Quality of refill drinking water in Greater Jakarta in 2010

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Abstrak

Latar belakang: *Air yang layak minum kian langka di perkotaan. Air yang dikonsumsi masyarakat harus memenuhi persyaratan kualitas air minum yang aman bagi kesehatan. Banyak masyarakat yang memanfaatkan air minum isi ulang untuk memenuhi kebutuhan air minum sehari-hari. Pada kajian ini disajikan penilaian kualitas air minum isi ulang berdasarkan pemeriksaan parameter fisik dan kimia pada tahun 2010.*

Metode: *Desain penelitian adalah cross-sectional. Sampel didapatkan dari masyarakat yang mengajukan permintaan pemeriksaan kualitas air minum di Laboratorium Farmasi di Pusat Biomedis dan Teknologi Dasar Kesehatan, Kementerian Kesehatan selama Januari-Desember 2010. Masing-masing sampel dilakukan pemeriksaan kualitas fisik dan kandungan zat kimia berdasarkan PERMENKES Nomor 492/MENKES/PER/IV/2010. Pemeriksaan secara fisik meliputi TDS (jumlah zat padat terlarut), kekeruhan, suhu, dan warna. Pemeriksaan secara kimia meliputi nitrit, besi, kesadahan, klorida, mangan, pH, sulfat, dan senyawa organik* $KMnO_4$. *Sampel dikatakan tidak memenuhi syarat jika salah satu atau lebih parameter memiliki nilai diluar batas maksimum.*

Hasil: *Di antara 121 sampel terdapat 23,1% (28) sampel tidak memenuhi syarat PERMENKES. Seluruh sampel yang tidak memenuhi syarat karena nilai pH di luar batas yang diperbolehkan dan 1 sampel karena kandungan mangan di atas 0,4 mg/l.*

Kesimpulan: *Air minum isi ulang di Jabotabek sebagian besar memenuhi syarat atau layak untuk diminum. Adapun sampel yang tidak memenuhi syarat karena kadar mangan yang tinggi dan pH yang terlalu rendah dan terlalu tinggi.* ***(Health Science Indones 2011;2:77-80)***

Kata kunci: *kualitas air, fisik dan kimia, Jabotabek*

Abstract

Background: Drinking water is increasingly scarce in urban areas. Water consumed by the public must meet the requirements of safe drinking water quality for health. Many people use refill drinking water to meet the needs of drinking water daily. This study presents the quality of refill drinking water assessment based on the examination of physical and chemical parameters in 2010.

Methods: The study design is cross-sectional. Samples were obtained from the public who requested the examination of drinking water quality in the Laboratory of Pharmaceutical Technology at the Center for Basic Biomedical and Health, Ministry of Health from January to December 2010. Each sample was assessed for physical and chemical content based on Miniter of Health decree Number 492/MENKES/PER/IV/2010. Physical examination includes TDS (the amount of dissolved solids), turbidity, temperature, and color. Chemical examination includes nitrites, iron, hardness, chloride, manganese, pH, sulfate, and organic compound KMnO4. The sample is said not to meet the standard quality if one or more parameters have a value beyond the maximum limit.

Results: Among 121 samples, about 23.1% (28) samples did not meet the requirement set by the Miniter of Health decree. All samples which did not qualify because the pH value was beyond the permitted limits and one sample because the content of manganese was above 0.4 mg / l.

Conclusions: Most refill drinking water in Greater Jakarta meets the quality requirement. Samples that did not meet the requirement because of high levels of manganese. too low or too high pH. ***(Health Science Indones 2011;2:77-80)***

Key words: quality of water, physical and chemical properties, Jabodetabek

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Water is a very basic requirement for human beings. Current problem is that drinking water is increasingly difficult to obtain, especially in urban areas. Water supply in Indonesia such as piped water has not been evenly distributed in each region so that the community generally use ground water (wells), river water, rain water, water sources (springs) and others. Ground water has become unsafe due to contaminated drinking water material from septic tanks and surface water.[1] The sources of water becoming polluted by untreated industrial waste due to the use of excess capacity compared to renewal ability. Currently besides industrial pollution caused by waste, pollution caused by domestic waste has demonstrated a serious effect. In Jakarta for example, as a result of inadequate urban waste water treatment facilities, river bodies have been polluted by domestic sewage, even the bodies of the river designated as a raw material of drinking water has been contaminated as well.[2] If contaminated water is consumed by the public, it would cause health problems.

Before consumption, water must be processed to eliminate or reduce levels of contaminated material to a level that is safe. Safe drinking water is when it meets the requirements for physical, microbiological, chemical and radioactive materials contained in the mandatory parameters and additional parameters. Mandatory parameters that must be followed by all providers of drinking water include:[3] (1) physical parameters including TDS (Total Dissolved Solids), turbidity, and color; chemical parameter: problem of toxic chemical compounds, heavy metals, discoloration and flavor; biological parameter determined by the presence of pathogenic bacteria contained in the water.

Many people use refill drinking water to fullfil their daily needs. With so many business of refill drinking water, more attention is required to guard the quality of drinking water produced. By implementing that way, the consumer is protected as well as the business of refill drinking water itself. In previous studies describing quality of drinking water in Greater Jakarta during the years 2007-2009, it was found that 27.5% of samples did not meet the requirements for drinking water.[4] Following the review, this paper examines the quality assessment of physical and chemical parameters specific to refill drinking water in Greater Jakarta in 2010.

METHODS

This study uses water quality data checks are performed at the Laboratory of Pharmacy, Center for Basic Biomedical and Health Technology in 2010. The study design is cross-sectional and type of experimental is laboratory research. Study results provide information about physical and chemical quality of refill water so that water, thus determined eligible or ineligible quality of drinking water.[4]

Samples were water proposed by communities of the Greater Jakarta area to be examined in the laboratory to obtain water quality certification. The number of samples obtained during January-December 2010 was as many as 426 samples. Samples analyzed were only refill drinking water and those with complete inspection data. Hence, the total number of samples analyzed was 148 samples.

Assessment of drinking water quality was carried out by examining the physical and chemical quality of each sample. Physical quality of the examined includes Total Dissolved Solids (TDS), turbidity, and color. Chemical quality was checked by measuring the level of nitrite, iron, hardness, chloride, manganese, pH, sulfate, and KMnO4 organic compounds in water samples.[3]

Determination whether the drinking water met the quality requirement was by comparing each parameter against the maximum limit in accordance with the Minister of Health decree Number 492/MENKES/PER/IV/2010. The requirements according to the Health Minister are as follows: TDS $\leq$ 500 NTU; turbidity $\leq$ 5 TCU; color of $\leq$ 15 mg / l; nitrite $\leq$ 3 mg / l; iron $\leq$ 0.3 mg / l; hardness $\leq$ 500 mg / l; chloride $\leq$ 250 mg / l; manganese $\leq$ 0.4 mg / l; pH 6.5 to 8.5; sulfate $\leq$ 250 mg / l; KMnO4 $\leq$ 10 mg / l. If any parameter exceeds a specified threshold then it is concluded that water samples are not qualified or not good to drink. Analysis was conducted by Stata 9 statistical program.

RESULTS

Of the 426 samples of water quality inspections in 2010 at the Laboratory of Pharmacy, 121 samples were used in this study.

Table 1 shows that the impropriety refill drinking water in Greater Jakarta was caused by two variables; i.e. that manganese is too high and the pH is too low and too high. Test results vary widely in terms of physical and chemical parameters, seen from the CV> 20%, except for pH.

Table 1. Quality of refill drinking water based on physical and chemical parameters

Parameter	Unit	Mean	SD	Min.	Max.	CV (%)	Standard	Meet the quality requirement			
								Yes		No	
								n	%	n	%
Physical											
TDS	mg/l	87.32	50.62	0	290.0	57.97	500	121	100	0	0
Turbidity	NTU	0.23	0.28	0	1.7	121.74	5	121	100	0	0
Color	TCU	4.56	2.19	0	12.0	48.03	15	121	100	0	0
Chemical											
Nitrite	mg/l	0.01	0.01	0	0.09	100.00	3	121	100	0	0
Iron	mg/l	0.02	0.02	0	0.1	100.00	0.3	121	100	0	0
Hardness	mg/l	37.73	28.06	0.5	168.0	74.37	500	121	100	0	0
Chloride	mg/l	11.74	4.80	3.0	34.0	40.89	250	121	100	0	0
Manganese	mg/l	0.01	0.05	0	0.5	500.00	0.4	120	99.2	1	0.8
pH	mg/l	6.85	0.61	5.2	8.5	8.91	6.5-8.5	93	76.9	28	23.1
Sulfate	mg/l	3.77	4.69	0	21.2	124.40	250	121	100	0	0
$KMnO_4$	mg/l	0.84	0.78	0	5.0	91.86	10	121	100	0	0

DISCUSSION

Limitations of this paper is that the data obtained was recorded data from the results of the proposed community water quality in 2010, and information regarding the origin of the sample was not recorded in full. However, samples were obtained during the months of January to December 2010 and the examination was performed by standard procedures. Another limitation was that the data of biological parameters was not obtained because it was done in other laboratories. Therefore, water quality can only be seen from the physical and chemical parameters.

Refill drinking water is generally made from water that has been treated with a variety of processes such as by ozonation, UV radiation, adsorption by activated carbon filtration or membran (reversed osmosis).[5] Water treatment done in depots of refill drinking water in Greater Jakarta seemed to have been able to produce excellent physical quality of water. It can be seen in Table 1 where all samples meet the requirements of physical parameters.

Drinking water should not only be safe but the physical quality is also a priority.[6] Poor physical water quality can indicate what chemicals contained in water. Water turbidity for instance, can be caused by the presence of organic materials and inorganic materials contained in the water like mud and materials derived from waste. In terms of aesthetics, turbidity in the water is associated with the possibility of contamination by sewage.[1] There are two parameters of the chemical that cause one sample that does not qualify, i.e. the content of manganese and pH. According to Permenkes 492/ MENKES/PER/IV/2010, the pH value should not be less than 6.5 or more than 8.5. Water with low pH (below 6.5) is acidic and not recommended for consumption because it may indirectly be bad for health. In addition, low pH water is corrosive because it can dissolve metals that are not required by the body. Water with high pH (above 8.5) is alkaline. Water that is alkaline usually contains excess ions that are not needed by the body. The pH value of drinking water depends on the pH of raw water and the processing process. Screening/ filtration stage was instrumental in normalizing the pH value, because at this stage both anions and cations that lead to high / low pH can be filtered.[7]

High content in water can cause water to become turbid, brown, and smelling the metal manganese.8 This study found one sample that had excessive levels

of manganese, but did not find a sample that has turbidity and color that exceeds the maximum limit. This may occur because in the sample that does not qualify the parameter of manganese levels was 0.5 mg / l whereas the requirement is 0.4 mg / l. Excess levels of manganese was of very little difference, so it can be said that excess manganese that occurs in this sample did not affect the physical quality of water. Manganese in water can be removed by chlorination followed by filtration.[6]

In conclusion, refill drinking water quality in Greater Jakarta according to chemical and physical parameters was generally of good quality. Water quality parameters that did not meet drinking water quality standard in refill drinking water were manganese and pH. It is necessary for drinking water depots to normalize the pH and reduce the levels of manganese in their drinking water products.

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