Evaluation of drinking water chemical pollutions in some regions of Tehran city with spectrometry methods

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Abstract: Water is a key source in food industrial and it's used in wide range with variety target. Therefore it is necessary to has knowledge of amount of parameters and quality changing. Aim of this study is assessment amount of some chemicals parameters like Fe, Zn, Cu, No_2, Po_4, Sio_2, Cl and COD of Tehran drinking water in some region and what relation between them in deferent's geography Zone is. Samples selected from tree zone of Tehran in tree time steps. For measuring amount of pollution concentration used atomic adsorption spectrophotometer method for Zn, Fe and Cu metal, visible Spectroscopy for nitrite, phosphate, silica and chloride anions and Ultraviolet Spectroscopy for chemical oxygen demand. Results studied and compared with Iranian standard institute and World Health Organization (WHO) standard. The results showed that average concentration of Fe, Zn, Cu, No_2, Po_4, Sio_2, Cl and COD respectively was 0.07, 0.02, 0.211, 41.39, 0.01, 0.05, 0.03 and 0.22 mg/liter that only concentration amount of COD had significant deference because of being more than maximum permission level according to Iranian standard institute and World Health Organization suggestion. This pollution might be leakage in network distribution of tap water or inadequate refinement in drinking water purification plant in that region.

Key words: water quality, Tehran city, chemical oxygen demand, spectrophotometer and Atomic adsorption.

Preface:

Water is essential to the life of any living creature. Water accounts for about 70% of the human body and about 80% of the Earth's surface.The demand forwater is increasing, and its quality should be maintained.Drinking water should be free of contaminants that cause taste, color, toxicity and harm to human health (Khadsan and Kadou, 2003)

Water in the advanced countries is responsible for 80% of the sick and deaths and kills more than 5 million people a year (Al-Sheikh, 2011).

Water is one of the key sources of food industry that is widely used for various purposes, for example in raw material (such as reactor feed), as a separating agent (such as extraction, absorption, cleansing, peeling), or as a rinse and warming medium (such as cooling and heating). (Clemes et al., 2008)

In the following, we will examine the elements in this study to determine their amount in Tehran's drinking water in some parts of the water distribution network, and their issues and problems are discussed briefly.

Zinc: Zinc metal is found in the human body at high concentrations in the prostate, bone, muscle, and liver. The half life on the remainder in the human body is one year. It is a vital ingredient for all living organisms and some of its adverse effects include poisoning, fever, numbness, nausea, vomiting and diarrhea. (Karbasi et al., 2009)

Copper: High levels of copper cause diseases such as anemia, changes in bones, increased cholesterol, and the appearance of hair loss in the body, and sometimes leads to death. (Melkotyan and Khashi, 2014)

Iron plays a major role in human nutrition, with a daily intake range of 10 to 50 milligrams. (Chanaieh et al., 2014)

Iron is found in soil and water, Iron penetrates with rainfall in the soil and has the ability to dissolve and transfer from soil to groundwater springs. Groundwater has Iron compounds that can transfer to underground and other sources of drinking water. Iron is also used to cover the pipes used for water conveyance, and over time, these coatings are becoming increasingly degraded and a factor in increasing Iron into the drinking water inside the tube. (Mandor, 2012)

Nitrite: The presence of nitrate or nitrite in water often indicates water contamination with feces or sewage. Nitrite in the body can react with amines of type I, II and III and produce nitrosamine, which is carcinogenic and mutagenic and has a defective odor. (Forouzan et al., 2008)

Phosphate: The importance of phosphate in water is environmentally similar to that of native matter and is used as a nutrient for the growth of algae. The presence of phosphate and nitrogen in high levels indicates the interference of human and agricultural sewage pollution. (Seyrani Eyvazi et al., 2009)

Chloride: Contamination of this ion can be related to the source of water and urban and industrial wastewater. The amount of ion intake by humans is higher than consuming it in foods than drinking water. Increasing chloride in water can increase the corrosion of water distribution facilities, which leads to more metal ions in drinking water. A concentration of more than 250 mg / L causes a change in the taste of water. (WHO, 2011)

The amount of chemical oxygen demand (COD):

Most contaminated waters contain organic materials that can be used to measure them by total organic carbon (TOC) and for comparative purposes it can be obtained from biochemical oxygen demand (BOD) or chemical oxygen demand. Chemical oxygen demand usually contains all or most of the cases, and the amount obtained for oxymorachemical oxidation is more than the other two methods. (Debora, 1997)

Moslehi and Nahid(2004) examined the heavy metals in drinking water in different regions of Tehran in seven locations in Tehran, where the samples were examined for Cr, Zn, Ni, Cu, Pb elements and compared with the standard permissible of the Protection Organization The environment was concluded that, unfortunately, the level of lead is several times higher than the limit.

Rezvani et al (2013) By studying the arsenic, cadmium, lead and oxides in drinking water sources in the southeastern villages of Rafsanjan plain and the Rafsanjan fault zone, using the atomic absorption system, it was concluded that the amount of copper is less than the recommended limit World health and standard was 1053 Iranian water and the amount of arsenic in 31.71% of samples and lead in 25% and cadmium in 58.1% of samples was higher than standard.

Chanaieh et al., (2014) conducted a survey on drinking water from India's Bungi River for human drinking. For this purpose, the amount of metals such as Fe, Mn, Ni, Pb, V, Mo, Zn, As, Cd, Co, Cu and Cr It was measured and the physical properties of water, such as total hardness and electrical conductivity, were performed. By comparing the results with the WHO standard reference, it was concluded that the only cobalt value in the samples measured was higher than the permitted range according to the WHO and BIS standards.

Alhaji et al., (2013) conducted a survey on drinking water in Nigeria's Meadgouri city in terms of physical, chemical and bacterial strains of E. coli and concluded that pH and total hardness and electrical conductivity and total alkalinity and manganese, Iron, nitrite, Copper and fluoride in accordance with the permitted levels in accordance with FAO or UN Food and Agriculture Organization.

Bahalmi and Nagrenik, (2012) A study on various contaminations of drinking water in the Indian city of Hing Nam, such as organic and inorganic pollution, heavy metals, plant pesticides and physical and chemical contaminants (chloride, sulfate, magnesium and calcium) in the regions Different ones that had already been done. And concluded that by comparing World Health Organization standards, water quality is appropriate for drinking purposes.

It seems that Tehran's drinking water is not suitable for drinking and in terms of concentrations of nitrite, chloride, phosphate and silicon anions, and the concentration of some heavy metals including iron, zinc, copper in drinking water in different regions of Tehran, is not in the standard Ranges.

Materials and ways:

In this study, the amount of chemical pollution of drinking water in some areas of Tehran is investigated and analyzed by determining the relationship between the chemical elements of Iron, zinc, copper, nitrite, phosphate, chloride and the amount of oxygen required for the chemical and the amount Their pollutants in drinking water in Tehran have been studied in terms of their health characteristics and their relationship in different geographical areas by random selection of sampling sites.The results are compared with internal and external standards.The chemical parameters of iron, zinc, copper by atomic absorption method, nitrite parameters, phosphate, silica, chloride were measured by ultrasonic spectroscopy using visible spectroscopy and oxygen oxidation.

Drinking water samples from drinking water drinking water from three urban areas of Tehran were taken from a geographical viewpoint that was randomly selected. Polythene and clean polyethylene were used for sampling.Samples were collected by sampling and coding timestamp. Three samples from each site were collected at intervals of two weeks and three samples were collected each time. Methods of examinations did according to standards in tables 1.

Mean classification of the test was performed based on the significance level of 0/05 in accordance with the one-way hypothesis test using the MiniTab13 software. Drawing diagrams using Excel 2007 software.

Data analysis:

The results are shown in Tables 2 and 4, respectively, and the concentration of Zn is from 81.6 to 48.17 micrograms per liter, copper is less than 0.20 mg / L, Iron less than 0.07, nitrite Less than 0.01, chloride 14 to 60, phosphate less than 0.05, silica less than 0.03, chemical oxygen demand 0 to 2 mg / l.

The average concentrations of Iron, copper, zinc, chloride, nitrite, phosphate, silica, and chemical oxygen demand were 0.07, 0.22, 211.0, 39.40, 0.01, 0.05, 0 and 0.22 mg / l respectively

In accordance with the values obtained for P-Value shown in Table 6, this value is zero for iron, copper, zinc, chloride, nitrite, phosphate, silica whichare less than 0.05. Therefore in these elements, there is no significant difference with the standard Values but P-Value for COD is more than 0.05 therefore it is a significant difference with the standard level that is more than standard value.

Summarizes the status of the results of the total concentrations obtained intable 6and the overall result of comparing these values with the national standard of Iran and the World Health Organization standard.

Conclusions and suggestions:

Conclusions

Based on the results obtained in this study,all chemical properties of water measured in Sharak Gharb (Region 1), Navab (Zone 2) and Nazi Abad (District 3) in Tehran of Iran, were accepted withnational standard of Iran and the WHO standard except for the chemical oxygen demand parameter.

The higher oxygen concentration in the Sharak gharb area than the amount listed in the drinking water standard was probably due to lack of proper water purification or leakage in the distribution network.

Suggestions

Due to the health hazards and the high level of oxygen demand, more water control is required.Continuous monitoring of the network and carrying out qualitative tests such as a study or other methods can be a good solution.

Also, increasing the ability and quality management of water production, compliance with world standards, proper maintenance of the distribution network, monitoring and timely control should always be taken into account by drinking water users.

Tables:

Table 1 - Standards used in measurements

Row	Standard reference	Test title
1	ASTM D1691-02	Measurement of Zinc by atomic absorption method with graphite furnace
2	ASTM D1688-02	Measurement of Cu by atomic absorption method with graphite furnace
3	ASTM D 1068-03	Measurement of Fe by atomic absorption method with graphite furnace
4	SM4500-NO2B	Measurement of nitrite in water with visible spectrophotometer
5	ASTM D1091 - 00 SM 4500 PO4	Measurement of phosphate in water with visible spectrophotometer
6	ASTM D1252 – 06	Measurement of COD by atomic absorption(Ultraviolet spectrophotometer)
7	ASTM D859 - 00 & SM 4500 SiO2	Measurement of silica in water with visible spectrophotometer
8	SM 4500 Cl	Measurement of chloride in water with visible spectrophotometer
9	ASTM D3370 ASTM D1192	Sample collection
10	ASTM D 1971-02	Sample digestion in an experimental test for atomic absorption

Table 2- Results of measured measurements

	Naziabad			Navab			Shahrak Garb		
elements	**Third Av Time**	**Sec Av Time**	**First Av Time**	**Third Av Time**	**Sec Av Time**	**First Av Time**	**Third Av Time**	**Sec Av Time**	**First Av Time**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Zn	0.0816	0.0712	0.08314	0.4213	0.3875	0.4817	125.8	127.3	125.25
Fe	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Cu	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
No2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Po4	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sio2	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Chloride	56.4	57.5	60	53.1	52.5	49	14	15	15
COD	0	0	0	0	0	0	0	0	2

Table 3- summarizes the statistical data obtained in West Shahrak area

Shahrak Garb	**COD**	**Chloride**	**Po4**	**No2**	**CU**	**Fe**	**Zn**
Scale	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Average	0.667	14.7	0.05	0.01	0.02	0.07	125.5
Middle	0	15	0.05	0.01	0.02	0.07	125.8
Variance	1.33	0.33	0	0	0	0	1.126
Confidence interval	0.257	0.057	Equality of data	Equality of data	Equality of data	Equality of data	0.367

Table 4- Summary of statistical data obtained in the Navab region

Navab	**COD**	**Chloride**	**Po4**	**No2**	**CU**	**Fe**	**Zn**
Scale	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Average	0	51.5	0.05	0.01	0.02	0.07	430.16
Middle	0	52.5	0.05	0.01	0.02	0.07	421.3
Variance	-	4.9	0	0	0	0	2277.37
	-	0.174	Equality of data	Equality of data	Equality of data	Equality of data	0.51

Table 5- Summary of statistical data obtained in Nazi Abad area

Naziabad	**COD**	**Cl**	**Po4**	**No2**	**CU**	**Fe**	**Zn**
Scale	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Average	0	57.97	0.05	0.01	0.02	0.07	78.64
Middle		57.5	0.05	0.01	0.02	0.07	81.6
Variance		3.4	0	0	0	0	42.18
Confidence interval		0.436	Equality of data	Equality of data	Equality of data	Equality of data	0.153

Table 6- Summary of the status of the results of the average concentrations obtained

Elements	Shahrak Garb	Navab	Naziabad	Total Av	P Value	Recommended limit according to WHO	Recommended limit according to Iran standard	The result of the regions
Fe	0.07	0.07	0.07	0.07	0.00	0.3	0.3	Lower than standard
Cu	0.02	0.02	0.02	0.02	0.00	2	2	Lower than standard
Zn	0.13	0.43	0.08	0.21	0.00	5	3	Lower than standard
No2	0.01	0.01	0.01	0.01	0.00	3	3	Lower than standard
Po4	0.05	0.05	0.05	0.05	0.00	No recommendations	0.02	Lower than standard
Cl	14.67	51.53	57.9	41.39	0.00	250	400	Lower than standard
Silica	0.05	0.05	0.05	0.05	0.00	No recommendations	20	Lower than standard
COD	0.67	0	0	0.22	0.7	No recommendations	0	More than standard

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