Quality Assessment Of Distributed Purified Drinking Water in Taunggoke Township

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ABSTRACT

Drinking water quality directly affects human health.The present study has been carried out in order to evaluate the potable drinking water quality in Taunggoke Township in 2015-2016 academic year. Physico-chemical parameters like color, odor, taste, pH, COD, DO, TDS, EC, salinity, iron content, chloride content and bacteria content were determined. Four different samples such as Shwe Pyi Rakhine, Wai Tharli Oo, Light and purified drinking water taken from Taunggoke Degree College Campus were collected in order to evaluate and to compare their qualities. An analysis of various parameters and their comparison with the standard values of (WHO) has been done. According to the results, the distributed purified drinking water samples are considered to be safe to drink.

Key words: Drinking water quality, Physico-chemical parameters, theWorld Health Organization (WHO), distributed purified drinking water

INTRODUCTION

Monitoring of drinking water quality is an important component of water management, while data analysis is necessary for the identification and characterization of water quality problems. Assessment is the process by which water quality data is transformed into information. The quality of drinking water is a crucial factor for human health (Farrukh *et al*., 2004). Clean water is generally defined as water that is free from microbial, chemical and physical contamination. This includes contaminants that present a health risk (e.g. disease-causing bacteria, toxic metals) and those that have no health risk but can make the water unpleasant to drink (e.g. poor taste resulting from high iron levels). Microbial contamination refers to the presence of disease-causing (or pathogenic) microbes, which are generally introduced to water sources by contact with faecal material. Common examples include Salmonella Typhi and Vibrio cholerae, which respectively cause typhoid fever and cholera, as well as pathogenic strains of Escherichia coli (E. coli). The World Health Organization (WHO) considers microbial pathogens the highest priority in water treatment given their ability to cause infectious disease. Coliform bacteria are organisms that are present in the environment and in the feces of all warm-blooded animals and humans (WHO, 2007). Coliform bacteria will not likely cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system. Most pathogens that can contaminate water supplies come from the feces of humans or animals. Testing drinking water for all possible pathogens is complex, time-consuming, and expensive. It is relatively easy and inexpensive to test for coliform bacteria. If coliform bacteria are found in a water sample,

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water system operators work to find the source of contamination and restore safe drinking water (Memon *et al*., 2011).

There are three different groups of coliform bacteria; each has a different level of risk. Total coliform, fecal coliform, and E. coli are all indicators of drinking water quality. Total coliform bacteria are commonly found in the environment (e.g., soil or vegetation) and are generally harmless. If only total coliform bacteria are detected in drinking water, the source is probably environmental. If environmental contamination can enter the system, there may also be a way for pathogens to enter the system. When total coliform bacteria are confirmed in drinking water, a water system or utility is required to notify its customers within 30 days about the situation (Soomro *et al*., 2011).

The presence of fecal coliform in a drinking water sample often indicates recent fecal contamination, meaning that there is a greater risk that pathogens are present than if only total coliform bacteria is detected. E. coli is a sub-group of the fecal coliform group. Most E. coli ba cteria are harmless and are found in great quantities in the intestines of people and warm-blooded animals. The presence of E. coli in a drinking water sample almost always indicates recent fecal contamination, meaning there is a greater risk that pathogens are present. Confirmation of fecal coliform bacteria or E. coli in a water system indicates recent fecal contamination, which may pose an immediate health risk to anyone consuming the water. Boiling or treating contaminated drinking water with a disinfectant destroys all forms of E. coli (Haydar *et al*., 2009).

Chemical contamination refers to metals, organic compounds and other chemicals that present potential health risks. Water naturally contains many chemicals (sodium and calcium, for example), most of which present no health concerns. A few chemicals, however, do present human health risks, especially for children and when contaminated water is consumed over time. They can stem from both natural sources and human activity like industrial waste disposal and agriculture (Saddozai *et al*., 2009).

Physical contamination refers to conditions relating to the water's physical condition, for example color, odor, temperature and turbidity (cloudiness resulting from the presence of small particles like pieces of soil). Most of these present no direct health risk, but they can influence other factors (e.g. soil particles in turbid water can shelter bacteria) and sometimes make water unpleasant to drink (Ahmad *et al*., 2012).

Environmental pollution is the global concern of today. The growth of industrial area is rapid and very fast thus related anthropogenic activities have also been increased like waste discharge from industries, transportation and domestic activities. The domestic waste generated is directly enters into the different sites of water bodies without any treatment. Also the continuous flow from agricultural waste water contaminates the water source of surrounding area. This entire problem affects the water resources and ultimately human health. Water is one of the three major components of the environment; therefore, there exists a close linkage between the quality of water and the environment which bears an almost importance for eco-system. Natural bodies of water are not absolutely pure as various organic compounds and inorganic elements remain in dissolved form. The physical and chemical quality of water vary according to the basin shape and size, depth, light penetration, precipitation, location, temperature, chemical nature of surrounding soil and dissolved minerals, pH, etc, and the biological components of the habitats depend upon them. If all the physical, chemical and biological parameters are in optimum condition, the balance between these is maintained (Khan *et al*., 2012).

The present work was carried out in order to study the purified drinking water quality of four different samples. The parameters like color, odor and taste were analyzed by visual and drinking. DO, BOD, TDS, EC and pH were analyzed with the help of water test kit. COD was determined by titration method. TDS is a general indicator of overall water quality. It is a measure of inorganic and organic materials dissolved in water. Increased TDS may impart a bad odor or taste to drinking water.

MATERIALS

Drinking water samples for analysis were collected from Taunggoke Degree College Campus. Analytical grade chemicals were used for preparing all reagents and solution. * Iron Reagent # 1(4450).cap and * Iron Reagent # 2 Power (4451) for iron content, Chloride Reagent #2 (4505DR) contained silver nitrate for chloride content were applied by the use of water test kit (LaMatte, Test Kit Instruction Manual Code 5905-02).

METHODS

For the analysis of water quality, the main water quality indicator parameters were detected from the laboratory including physicochemical quality. Physico-chemical parameters like color, odor, taste, pH, COD, DO, TDS, EC, iorn, chloride, salinity and bacteria content were determined. The physicochemical quality included: electrical conductivity (EC), pH, dissolved oxygen (DO) and total dissolved solid (TDS) were determined in the laboratory with the help of water test kit. Then iron, chloride and salinity contents were analyzed. COD values were determined by titration with $KMnO_4$ (new method approved by United Nations Environment Programme Global Environment Monitoring System (GEMS)/Water Programme, in collaboration with the International Atomic Energy Agency , Method code- 08305). All tests were performed at least three times to calculate the average values.

Questioners to the consumers were used to obtain information about physical qualities like color, taste and odor. Taste in water can be traced to a number of factors including decaying organic matter, living organisms, iron, mixing industrial waste etc.

RESULTS AND DISCUSSION

Physicochemical and Bacteriological Properties of Purified Drinking Water Samples

The results of the study are presented in Table 1. Shwe Pyi Rakhine and Wai Tharli Oo have little less pH values than that of the acceptable level of WHO standard and are slightly acidic. Light and drinking water from Campus are slightly alkaline, and are generally considered safe. Electrical conductivity (EC) is measured by passing an electric current through the water and measured how readily the current it flows. EC of water also estimates the total amount of solids dissolved in water- TDS, which stands for total dissolved solids. The excellent TDS values are less than 300ppm; good, between 300 and 600ppm; fair, between 600 and 900ppm; poor, between 900 and 1200ppm; and unacceptable, greater than 1200ppm. Although all samples have more or less EC and TDS, they are excellent within the acceptable values.

Permission limits for various parameters for drinking water can be found in WHO standard. In environmental chemistry, the chemical oxygen demand (COD) is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solution. Therefore, COD for drinking water should be nil. Dissolved oxygen (DO) levels will also fluctuate with temperature, salinity and pressure changes. As such DO levels can range from

less than 1 ppm to more than 20 ppm depending on how all of these factors. According to the Table 1, all samples have some distinct COD and DO values.

The salinity was not detected in Wai Tharli Oo and Shwe Pyi Rakhine whereas higher salinity was found in Light and drinking water from Campus. The chloride contents in all samples are very less than the WHO standard. In all samples, iron is not completely detected.

Coliform bacteria will not likely cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system. Boiling or treating contaminated drinking water with a disinfectant destroys all forms of E. coli.

Table 1. Physicochemical and Bacteriological Properties of Drinking Water Samples

Parameter	Light	Wai Tharli Oo	Shwe Pyi Rakhine	Drinking water from Campus	WHO
pH	7.4	6.3	6.2	7.8	6.5-8.5
EC(μS/cm)	198	26	26	94	400
TDS(ppm)	78	26	19	47	500
DO(ppm)	7.6	7.5	7.6	7.5	5
COD(ppm)	2.4	9.6	7.2	19.2	10
Chloride(ppm)	24	14	12	16	250.0
Salinity(ppm)	100	0	0	100	<100
Iron(ppm)	ND	ND	ND	ND	0.3
E.coli	0	0	0	0	0

CONCLUSION

Since there is no Escherichia coli (E.coli) and iron in all samples, the distributed purified drinking water samples in Taunggoke Township are considered to be safe to drink.

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REFERENCES

Ahmad, I., Bahadar, K., Hussain, U., Rehman, A., Iqbal, H., Wahab, A., Haq, A. U., Khan, M. A., & Ijaz, F. (2012). Physico-Chemical Analysis of Drinking Water Sources at Sampling Point of Billitang, Kda, Nasrat khel and Chongee of District Kohat, K.P.K., *Pakistan. International Journal of Science Innovations and Discoveries*, **2(6)**, 598-609.

Farrukh, R. H., & Qureshi, N. A. (2004). Assessment of Drinking Water Quality of a Coastal Village of Karachi.

Haydar, S., Arshad, M., & Aziz, J. A. (2009). Evaluation of Drinking Water Quality in Urban Areas of Pakistan: A Case Study of Southern Lahore. *Pakistan Journal of Engineering & Applied Sciences*, **5**, 16-23.

Khan, N., Hussain, S. T., Hussain, J., Jamila, N., Ahmed, S., Riaz, U., Zain, U., & Saboor, A. (2012). Physiochemical Evaluation of the Drinking Water Sources from District Kohat, Khyber Pakhtunkhwa, *Pakistan. International Journal of Water Resources and Environmental Engineering*, **4(10**), 302-313.

Memon, M., Soomro, M. S., Akhtar, M. S., & Memon, K. S. (2011). Drinking Water Quality Assessment in Southern Sindh (Pakistan). Environmental Monitoring and Assessment, **177**, 39-50.

Saddozai, A. A., Khalil, S., & Hameed, T. (2009). Microbial Quality of Food Snakes and Drinking Water in Islamabad Schools and Colleges. *Pakistan, Journal of Agricultural Research*, **22(3-4),** 144-149.

Soomro, Z. A., Khokhar, M. I. A., Hussain, W., & Hussain, M. (2011). Drinking Water Quality Challenges in Pakistan. World Water Day April-2011, 17-28.

WHO (2007). " Guidelines on Technologies for Water Supply Systems in Small Communities" , Centre for Environmental Health Activities, Amman, 1-119.