

Chemical and microbiological quality of drinking water in Bandar Abbas

Roya Mousazadeh

Department of Fishery, Islamic Azad University, Bandar Abbas Branch, Bandar Abbas, Iran

ABSTRACT

Groundwater and dam water are the main water sources to supply water for the towns and villages'. Water from these sources should be very pure and low in soluble material and free from pathogenic microorganisms. The aim of this study is to determine the chemical and microbial quality of drinking water of Esteghlal Dam of Bandar Abbas and its comparison with international standards. This Method is cross - sectional. In 2012, four sets of water samples were collected from the Esteghlal dam of Bandar Abbas for chemical and microbial analyses. In terms of Microbial quality, the MPN index (All possible coli forms in hundred ml of water) was determined and the presence of coli forms through a multi-tube samples test was performed. Chemical samples in 2-liter glass containers were collected, and then parameters of anions, cations, alkalinity, water hardness and nitrogen compounds (nitrate, nitrite and ammonia) values were determined. The results of the chemical experiments of water samples showed that pH Parameter of Esteghlal Dam is desirable and study on water hardness showed that 160 mg/l was calcium carbonate, which was According to World Health Organization standards. Studies on anion and cation of the water of the dam indicate that their concentrations were optimal, but the amount of fluorine 1.85mg was more than the maximum of standard concentration. And the results of microbial tests on water samples indicated that the water of dam contains microbial contamination, and the results of the samples tested was positive for existence of coli forms. Therefore, considering the standard of the World Health Organization and Institute of Standards and Industrial Research of Iran, drinking water of Bandar Abbas without purging is non-potable.

Key words: Dams Water, Chemical Quality, Microbial Quality.

INTRODUCTION

The importance of water in everyday life of creatures is clear to all. Existence of safe and adequate water is one of the most essential human requirements [1,3]. Underground water reservoir and dams water are the main sources of water supply in cities and for industrial and agricultural purposes. Therefore, it should be exploited reasonably and prevent unnecessary use of it and also prevent the loss of its quality as possible. Studies show that the amount of available water resources in the world are limited and a low proportion of water dams as freshwater resource shows the quantitative and qualitative necessity of this precious source. Dams water as a vital and trusted source in many countries widely used in rural and urban areas [8]. Groundwater and dams water are the important reason of hydrological cycle therefore all human activities such as over-exploitation of them may have harmful effects on water resources and ecology of that area [3].

Microbial quality of water is one of the main points that are directly relevant to personal and public health. More than anything, Human health depends on clean and sanitary water. Essentially, human life depends on safe water and efforts to provide safe water is a huge and holy struggle. Many health problems in developing countries, is mainly due to the lack of clean water [2]. Studies show that in India after upgrading the water distribution network, the death rate from infectious diseases in the community, such as cholera, and 74.1% diarrheal 42.7% typhoid 63.6%

and deaths due to dysentery 23.1% decreased. More research shows that in the third world countries 80% of all diseases and 23% of deaths are due to poor quality or contaminated water, respectively [7]. Selection of high-quality water supplies and its costly treatment for urban water supply, resource conservation and protection of water distribution networks is a fundamental work in urban water authorities [2]. Access to clean water is sometimes necessary to change. For example cholera outbreak in 1987 in Kermanshah city water caused the change of water supply of refinery. Waters should be used by people which are lack of any kind of chemical and microbial pathogens or toxins or undesirable characteristics, such as color, turbidity, taste and smell [9]. According to a study of the sources of drinking water of Bandar Abbas city, drinking water of city is largely provided from Esteghlal dam of Minab and deep wells supplied. This study aimed to determine the chemical and microbial quality of drinking water in Bandar Abbas in comparison with international standards.

MATERIALS AND METHODS

Methods in This study were a cross - sectional method. With reference to water and wastewater (sewage) organization and refinery of the city of Bandar Abbas, the information needed obtained. Studies show that 0.70 percent of drinking water of Bandar Abbas city was provided from Esteghlal Dam located in Minab Township. In drought they use the water of wells of Shamil plain and Minab plain. In summer (2012) 4 series of samples of the Esteghlal dam were collected and sent to the laboratory. Because of the chemical quality of the samples, they were collected in 2-liter plastic container and then according to the standard method book which was published in 1998 hardness, alkalinity, conductivity, anions and cations test were done on the samples. For analysis of the samples, laboratory kits and spectrophotometer set model Dr -2000 from HACH Company of America and also Tetramer method (volume measurement) were used. To determine the microbial quality of water, coli form index was used generally, all rod-shaped gram-negative bacteria that are able to ferment lactose and create gas and grow in the liquid environment and between temperatures 32 to 37 ° C for 48 hours they considered as a coli form group [4]. For sampling, 250 ml glasses with door were wrapped in aluminum-paper and then were sterile. Samples were kept in 4°C and they were carried to laboratory less than 6 hours and were tested immediately and recognition and numeration of the coli forms were done in three stages [6].

1) Possible Test: calculating and comparing were done with the help of coli form MPN tables which were used by Iranian standard.

2) Confirmatory test

3) Supplementary Tests

Counting and existence of coli forms in water fulfilled by lactose broth culture. This method through a few different techniques with multiple tube fermentation tube was tested as MPN. In this series, 9-tube method was used [2, 5].

RESULTS AND DISCUSSION

Chemical test results are represented in Table 1 which they showed that the pH parameter in Esteghlal dam in Minab was in an acceptable rate. Studies on hardness of water shows that it was 160 mg/l of calcium carbonate which was according to standards of global hygiene association, the most allowed amount of that is 500 mg/l of calcium carbonate that is in a desired rate. Studies on anion and cation concentrations in the dam water shows that their density was considered desirable. But the amount of fluoride in the dam water 1.85 mg/l, and the maximum concentration was determined by standard 0.35 mg more per liter (Table1). The diagrams depicted the drinking water of Bandar Abbas is located in good drinking water groups. Results of microbial experiments from the point of multi-pipe test and existence of coli form in water samples showed that dam water is microbial polluted and the result of experimenting the samples is positive from the aspect of general existence of coli forms.

Several studies have presented in the case of water pollution, including the study of Pourmoghadas that it has been found in general, the water of Lenjan in Esfahan is hard water [12]. In the evaluation of physical and chemical indexes of Ardabil's water, Sadeghi and Ruhollahi, stated that the sulfate in 9% of the samples, total hardness in 4% and phosphate in 71% of samples exceeded and Fluorine in 57% of samples less than the minimum allowed [9]. According to the study of Rajai et al, [8] in examination of the quality of Birjand and Cain drinking water plain, the hardness of water 25 percent, sulfate 33%, sodium 7%, Chloride 25 percent, electrical conductivity 51 percent higher than national standard and fluoride in 92% of the analyzed samples was less than the minimum recommended fluoride [7].

A recent study showed that the chemical quality of the dam water in the concentration of various chemical parameters measured were compared with the criteria of international standards, is desirable. However, some parameters, such as fluorine is rather than 1/85mg/l that this may cause fluoride poisoning. Although there were concerns about the possibility of toxicity of the Florida water, but there is no evidence of such intoxication. Under

laboratory and experimental conditions, high levels of fluoride cause smearing of the bone, remains of high calcium and abnormal formation of connective tissue. These effects increased in condition of shortage of vitamin c, protein and calcium. Gathering spots on the upper jaw incisors is usually greater. This toxicity is found among workers in factories that deal with fluoride salts, such as aluminum smelting factories. Symptoms associated with anorexia and dense mass of bone (sclerosis) in the spine hips and thighs bones appear to be associated with neurological disorders [2]. The results for the presence of coli forms were positive, therefore considering the standard of the World Health Organization as well as Institute of Standards and Industrial Research of Iran, drinking water Bandar Abbas without filtration is non- potable. According to the above results and discussion, we recommend repeating tests of chemical and microbial parameters of the dam water should be done. Due to the importance of fluoride in public health, further research should be done to reduce the amount of fluoride in Bandar Abbas water.

Table 1: Results of chemical quality of Onions and Cations of Independence Dam of Minab Township

Parameter	Amount	Unite	Maximum
Total Hardness	160	Mg/mlCaco ₃	500
Alkalinity	107.5	mEq/l	-
pH	7.97	-	6.5/9
Fluoride	1.85	Mg/l	0.5-1.5
Chloride	120.7	Mg/l	400
Sulfite	57.6	Mg/l	250
Calcium	61	Mg/l	300
Magnesium	1.8	Mg/l	30
Iron	0.07	Mg/l	0.3
Manganese	0.06	Mg/l	0.4
Aluminum	0.014	Mg/l	0.1
Sodium	74.06	Mg/l	200
Potassium	6.37	Mg/l	-
Nitrate	0.02	Mg/l	50
Nitrite	0.005	Mg/l	3
Ammonium	0	Mg/l	1.5

Acknowledgement

The authors wish to acknowledge the Bandar abass branch Islamic Azad University for financial support and cooperation in this project.

REFERENCES

- [1] Varnam H, Alan. Malcolm J. Evans. "Environmental Microbiology". Translated by Mashreghi, Mansour. Dowlatabadi, Somaye. Ferdowsi University of Mashhad publication, first edition, **2008**. P, 161 (In Persian).
- [2] Levinson, Van. "Medical Microbiology Javtez 2008". Translation: Arjmand, M. Sotodeh Nia, Abdulhossein. Ghorbani, Mohammad Hossein. Arjmand Publication, first edition, **2010**, P, 199 (In Persian).
- [3] Badlyans Quli Kennedy Gagyk. "Applied Microbiology of Water and Sewage." Ayizh publication, first edition, **2002**, P, 155 (In Persian).
- [4] Mosazadeh R. "Practical microbiology." Azad University of Bandar Abbas Publication, second edition, **2010**, pp. 145-148 (In Persian).
- [5] Heshmatipour Z and Roshan M. "" Practical Microbiology ". Tehran publication, Mir book, first edition, **2007**, pp. 124-125 (In Persian).
- [6] Oodi, Gh. "The quality of drinking water." Mohaghegh Publications, first edition, **1993**, pp. 33-23(In Persian).
- [7] Rajai G. *Journal of the health system*. **2011**. 6: 57-64 (In Persain).
- [8] Pourmoghadas H. Study of groundwater quality in Lenjan, Isfahan regional. Pub Heal and Sani Res Inst of The *Med Sci Uni*. **2002**; 1(4): 32-39. (In Persian).
- [9] Sadeghi H, Rohollahi S.[Measure physical and chemical parameters of drinking water in Ardabil. *Ardabil med sci*. **2007**; 1: 56-52. (In Persian).