipality of Recife/PE, it is estimated that its territorial area is approximately 218 km², being formed by an alluvial plain, containing islands, peninsulas and mangroves. This municipality has an average of 1,645,727 inhabitants who are divided into 94 neighborhoods. In the case of inhabitants enrolled in public schools in primary and secondary education, there are approximately 248,408 students (97.1%), with an average age between 6 and 14 years, respectively. To compose the sample of this research, schools located in the ten most populous neighborhoods in the municipality of Recife were chosen, but only eight schools accepted to participate in the research. These schools are located in the neighborhoods of Afogados, Água Fria, Cordeiro, Ibura, Iputinga, Imbiribeira, Nova Descoberta e Várzea. [16].

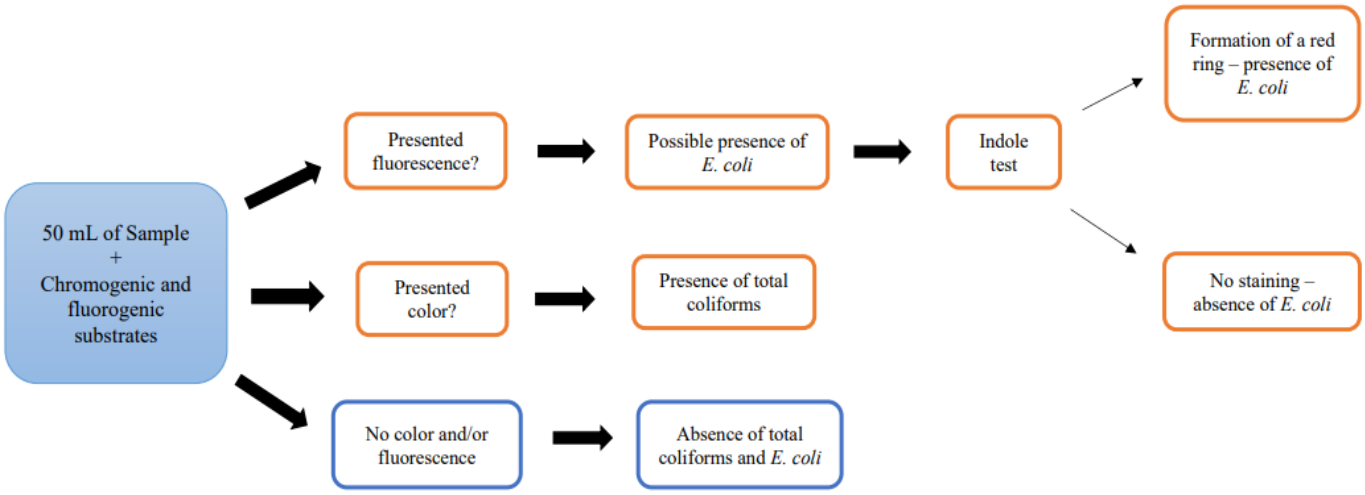
Period of collection and sampling

The collection of water samples from the eight schools was carried out in October and November 2018. For the collection, two points were chosen, one in the reservoirs (water tanks) and another in the kitchen taps, totaling 16 samples. Each sample was placed in sterile 50 ml glass bottles containing 1.0 ml of 10% sodium thiosulfate solution, a solution that aims to neutralize residual chlorine. Before collection, the taps were disinfected with 70% alcohol. The samples were transported in an isothermal container with ice and sent to the Antibiotics Department of the Federal University of Pernambuco (DANTI / UFPE) where the determination of the hydrogen potential (pH) and microbiological analyzes were carried out [24].

Microbiological analysis

The microbiological analyzes of the waters of the eight schools were carried out by the qualitative method, using chromogenic and fluorogenic substrates (Merck Readycult Coliforms kit) to determine the presence or absence of total coliforms and *Escherichia coli*. The substrates were placed in test tubes containing 100 mL of the sample, homogenized and incubated for 24 hours at 37 ° C. Samples that did not show a color change after the incubation period were

considered negative for total coliforms. However, samples that showed blue-green color were considered positive for total coliforms. The samples that showed bluish fluorescence under ultraviolet light suggested the presence of *E. coli*. To confirm this bacterium in the samples, the indole test was performed, in which 2 mL of the water sample were removed and 4 drops of the Kovacs reagent were added. The formation of a red ring confirmed the presence of E. coli [24]. The diagram below (Scheme 1) represents the procedures used in the microbiological analysis of the samples.



Scheme 1 – Procedures used in microbiological analysis. **Source:** Authors

Determination of pH

The determination of pH is a quality parameter included in the physical-chemical analysis of water for human consumption and measures the acidity (concentration of hydrogen ions [H +]) or alkalinity of the water [24]. Although this parameter is not related to health risks, the determination of pH helps to prevent corrosion of the reservoirs and clogging of the pipes [15]. The determination of the average water pH value of the schools was carried out using the pH meter of the Tecnal model TEC-2, duly calibrated. The test was performed in triplicate, where the mean and standard deviation of the values were obtained. According to the legislation in force, the recommended pH range for the water potability standard must be between 6.0 and 9.5 [5-8,14].

Inclusion and exclusion criteria

Public schools, which consume water provided by Compesa and whose managers sign the Consent Form, were included in the survey. Public schools that did not consume water supplied by Compesa, private schools and day care centers were excluded.

Ethical Considerations

As this is not a research involving human beings, biological materials or any factors of the same nature, this study does not need to be submitted to the Ethics Committee on Research with Human Beings according to CNS Resolution No. 466 of 2012 [8]. From now, the authors declare that the present study has no conflicts of interest.

RESULTS AND DISCUSSION

With the results obtained in the analyzes and expressed in Table 1, we can approximate that of the 8 schools evaluated, 4 (50%) were positive for total coliforms in the kitchen taps. Among these four schools, it was also possible to observe that the school located in the Nova Descoberta neighborhood showed positive results for total coliforms both in the kitchen tap and in the water tank (Table 1). Regarding the presence of *E. coli* (thermotolerant), it is

observed that only the school located in Várzea (12.5%) was positive, however, it should be noted that this same teaching unit was positive for total coliforms in the kitchen tap.

The results obtained in this research show that the water for human consumption used in four schools in the city of Recife is not in proper conditions of use. According to Nicholson et al (2017) [27], total coliforms have a longer survival time than *E. coli*, which may suggest that the reservoirs and pipes of these schools may be contaminated with coliforms for longer. Total coliforms (TC) are not necessarily pathogenic, but their high levels in drinking water can be considered a sign of the presence of pathogenic microorganisms such as *Pseudomonas*, *Aeromonas*, *Xanthomonas*, *Klebsiella*, *Acinetobacter*, *Flavobacterium*, *Moraxella* and *Serratia*, which can cause various diseases for humans, such as diarrhea [19].

Table 1 – Results of microbiological analysis of water for human consumption from water tanks and kitchen taps in 8 public schools in the city of Recife-PE

LOCALITY	TOTAL COLIFORMS		*E. COLI* (THERMOTOLERANT)		FINAL REPORT
	KITCHEN TAP	WATER TANKS	KITCHEN TAP	WATER TANKS	
AFOGADOS	-	-	-	-	POTABLE WATER
ÁGUA FRIA	-	-	-	-	POTABLE WATER
CORDEIRO	+	-	-	-	**NON-DRINKING WATER**
IBURA	-	-	-	-	POTABLE WATER
IPUTINGA	-	-	-	-	POTABLE WATER
IMBIRIBEIRA	+	-	-	-	**NON-DRINKING WATER**
NOVA DESCOBERTA	+	+	-	-	**NON-DRINKING WATER**
VÁRZEA	+	-	+	-	**NON-DRINKING WATER**

Legend: (-) – absence of total coliforms and/or *E. coli* (thermotolerant); (+) – presence of total coliforms and/or *E. coli* (thermotolerant). **Source:** Authors

Nicholson et al (2017) [27] also report that the presence of *E. coli* in water samples can be considered as an indicator of recent fecal contamination, as, in most cases, this type of bacteria can be present in waters of places where sanitation water is not of good quality, that is, the water that should be suitable for human consumption may be contaminated with the sewage network.

In this study, it is possible to notice a greater contamination by total coliforms in the kitchen taps and not in the water reservoirs, given that this may be correlated with some unhygienic practices of those who work in this establishment. Knowing the focus of contamination is extremely important, as it will facilitate better targeting for some interventions such as cleaning the plumbing and the environments, as well as water chlorination. It is known that public schools are challenging environments and often work with limited resources, however, it is recommended to make all members of the public-school network aware of hygienic practices to guarantee access to drinking water [20,27].

The lack of knowledge about waterborne diseases can cause some types of inflammatory diseases, such as diverticulitis caused by parasites, enterobacteriosis, diarrhea, among

others. In the literature it is reported that a large part of the population who work or study in schools can present these diseases, being considered a serious public health problem. A study carried out in N'djiliKilambu in the Democratic Republic of the Congo points out that between the years 2013 to 2017, 61% of the entire population suffered from waterborne diseases, among these patients, 11% had chronic diarrhea; 7% had gastroenteritis; 5% suffered from typhoid fever; 5% had dysentery caused by amoebiasis; 4% developed filariasis; less than 1% had cholera, among other infections and inflammations caused by contaminated water [19].

When observing the data of the present study, in relation to the pH levels, it can be seen in Table 2 that all the public educational institutions analyzed, had pH values between 6.93 to 7.46. The data obtained inform that, in the case of the hydrogen potential of these waters, all samples are within the parameters which informs Ordinance 2.914/11, where the recommended pH range should be between 6.0 to 9.5.

Table 2 – pH values of the analyzed samples

LOCALITY	pH		FINAL REPORT
	KITCHEN TAP	WATER TANKS	
AFOGADOS	7,02 ± 0,01	6,89 ± 0,06	APPROVED
ÁGUA FRIA	7,24 ± 0,21	7,23 ± 0,03	APPROVED
CORDEIRO	7,17 ± 0,23	7,22 ± 0,03	APPROVED
IBURA	7,02 ± 0,01	7,21 ± 0,02	APPROVED
IPUTINGA	7,14 ± 0,02	7,14 ± 0,03	APPROVED
IMBIRIBEIRA	7,47 ± 0,12	7,26 ± 0,04	APPROVED
NOVA DESCOBERTA	7,26 ± 0,05	7,15 ± 0,03	APPROVED
VÁRZEA	7,50 ± 0,05	7,30 ± 0,03	APPROVED

Source: Authors

Although the pH values of water for human consumption do not directly influence drinking patterns, pH values are influenced by minerals, gases and pollutants dissolved in water. Some authors comment that there may be a direct correlation between the pH and components present in the water consumed with the balance of the pH of the plasma, which can trigger complementary mechanisms that will keep the blood pH within the limits compatible with the vital processes [1]. In addition, the pH of water for consumption that is too acidic or too alkaline can cause deterioration in the structure of reservoirs and pipes and, consequently, may favor the growth of pathogenic microorganisms and water contamination by components present in these structures, such as aluminum, contributing to the transmission of infectious diseases associated with water sources [12,26,28].

FINAL CONSIDERATIONS

The results obtained in this study showed that water for human consumption in four public schools belonging to the neighborhoods of Cordeiro, Imbiribeira, Nova Descoberta and Várzea in the city of Recife-PE are not in accordance with the drinking standards recommended by Ordinance No. 2,914/11, for having the presence of total coliforms and *E. coli* in qualitative colorimetric tests. The presence of these microorganisms in drinking water can contribute to the transmission of infectious

diseases in the students of these institutions, which can affect their academic performance. Adequacy and monitoring of water quality control standards in these schools is necessary.

In this sense, public policies, actions and campaigns aimed at Health Education are necessary in order to reduce the risk of transmission of infectious and parasitic diseases that are linked to the water character, because when ingested or used, contaminated water for consumption can contribute to individuals with greater vulnerability to develop inflammatory diseases, such as diverticulitis. However, multidisciplinary attention to personal hygiene, cleaning of reservoirs and kitchens and training of employees in these schools can contribute positively to the water quality of these institutions.

The performance of surveillance and inspection agencies from different spheres of public administration are also of great importance in the evaluation, monitoring and treatment of water for consumption by the population and institutions, such as schools. In addition, the population's awareness through multidisciplinary practices regarding the management and use of drinking water are ideal for the prevention of infectious and parasitic diseases.

As perspectives, we suggest carrying out quantitative tests and identification of microorganisms present in school water that failed this preliminary test. As well as carrying out more physical-chemical tests, such as hardness, quantification of the content of aluminum, chloride and iron present in the water for consumption by all institutions. It is also recommended that testing and constant monitoring of drinking water be carried out in all schools, in addition to the hygiene of taps and water tanks.

REFERENCES

[1]. ALMEIDA, C. A. N; FILHO, D. R. Potencial hidrogeniônico da água e sua influência no organismo humano: um artigo de revisão. International Journal of Nutrology, v. 11, n. S 01, p. S16-S23, 2018.

[2]. AMARAL, L. A. et al. Água de consumo humano como fator de risco à saúde em propriedades rurais. Revista Saúde Pública, v. 37, n.4, p. 510-514, 2003.

[3]. AUGUSTO, L. G. S. et al. O contexto global e nacional frente aos desafios do acesso adequado à água para consumo humano. Ciência & Saúde Coletiva, v. 17, n. 6, p. 1511-1522, 2012.

[4]. BRANDÃO, A. R. B. Modelos estatísticos para a caracterização e previsão de parâmetros indicadores da qualidade da água. Dissertação (Mestrado em Engenharia Civil: Ciclo de Estudos Integrados Conducentes ao Grau). 124 p. Minho. Universidade do Minho. 2015.

[5]. BRASIL. Fundação Nacional de Saúde. Manual prático de análise de água. 4 ed. Brasília: Funasa, 2013. p. 150.

[6]. BRASIL. Fundação Nacional de Saúde. Manual prático de análise de água. 2ª ed. Revista Brasília: Fundação Nacional de Saúde, 2006, 146p.

[7]. BRASIL. Ministério da Saúde. Portaria 2.914, de 12 de dezembro de 2011. Dispõe sobre os procedimentos de controle e de vigilância da qualidade da água para consumo humano e seu padrão de potabilidade. Diário Oficial da União, 2011.

[8]. BRASIL. Resolução nº 466, de 12 de dezembro de 2012. Dispõe sobre diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. Diário Oficial [da] República Federativa do Brasil, Brasília, DF, 13 jun. 2013. Disponível em: <Disponível em: http://bit.ly/1mTMIS3 > Acesso em: 10 jul 2020.

[9]. CARVALHEIRO, J. R. Água e saúde: bens públicos da humanidade. Estudos avançados v. 29, n. 84, 2015.

[10]. CASTILHO, C. P.; OLIVEIRA, L. H. Avaliação durante operação de sistemas de água não potável em edifícios residenciais. Ambiente Construído, v. 18, n. 1, p. 409-421, 2018.

[11]. CASTRO, I. L. R. de. Elaboração de Ferramentas para Avaliar a Eficiência de Tratamento de uma ETA – ETA de S. Jorge (Tese de Mestrado). Vila Real. Universidade de Trás Dos Montes e Alto Douro. (2015).

[12]. CLETO, C. I. T. P. O alumínio na água de consumo humano. Dissertação (Mestrado em Química Industria: 2º Ciclo de Estudos). 87p. Covilhã Universidade da beira interior. 2008.

[13]. DELPLA, I. et al. Impactos da mudança climática na qualidade da água da superfície em relação à produção da água de beber. Revista de saúde

meio ambiente e sustentabilidade, v. 6, n. 2, p. 85-107, 2011.

[14]. EPA. Parameter soft water quality Interpretation and Standards. Ireland: Environmental Protection Agency. 2001.

[15]. FERREIRA, F. S. et al. À margem do rio e da sociedade: a qualidade da água em uma comunidade quilombola no estado de Mato Grosso. Saúde e Sociedade, v. 26, n. 3, p. 822-828, 2017.

[16]. GASPAR, L. Bairros do Recife. Pesquisa Escolar Online. Fundação Joaquim Nabuco, Recife. Disponível em: http://basilio.fundaj.gov.br/pesquisaescolar/index.php Acesso em: 01 ago 2020.

[17]. GALVÃO, J.; BERMANN, C. Crise hídrica e energia: conflitos no uso múltiplo das águas. Estudos avançados, v. 29, n. 84, 2015.

[18]. GUEDES, G. R. et al. Risco de adoecimento por exposição às águas do Rio Doce: um estudo sobre a percepção da população de Tumiritinga, Minas Gerais, Brasil. Cadernos de Saúde Pública, v. 31, n. 6, p. 1257-1268, 2015.

[19]. KAPEMBO, M. L. et al. Prevalence of water-related diseases and ground water (drinking-water) contamination in the suburban municipality of Mont Ngafula, Kinshasa (Democratic Republic of the Congo). Journal of Environmental Science and Health, Part A, v. 54, n. 9, p. 840-850, 2019.

[20]. MAHMUD, Z. H. et al. Occurrence of *Escherichia coli* and faecal coliforms in drinking water at source and household point-of-use in Rohingya camps, Bangladesh. Gut Pathogens. v 11, n 52, p. 1-11, 2019.

[21]. MARINOSKI, A. K.; GHISI, E. Avaliação de viabilidade ambiental e econômica de sistemas de aproveitamento de água pluvial em habitação de baixo padrão: estudo de caso em Florianópolis, SC. Ambiente Construído, v. 18, n. 1, p. 423-443, 2018.

[22]. MEDEIROS, A. C.; LIMA, M. O.; GUIMARÃES, R. M. Avaliação da qualidade da água de consumo por comunidades ribeirinhas em áreas de exposição a poluentes urbanos e industriais nos municípios de Abaetetuba e Barcarena no estado do Pará, Brasil. Ciência & Saúde Coletiva, v. 21, n. 3, p. 695-708, 2016.

[23]. MELLO, C. N.; RESENDE, J. C. P. Análise microbiológica da água dos bebedouros da Pontifícia Universidade Católica de Minas Gerais campus Betim. Revista Sinapse Múltipla, v. 4, n. 1, p. 16-28, 2015.

[24]. MENDES, B. S.; SANTOS, J. F. O. Chlorine use in water disinfection, trihalomethane formation, and potential risks to public health. Cadernos de Saúde Pública, v. 10, n. 1, p. 99–110, 2004.

[25]. MIRANDA, J. P. R.; GARCÍA-UBAQUE, C. A.; GARCÍA-UBAQUE, J. C. Enfermedades transmitidas por el água y saneamiento básico em Colômbia. Revista de Salud Pública. v. 18, n. 5, p. 738-745, 2016.

[26]. MORAES, M. S. et al. Avaliação microbiológica de fontes de água de escolas públicas e privadas da cidade de Santa Rita (PB). Revista Engenharia Sanitária, v. 23, n. 3, p. 431-435, 2018.

[27]. NICHOLSON, K. N. et al. *E. coli* and coliform bacteria as indicators for drinking water quality and handling of drinking water in the Sagarmatha National Park, Nepal. Environmental management sustainable development, v. 6, p 411-428, 2017.

[28]. PAIVA, R. F. P. S.; SOUZA, M. F. P. Associação entre condições socioeconômicas, sanitárias e de atenção básica e a morbidade hospitalar por doenças de veiculação hídrica no Brasil. Cadernos de Saúde Pública, v. 34, n. 1, 2018.

[29]. PEIL, G. H. S. et al. Avaliação da qualidade bacteriológica da água utilizada para abastecimento público no município de Pelotas - RS – Brasil. Ciência e Natura, v. 37, n. 1, p. 79 – 84, 2015.

[30]. PORTO, M. A. L. et al. Coliformes em água de abastecimento de lojas fast-food da Região Metropolitana de Recife (PE, Brasil). Ciência & Saúde Coletiva, v. 16, n. 5, p. 2653-2658, 2011.

[31]. RÍOS-TOBÓN, S., AGUDELO-CADAVID, R. M., GUTIÉRREZ-BUILES, L. A. Patógenos e indicadores microbiológicos de calidad del água para consumo humano. Revista Facultad Nacional de Salud Pública; v. 35, n. 2, p. 236-247, 2017.

[32]. ROCHA, E. S. et al. Análise microbiológica da água de cozinhas e/ou cantinas das Instituições de ensino do município de Teixeira de Freitas (BA). Revista Baiana de Saúde Pública Miolo, v. 34, n. 3, p. 694-705, 2010.

[33]. ROHDEN, F. et al. Monitoramento microbiológico de águas subterrâneas em cidades do Extremo Oeste de Santa Catarina. Ciência & Saúde Coletiva, v. 14, n. 6, p. 2199-2203, 2009.

[34]. SCURACCHIO, P. A.; FILHO, A. F. Qualidade Da Água Utilizada Para Consumo Em Escolas E Creches No Município De São Carlos – Sp. Revista Alimentos e Nutrição - UNESP Campus de Araraquara, v. 22, n. 4, p. 641-647, 2011.

[35]. SOUSA, N. C. F. de et al. Análise físico-química e bacteriológica de coliformes totais e termotolerantes da água de consumo distribuída aos alunos de 3 creches privadas do setor leste da cidade de porto velho – Rondônia. Saber Científico, Porto Velho, v. 5, n. 1, p. 24–32, 2016.

[36]. SOUZA, C. M. N. Gestão da água e saneamento básico: reflexões sobre a participação social. Saúde Sociedade, v. 26, n. 4, p. 1058-1070, 2017.

[37]. SOUZA, C. A. B. de et al. Qualidade da água consumida em unidades de educação infantil no município de Mossoró-RN. Revista Ciência Plural, v. 1, n. 2, p. 57-67, 2015.

[38]. SPERLING, M. V. Afinal, Quanta Água Temos no Planeta? Revista Brasileira de Recursos Hídricos, v. 11 n. 4, p. 189-199, 2006.

[39]. TARQUI-MAMANI, C. et al. Calidad bacteriológica del água para consumo entres regiones del Perú. Revista de salud pública, v. 18, n. 6, 2016.

[40]. TEIXEIRA, J. C.; HELLER, L. Fatores ambientais associados à diarreia infantil em áreas de assentamento subnormal em Juiz de Fora, Minas Gerais. Revista Brasileira de Saúde Materno Infantil, v.5, n. 4, p. 449-455, 2005.

[41]. TRINDADE, G. A.; SÁ-OLIVEIRA, J. C.; SILVA, E. S. Avaliação da qualidade da água em três Escolas Públicas da Cidade de Macapá, Amapá. Biota Amazônia, v. 5, n. 1, p. 116-122, 2015.

[42]. VENTURINI, C. Q. et al. Vigilância e monitoramento de fluoretos em águas de abastecimento público: uma revisão sistemática. Revista Ambiente e Água, v. 11 n. 4, 2016.

[43]. VIDAL, A. P. et al. Evaluación del tratamiento de água para consumo humano mediante filtros Lifestraw® y Olla Cerámica. Revista de Salud Pública, v. 18, n. 2, p. 275-289, 2016.

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