Study of Some Chemical Characteristics and Total Count of E coli form Bacteria in Drinking Water Plants in Ilaje Jboor Region –Hilla

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Abstract

This study deals with measuring of some chemical parameters including :pH, EC, SO_4^{-2}, Cl^- ,Ca^{+2}, total hardness, and alkalinity of drinking water in Ilaje Jboor in Hilla governet . The total count of coli form bacteria was also studied, to evaluate the quality of drinking water.

During the period from April 2008 to February 2009 samples ware collected monthly. The analysis explained that drinking water depending on characters of raw water (river) and the efficiency of drinking water plants different but in most samples the chemical parameters were within compared EPA,WHO and Iraqi guidelines of drinking water.The results indicated that the water which was processed in Ilaje Jboor can not be used for drinking because of contamination of *E. coli* form bacteria.

الخلاصة

تضمنت هذه الدراسة قياس عدد من الخواص الكيميائية متمثلة بالاس الهيدروجيني والتوصيلية الكهربائية و تراكيز الكالسيوم، المغنيسيوم، الكلوريدات، الكبريتات، العسرة الكلية، والقاعدية في ماء الشرب في منطقة علاج جبور في مدينة الحلة. كما شملت دراسة العدد الكلي لبكتريا القولون لغرض تحديد نوعية ماء الشرب.

خلال المدة بين نيسان 2008 وحتى نهاية شباط 2009 تم جمع العينات شهرياً. اوضحت نتائج تحليل العينات بأن خواص مياه الشرب تعتمد على خواص الماء الخام (النهر) وان كفاءة محطات مياه الشرب متباينة من ناحية الصفات الكيميائية والفيزيائية قيد الدراسة في معظم العينات اذ كانت ضمن محددات EPA و WHO والمحددات العراقية لمياه الشرب.غير ان تلوث المياه ببكتريا القولون يجعله غير ملائم للشرب.

Introduction

Water is essential to life and satisfactory supply must be available to all. Improving access to safe drinking water can result in tangibles to health(HNMRC,2004).

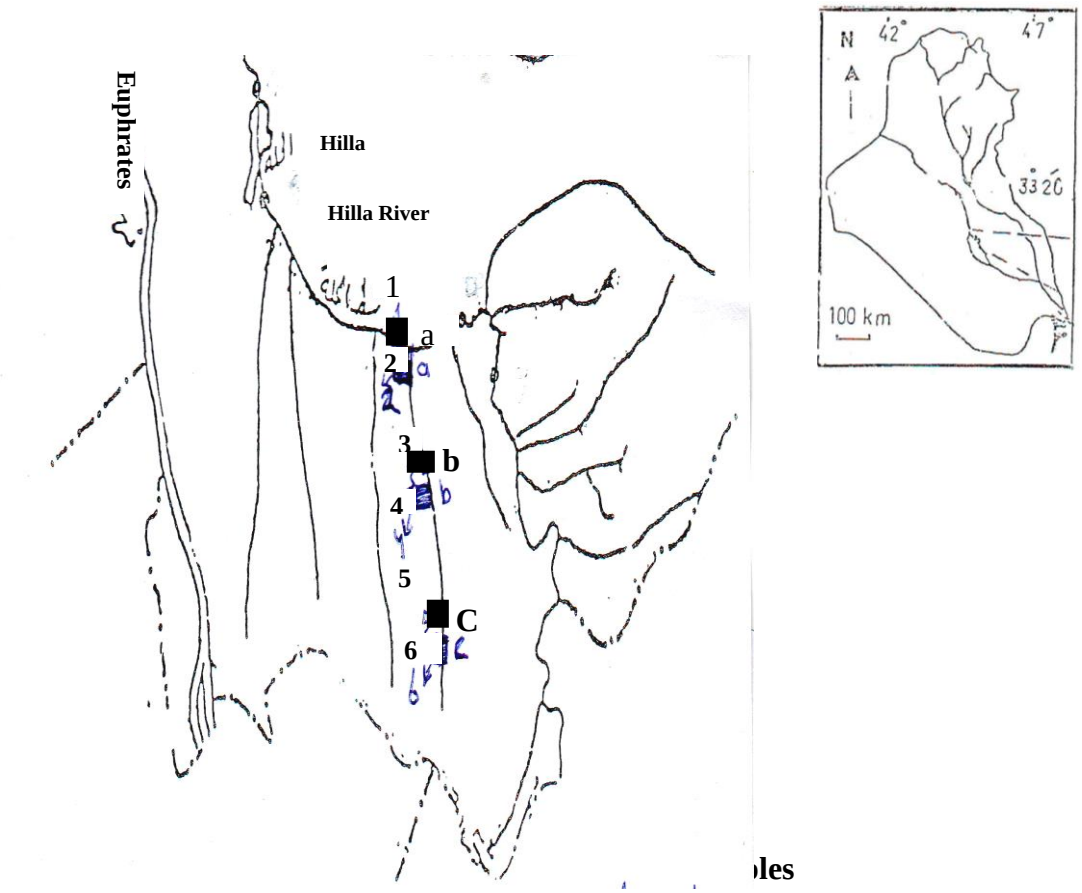
Health concerns associated with chemical constituents of drinking water differ from those associated with microbial contamination ,some chemical found normal in water but when increase than normal levels lead to health problem(WHO,2004),for example drinking water must have amount of sulfate less than 250 ppm but when increase more this concentration caused thickness of intestine and laxative(WHO,1996). While increase nitrate more 10 ppm caused methemoglobinemia(office of environment health,2005). The microbiological quality of drinking water is the most important aspect of drinking water because of its association with waterborne diseases as well as typhoid fever and choleraOnteria,2006),and the hourly toll from biological contamination of drinking water is 400 deaths of children(Askork,1998).

To protect the health, water must be treated before used for drinking and first document drinking water treatment can be found in Egyptian hieroglyphic describing procedures to purify water by boiling ,filtration and chemical treatment (Michalski,2005).The drinking water system must have and continuously maintain robust multiple barriers appropriate to the level of potential contamination facing the water supply (Nitm,2004).

Many studies explained that drinking water systems in Hilla city are not efficient to reduced bacterial contamination due to bad precipitation ,and bad sedimentation processes (Al Azawi,1998&Al Azawi,2004).

Experimental part

The samples were collected from 6 positions from three drinking water plants as well as show in figure (1).The positions 1,3 and5 were collected from river which used as raw water to supply these plants ,wile 2,4and 6 positions were from houses nearest to plants . From April 2008 to February 2009 samples were collected monthly from Ilaje Jboor Region which lies on the way from Hilla to Diwaniyah about 10 km east Hilla city center. Population in this region were using river water for all uses but in 2007 a small drinking water plants build up, and this study come to evaluate water that produced by these plants.



les

Scale 1/600000
a■ Drinking water plant
b■ Drinking water plant
c■ Drinking water plant

The standard methods for drinking water analysis(WHO,200) were used to determine concentrations of calcium and total hardness, while alkalinity ,chloride ,sulfate, phosphate were determined according to A.P.H.A. methods(APHA,1975).Parsons method used to evaluate nitrate concentrations(Parsons *et al,1984)*,and depended a classic method to analysis total count of bacteria(Al Moffraji *et al*,1991).

Results and Discussion

Table 1 show the chemical parameters which studied in water of samples in sex positions.

Table 1 chemical characteristics of water in sample

Parameters	Date position	Ap\ 2008	Ma\ 2008	Ju\ 2008	jul\ 2008	Oct\ 2008	Sp\ 2008	Oc\ 2008	No\ 2008	De\ 2008	Ja\ 2009	Fa/ 2009	Range
pH	1	6.7	7.2	7.2	7.8	6.9	7.6	6.8	6.9	7	7.5	7.3	6.7-7.8
	2	6.8	7.1	7.1	7.3	6.9	7.7	6.8	6.8	6.9	7.5	7.3	6.8-7.7
	3	7.4	7	7.3	7.3	6.8	7.6	6.8	6.95	7.1	7.45	7.45	6.8-7.45
	4	7.5	7.3	7.4	7.1	6.6	7.6	6.8	6.75	7.1	7.3	7.5	6.6-7.5
	5	7.5	7.3	7.3	7.3	7.2	7.2	6.9	7.1	7.1	7.45	7.5	6.9-7.5
	6	7.4	7.2	7.3	7.3	7	7.2	6.8	6.8	6.9	7.5	7.5	6.8-7.5
EC (micro mohs)	1	1034	1048	808	923	970	842	839	967	770	845	810	770-1048
	2	1045	980	793	948	992	875	822	955	763	841	783	763-1045
	3	1017	953	785	941	1000	878	830	958	771	813	778	771-1017
	4	1041	965	813	991	988	866	821	974	773	825	778	773-1041
	5	1051	882	797	921	984	875	794	973	773	818	804	773-1051
	6	1050	955	759	982	980	897	832	1028	791	808	778	759-1050
Alkalinity (ppm)	1	200	100	180	40	40	60	5	90	135	180	120	50-200
	2	200	120	140	40	50	60	30	80	125	120	100	30-200
	3	300	100	100	30	50	80	60	95	100	165	140	30-300
	4	150	120	120	50	50	70	60	95	115	165	140	50-165
	5	150	100	140	50	40	90	100	115	120	155	15	40-155
	6	150	120	120	40	50	80	50	111	160	125	130	40-150
Cl^- (ppm)	1	581	664	611	508	334	218	262	78	189	209	199	78-664
	2	508	436	348	654	320	276	233	63	231	219	189	63-654
	3	654	436	494	509	305	349	189	59	184	209	147	59-654
	4	581	291	291	582	334	305	320	49	186	206	284	49-582
	5	127	436	611	473	334	349	305	74	201	209	216	74-473
	6	654	407	785	727	378	262	323	66	171	284	264	66-785
T H (ppm)	1	260	560	200	160	70	100	100	380	370	460	300	70-560
	2	230	580	140	140	130	110	100	370	420	470	460	100-580
	3	290	560	100	120	110	110	110	420	420	355	330	100-560
	4	370	640	180	140	130	140	110	515	515	315	410	110-640
	5	320	480	180	90	100	120	120	450	450	295	380	90-480
	6	320	720	220	50	80	140	160	410	410	340	350	50-720
Ca^{+2} (ppm)	1	60.2	160.3	200.4	100.2	20.01	80.2	40.1	78	162	184	80	20.01-184
	2	60.2	80.1	80.2	60.1	40.1	60.1	60.1	50	154	80	72	100-580
	3	80.1	140.3	80.2	40.1	40.1	70.1	60.1	64	96	66	52	100-560
	4	60.1	120.2	60.1	40.1	30.1	30.1	80.2	44	96	116	190	110-640
	5	60.1	80.2	60.1	80.2	20.04	40.1	100.2	28	90	120	68	90-480
	6	60.1	60.1	40	20.04	20.04	20.1	50.1	28	96	82	70	50-720
So_4^{-2} (ppm)	1	166	329	93	80	72	89	204	139	341	291	402	20.01-184
	2	158	90	223	179	150	211	221	95	147	229	365	50-154
	3	157	267	232	157	168	184	222	193	87	397	392	40.1-140-3
	4	189	139	210	105	113	181	207	164	130	397	285	30.1-120.2
	5	159	159	222	128	170	151	219	150	107	420	374	28-120
	6	168	173	205	90	99	188	225	85	161	909	317	20.04-96

The pH values ranged 7.8-6.6 which are within the normal values as show in table 2 which summarized the guidelines of drinking water (WHO,2006,EPA,1999 and Iraqi Standards,1976) .

Drinking water plants not effecting on pH due to their processing which depending on chlorination and lime addition in some days.

Alkalinity concentration were differencing from month to month ,high values were recorded in March while lower values were in July , August , September, and December. The decrease of alkalinity values due to increase in temperature which made carbonate and bicarbonate break up to carbon dioxide(Taj aldeen,2003). Study classified two types of water according to the total hardness concentration. First was very hard water which were above 180 ppm ((Al Moffraji *et al*,1991) these concentrations can seen in samples of March , April , December, January, and February. Second type of water was hared which seen in other months ranged 50-160 ppm . Increase and decrease of TH values depending on rate of irrigation which effected on dissolving of bicarbonate from soil that at end inter the river (Taj aldeen,2003).

High concentration of total hardness in drinking water (above 500 ppm) have negative effect on health by causing many diseases associated with kidney (Davison,1999).

Calcium as show in table 2 were not different from TH . Ca^{+2} concentration difference from month to another and ranged 20.04-200.8 ppm which are normal values .Plants didn't effect on Ca^{+2} concentration which depending on concentration in river.

This study explained very high levels of chlorides in river and drinking water. Concentrations ware above maximum contaminant level (M C L) of chloride which about 200 ppm(Iraqi Standards,1976) ;except samples of November and December and samples of 1,2 and 3 positions in January that ranged 49-199 ppm as well as explained in table 2 .Cl increased in spring , summer and autumn mater due to evaporation of water and concentration of water by heat in these seasons.

Sulfate were various through period of study in river water . Lower values recorded in hot month contrast with samples that collected in winter mater lead to think that almost sulfate resources are natural which increase in water by raining . Sulfate in drinking water ware differ from plant to another and where differ from sample to sample in same plant .Plants produced water with high concentrations of sulfate in some times (specially in plant 1) because of additions of alum as coagulant agent to reduce turbidity of water; whoever that almost sulfate concentrations were within guideline of drinking water which about 500 ppm as sodium sulfate (WHO,2000).

The electrical conductivity(EC) values were differencing as the values of anions and cations and pH values. EC ranged 763-1051micro mohs, these values more than medium of lower values that recorded in drinking water of Hilla city in another study which was about 540 micro mohs((Al Azawi,1998).

Table 2 some characteristics of drinking water

Parameter	Unit	WHO Guideline (WHO,2006)	US EPA Guideline (EPA,1999)	Iraqi guideline (Iraqi Standards, 1976)
pH	--	6.5-8.5	6.5-8.5	6.5-8.5
TDS	Micromohs	1000	500	--
EC	PPM	1600	755	--
Mg	PPM	--	--	50
Ca	PPM	--	--	200
T H	PPM	500	--	500
Na	PPM	200	--	--
So_4	PPM	400	250	200
Total count of bacteria	Cell/100 ml of sample	0.0	0.0	5

Table 3 explained the total count of coli form bacteria. River water was contaminated with coli form bacteria . Plants were reducing total count of bacteria (but not preventing it) by chlorination.

Table 3 total count of bacteria cell /100 ml

Station	/AP 2008	/MA 2008	/JU 2008	/JL 2008	/OG 2008	/SP 2008	/OC 2008	/NO 2008	/De 2008	Jan / 2009	/Fa 2009	Range
1	221	180	107	42	47	87	54	57	42	19	18	18-221
2	18	26	44	22	31	13	0	27	27	11	27	0-44
3	93	64	177	37	52	17	43	110	38	26	23	17-110
4	14	13	83	76	69	15	26	32	20	19	17	13-83
5	88	100	318	31	43	40	38	98	26	10	12	10-100
6	94	70	104	16	28	24	17	9	25	19	22	9-104

These plants were not have complete precipitating units and not controlled chlorination so water was could not suited for drinking because drinking water should be free from any microbial contamination(Mark &Hummer,2004).

]Statistical analysis

The statistical analysis of results by using correlation factor explain that some parameters are related with other parameters but not all as well as show bellow in table 4.

Table 4 correlation factor among parameters

parameter	pH	EC	Alkalinity	Cl^{-1}	TH	Ca^{+2}	SO_4^{-2}	Bacteria
pH	**1**	**-**	**-**	**-**	**-**	**-**	**0.015**	**-**
EC	**-**	**1**	**-**	**0.025**	**-**	**0.002**	**0.001**	**-**
Alkalinity	**-**	**-**	**1**	**-**	**0.0**	**0.001**	**-**	**-**
Cl^{-1}	**-**	**0.025**	**-**	**1**	**0.009**	**-**	**-**	**0.0**
TH	**-**	**-**	**0.0**	**0.029**	**1**	**0.003**	**-**	**-**
Ca^{+2}	**-**	**0.002**	**0.001**	**-**	**0.003**	**1**	**-**	**-**
SO_4^{-2}	**0.015**	**0.001**	**-**	**-**	**-**	**-**	**1**	**-**
Bacteria	**-**	**-**	**-**	**0.0**	**-**	**-**	**-**	**1**

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