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Determine the Impact of Bacterial Contents on the Quality of Tap Water in Hawija District Desalination Station.

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Abstract

Polluted tap water with coliform and fecal bacteria produced from the desalination plant of Hawija district/Kirkuk governorate was studied from November 2021 Until April 2022. Ten sites located on Hawija district named 1-10 were selected in this study on the feeding channel, the desalination stages plant and the distribution grid in the district. Total bacterial count and values of coliform cells per 100 ml of water sample was examined. The results of the study indicated that the filtration plant was operating with high efficiency in removing bacterial contaminants in most sites after desalination plant. Sites 5,6 recorded undictable average values and site 9 recorded lower average values (8.33 cell/100 ml) respectively. The study also showed that the distribution grid is weak because the obsolescence of the pipes in some residential neighborhoods with average coliform values 17cell/100 ml and 17.17 cell/100 ml in sites 8 and 7 respectively as contamination was recorded in some selected water samples. In reference to the results of the station operates with high efficiency and the tap water produced from it was within the Iraqi and international standards for drinking water.

1. Introduction:

Water is the basic component of life around the globe, and there is no life without water [1]. It is a blessing from God's blessings to all creatures for its vital role in the metabolic and biological activities of living organisms, especially human life [2]. Water constitutes about 70% of human's body [3]. It is currently threatened by many pollutants that threaten the lives of all living creatures due to human, industrial and agricultural activities which pollute wide range of water resources in the world [4]. Although Iraq possesses many water bodies and groundwater resources, there is an urgent need for safe drinking water to overcome shortage water supply facing the world including Iraq due to lacking of rain which suffers from a lack of rain, Also, the water level of the Tigris and Euphrates rivers drops as a result of building dams in the neighboring countries [5]. Sewage pollution (dumping of raw sewage into rivers without proper management) represents global issue facing several countries. This leads to a Deterioration of water quality and increase the infection risk [6]. At the present time, the need for fresh water has increased, as about one-fifth of the world's population lacks access to drinking, healthy and safe water due to the lack of adequate wastewater treatment systems for 50% of the world's population, especially in developing countries [7]. In these countries, 95% of wastewater are discharged directly into water sources without any treatment, which negatively affects the health of consumers by

transferring diseases to them from the water such as cholera, hepatitis, shigellosis, typhoid and bacterial diarrhea [8]. Reports indicate that three million deaths are reported annually in the world as a result of the use of non-potable water [9]. Therefore, efforts must be increased to protect Iraqi water resources from pollution and activate deterrent environmental laws while continuing to conduct continuous studies of drinking water sources to take what is necessary when there is a problem. There are many studies[5] [6][10] [11] in Iraq on the drinking water index, the results showed that the water quality values are ranged from non-potable water to excellent. The water quality became worse because of fecal coliform bacteria contamination which amounted to ¡16 cells/100 ml to 800 cells/100 ml [12]. The argument for establishing filtration plants is to provide water suitable for daily uses, as it is noted that filtration plants are located on both sides of rivers [13]. Also, these plants are weak in many characteristics, including production capacity and additives in terms of quantity and quality, and all these characteristics affect the efficiency of the stations [14].

Many transactions are conducted on water at the stations to clean it from pollutants, where many chemicals are added to ensure that it is clean from impurities, bacteria and other microorganisms present in the water that transmit diseases to humans until it becomes fit for daily use [15]. Raw water treatment projects mast evaluated stages and tools to remove the pollutants from it [10]. Our study aims to determine the efficiency of the Hawija district desalination plant in produce unpolluted tap water with coliform bacteria.

2. Materials and Working Methods:

The Hawija district water project was established in 1983, and in 2008 a new project was built near the old project with a capacity of $4000 m^3/h$. The project is fed with raw water from the Hawija district stream, which branches from the Lower Zab River. The length of the stream reached 26 km and considered the main source of water in Hawija district. The desalination project was built at a distance of 50 m from the stream.

The desalination project consists of units that were used as sites for the current study. Ten sites were selected within the study area in Hawija district-Kirkuk governorate, where these sites were distributed on each of the feeding canal (within the district of Hawija), Hawija water purification project and drinking water distribution grid in the residential neighborhoods of the district.

2.1 Sample Collection:

Water samples were collected to conduct bacteriological tests from the study site on a monthly basis for a period of 6 months, starting from November 2021 to April 2022. Raw water samples were collected by sterilized airtight bottles, each of which has a capacity of 250 ml, and placed in the used bottles for bacteriological examination. The water samples were treated with 0.1 ml of sodium thiosulfate solution to remove the effect of chlorine. Raw water samples were collected from the river at a depth of approximately 10-20 cm. The samples package after placing it against the direction of the water current and filled to 200 ml and then closed with a plug under water. Samples were collected from the following sites:

1. First site - represents raw water from the feeding channel, 2 km away from the station.
2. Second site - collection basin of raw water from the river.
3. Third site - the sedimentation basins, which are 3 basins.
4. Fourth site - the class filters, which are 10 filters.
5. Fifth sites - the collection basin.
6. Sixth site - the payment pumps to the distribution grid.
7. Seventh site - the distribution grid Al-Qadisiyah district.
8. Eighth site - the distribution grid of Al-Nida district.
9. Ninth site- the distribution grid of the village of Al-Dis.
10. Tenth site - the raw water from the river 2 km after the purification station. These sites are shown in the Following diagram.

2.2 Tests:

Three types of tests were chosen to detect the types of bacteria in our study: Total Plate Count (T.P.C), Total Coliform bacteria (T.C.B.) and Fecal Coliform bacteria (F.C) [16] [17].

3. Results and Discussion:

3.1 Bacteriological Properties:

Presence of bacteria in drinking water considers one of the important indicators to identify the degree of contamination of all water sources with aerobic, facultative and non-aerobic bacteria and it was bioindicator for organic pollution [18] [19].

3.2 Total Bacterial Count:

The results of the study shown in Table 1, where the highest value was recorded in sites 4 and 3, was 120 cells/100 ml in November 2021, February and April 2022. These sites were both sedimentation basins and filtration filters which are considered the beginning of water treatment operations in the

filtration plant. Also, the sites recorded 10,2,1 value in the total number of bacteria, where it was ¡100 cells/100 ml in all months of the study. These sites represent raw water before treatment and water from the channel feeding the station, and the lowest value recorded was 0 cells/100 ml in the sites 6 and 5.

Table 1. The monthly changes in the values of the total number of bacteria cells/100 ml.

Cite	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
Month										
November	> 100	> 100	120	120	0	0	20	60	10	> 100
December	> 100	> 100	60	80	0	0	10	10	0	> 100
January	> 100	> 100	70	76	0	0	16	0	0	> 100
February	> 100	> 100	120	84	0	0	0	10	20	> 100
March	> 100	> 100	110	70	0	0	40	12	0	> 100
April	> 100	> 100	120	50	0	0	20	10	20	> 100
Average	> 100	> 100	100	80	0	0	17.7	17	8.33	> 100

The sites are the water after treatment and before processing to the distribution grid. As for the sites 9,8,7 which represented the distribution grid, the values of the total number of bacteria ranged from 0-60 cells/100 ml. We can conclude from this examination that the filtration station works with high efficiency and the bacteria in the sites of the distribution grid are due to the ageing of the gride pipes, and mismanagement which cause damaging of water supply pipes. From observing the bacteria values in the study sites, especially the distribution grid, Indicates the pollution in the water supply grid. Various types of bacteria exist in natural waters, the source of these bacteria being from soil or sewage, which drifts into water bodies [20]. These bacteria may be pathogenic or non-pathogenic [21].

The presence of bacteria in the water column is suspended or at the sediment and it spores are protected against external influences and bacteria feed in water by oxidizing organic or inorganic compounds [22]. The importance of examining the total count of bacteria, as through this examination it is possible to determine the pathogenic bacterial content in the water [17]. The presence of specific types in water does not include all bacterial species in water because of their inability to provide food, and the difficulty of providing appropriate conditions for their growth in water [23].

3.3 Escherichia Coli Bacteria:

The intestines of humans and animals are the final host for the presence of coliform bacteria therefore water and soil can be polluted with their feces [24]. The presence of *E. coli* in water sources gives evidence for the presence of other types of intestinal pathogens in the water, such as Salmonella and Shigella. These pathogens that cause a variety of Intestinal infections that affect the digestive system, such as diarrhea and hemorrhagic colitis [25].

The results of the current study, which are shown in Table 2, recorded that the number of coliform bacteria had the highest value in sites 1, 2, 10, and these sites represented raw water before treatment, and the number of colon bacteria in it more or less than 16 cells/100 ml, and in the two sites 4,3 values ranging from 2-16 cells/100 ml. These two locations

Table 2. Represents the monthly changes in the values of coliform bacteria cell/100 ml.

Cite	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
Month										
November	> 16	> 16	9	2	0	0	0	0	0	> 16
December	> 16	> 16	9	9	0	0	0	0	0	> 16
January	> 16	> 16	6	9	0	0	0	0	0	> 16
February	> 16	> 16	16	9	0	0	0	0	0	> 16
March	> 16	> 16	9	16	0	0	0	0	0	> 16
April	> 16	> 16	16	5	0	0	0	0	0	> 16
Average	> 16	> 16	10.8	8.33	0	0	0	0	0	> 16

are the sedimentation basins and filters in the station. The sites 9,8,7,6,5 was free of bacteria, and zero cells/100 ml were recorded in all months of the study, which are the beginning of the water treatment process. Here, chlorine is added in the fifth and sixth sites, while sites 9,8,7 stood for the distribution grid in the district, where they were free from colon bacteria. There are no colon bacteria because of the addition of sterile materials in these sites [26]. The water supplied by the station was free of coliform contamination and within the permissible limits of the Iraqi Standard Specifications No. 417 of 2001.

3.4 *Fecal Coliform* Bacteria:

Water contamination with bacteria is considered the most contributor to water borne diseases. The presence of fecal bacteria in water proves water contamination with feces, and caution should be exercised about the existence of health risks from using this water for drinking [27].

The average values recorded on sites 1, 2, 3 and 10 Table 3 documented highest coliform bacteria value before treatment and site 4 recorded 4.33 cells/100 ml less them. As for sites 4.3, the numbers of fecal coliform bacteria ranged from (0-16) cells/100 ml. These sites were located inside the filtration plant and filled the sedimentation basins and filters, which is the beginning of the water treatment in the station. The sites 5,

6, 7 and 9 recorded imperceptible values which represents the produced water. These indicate station was working efficiently on it in ridding the water of bacteria. As for the site 8, fecal coliform bacteria were recorded in the month of February and it was 2 cells/100 ml. This indicates the aging of pipes in this site. In general, Hawija. The Hawija district station works efficiently in the disposal of bacterial contaminants, and the water produced in the station was within the Iraqi standard specifications No. 417 of 2001.

Table 3. Represents the monthly changes in the values of fecal coliform bacteria cell/100 ml.

Cite	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
Month										
November	> 16	> 16	16	2	0	0	0	0	0	16
December	> 16	> 16	9	6	0	0	0	0	0	> 16
January	> 16	> 16	9	9	0	0	0	0	0	9
February	> 16	> 16	9	9	0	0	0	2	0	> 16
March	> 16	> 16	9	0	0	0	0	0	0	> 16
April	> 16	> 16	16	0	0	0	0	0	0	> 16
Average	> 16	> 16	11.3	4.33	0	0	0	0.33	0	12.5

3.5 Evaluation of the Efficiency of the Desalination Station of the District:

Monitor tap water sources is important to determine its validity as source to establish tap water desalination [28]. The Weighted Mathematical Model was used in many studies [29],[30]. It is noted from Table 4 that the values of water quality produced by the desalination station of Hawija district, Kirkuk governorate were not contaminated with coliform and fecal bacteria, as the quality of water produced therein was excellent. Also, the produced fecal matter, and the water produced from the station were within the Iraqi and international standards for drinking water.

4. Conclusion:

The results of the water quality index indicate that the water produced from Hawija district desalination station is valid according to Iraqi drinking water standards.

Table 4. Results of sub-index values and water quality index for the studied sites.

		Sites									
		1	2	3	4	5	6	7	8	9	10
Pharm											
Turb.	Sli	109.5	114.4	24.30	8.372	5.069	5.174	6.093	5.767	6.791	109.3
	QI	942.0	984	209	72.00	43.60	44.50	52.40	49.60	58.40	940
T.C	Sli	1.783	1.823	1.991	1.991	2.065	2.121	2.121	2.140	2.158	1.782
	QI	38.30	39.2	42.8	42.80	44.40	45.60	45.60	46.00	46.40	38.32
pH	Sli	5.427	8.074	8.153	8.044	8.066	8.022	7.989	8.088	7.956	8.274
	QI	86.11	86.8	87.6	86.47	86.71	86.24	85.88	86.94	85.53	88.94
$E_{c/25}$	Sli	3.210	3.182	2.983	2.997	2.977	2.976	2.943	2.997	2.997	3.009
	QI	34.50	34.2	32.1	32.21	32.00	32.00	31.64	32.21	32.21	32.36
T. Hard.	Sli	1.758	1.758	1.832	1.730	1.730	1.730	1.730	1.740	1.758	1.749
	QI	37.80	37.8	39.4	37.20	37.20	37.20	37.20	37.40	37.80	37.60
T. Alk.	Sli	4.465	4.434	4.403	4.341	4.341	4.310	4.341	4.372	4.310	4.310
	QI	96.00	95.3	94.7	93.33	93.33	92,67	93.33	94.00	92.67	92.67
Na^+	Sli	0.464	0.471	0.461	0.478	0.453	0.429	0.443	0.453	0.471	0.495
	QI	6.650	6.75	6.60	6.850	6.500	6.150	6.350	6.500	6.750	7.100
K^+	Sli	0.166	0.169	0.163	0.159	0.169	0.172	0.161	0.171	0.166	0.195
	QI	7.150	7.25	7.00	6.850	7.250	7.400	6.900	7.350	7.150	8.400
$SO_4^=$	Sli	0.928	0.912	0.903	0.889	0.893	0.898	0.895	0.947	0.910	0.968
	QI	13.30	13.1	13.0	12.75	12.80	12.88	12.83	13.58	13.05	13.88
Cl^-	Sli	0.354	0.348	0.341	0.348	0.357	0.428	0.441	0.474	0.419	0.443
	QI	7.600	7.48	7.32	7.480	7.690	9.200	9.480	10.20	9.000	9.520
NO_3^-	Sli	0.107	0.140	0.100	0.121	0.125	0.112	0.102	0.121	0.160	0.177
	QI	1.160	1.50	1.08	1.300	1.340	1.200	1.100	1.300	1.720	1.900
PO_4^-3	Sli	0.040	0.047	0.037	0.040	0.044	0.053	0.061	0.049	0.061	0.072
	QI	1.700	2.00	1.60	1.700	1.900	2.300	2.600	2.100	2.600	3.100
TPC	Sli	116.3	116.3	116.3	93.02	0.000	0.000	20.58	19.77	9.686	116.3
	QI	1000	1000	1000	800	0.000	0.000	177	170	83.30	1000
F.C.	Sli	186.5	186.1	113.4	96.86	0.000	0.000	0.000	3.837	0.000	186.0
	QI	1600	1600	1130	833	0.000	0.000	0.000	33.00	0.000	1600
WQI Value	Value	430.	438.2	275.4	219.4	26.29	26.43	45.9	50.93	37.84	433.1
	Class	Unfit	Unfit	V.P	V.P	Exc.	Exc.	Exc.	Good	Exc.	Unfit

V.P: Very Poor.,
Exc.: Excellent,
Unfit.: Non-potable water,
Sli: Subindex,
QI: Water Quality Index.

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References

[1] Reidh A. Abdul Jabar, Ali A. Z. Al-Lami, Rushdi S. Abdul Khader, and Aseel G. Rahdi. Effects of some physical and chemical factors of lower zab water on tigris river. *Tikrit Journal of pure science*, 13(1):132–142, 2008.

[2] Ali El-Naqa and Amal Al Raei. Assessment of drinking water quality index (wqi) in the greater amman area, jordan. *Jordan Journal of Earth and Environmental Sciences*, 12(4):306–314, 2021.

[3] Abdullah Othman, Omar B. Ahmed, Abotalib Z. Abotalib, Ali Sayqal, Hamza Assaggaf, and Jahan Zeb. Assessment of supplied water quality during mass gatherings in arid environments. *Journal of King Saud University-Science*, 34(4):101918, 2022, doi:10.1016/j.jksus.2022.101918.

[4] Omar Mosa Ramadhan, Abdul-Aziz YT Al-Saffawi, and Mohammed H. S. Al-Mashhdany. Application of water quality index [ccme wqi] to assess surface water quality: A case study of khosar and tigris rivers in mosul, iraq. *International Journal of Enhanced Research in Science*, 7(12), 2018.

[5] Jihad D. M. Alganabi Wisam Kader Rashed Al shomeasy and Rushdi S. Abdulqader. *Evaluating of drinking water quality for water treatment plant in qaratapa*. 3^{rd} scientific conferences of college of sciences-University of Tikrity, 2019.

[6] A. Y. T. Al-Saffawi and A. Y. R. Al-Asaaf. quality assessment of tigris river water using (wqi) for drinking within nineveh governorate. In *Proceedings of the* 9^{th} *Sci. Conf. of Res. Center for Dams Water Resources*, pages 27–28, 2018.

[7] F.S. Radin Nizar, R. Mohd Ghazi, N.R. Awang, and M. Muhammad. Assessment of kelantan river water quality using water quality index (wqi). In *IOP Conference Series: Earth and Environmental Science.*, volume 842, page 012005. IOP Publishing, 2021, doi:10.1088/1755-1315/842/1/012005.

[8] Umara Qayoom, Sheikh Tajamul Islam, Inam Sabha, Sami Ullah Bhat, and Shahid Ahmad Dar. Coliform pollution mapping in major watersheds along jhelum river basin of kashmir himalaya. *Environmental Science and Pollution Research*, pages 1–12, 2022, doi:10.1007/s11356-022-22727-0.

[9] Abdulaziz Al-Saffawi. Water quality of nimrud district wells southeast of mosul city for drinking and civil purpose using the canadian model of water quality. *Pakistan Journal of Analytical Environmental Chemistry*, 20: 75–81, 07 2019, doi:10.21743/pjaec/2019.06.10.

[10] Abdulaziz Al-Saffawi, Alaa Al-Maathidi, and Waffaa sinjari. Assessment of drinking water quality by using water quality index (wqi) of some schools in mosul city, iraq. In 9^{th}. *Sci. Conf. of DWRRC, Mosul University, Mosul, Iraq.*, 2018.

[11] Shuokr Qarani Aziz, Evan Ogestin Slewa, and Wali Ali Abdullah. Evaluation of water quality for lesser-zab river for various applications. *Kirkuk University Journal-Scientific Studies (KUJSS)*, 12(4), 2017, doi:10.32894/kujss.2017.132387.

[12] Shuokr Qarani Aziz, Evan Slewa, and Wali Abdula. Assessment of the quality of drinking water in the sabaa qusour area in the rusafa side / baghdad. *Journal of the College of Basic Education for Educational and Human Sciences*, 24(101):45–62, 2018, doi:10.32894/kujss.2017.132387.

[13] Bagus Reynaldi and Taty Alfiah. Analysis of residual chlorine and total coliform on consumers of perumdam maja tirta, mojokerto city. *Journal of Community Based Environmental Engineering and Management*, 6(2):73–78, 2022, doi:10.23969/jcbeem.v6i2.

[14] M. A.J. Abdul-Baqi. The reality of water liquefaction stations in the city of mosul. *Al-Rafidain Engineering Journal.*, 25(2):19–29, 2020.

[15] Lawrence K. Wang and Mu-Hao Sung Wang. Reduction of color, turbidity, odor, humic acid, metals, edb, coliform and tthm by adsorption, flotation and filtration. *Evolutionary Progress In Science, Technology, Engineering, Arts And Mathematics(STEAM)*, pages 1–51, 2022, doi:10.17613/r7xv-nb12.

[16] APHA (American Public Health Association). *Standard methods for the examination of water and wastewater*. American Water Works Association, Water Environment Federation., 23^{th} edition, 2017.

[17] World Health Organization and WHO. *Guidelines for drinking-water quality*. world health organization, 3^{rd} edition, 2011.

[18] Happiness Anold Moshi, Daniel Abel Shilla, Ismael Aaron Kimirei, Catherine O'Reilly, Wim Clymans, Isabel Bishop, and Steven Arthur Loiselle. Community monitoring of coliform pollution in lake tanganyika. *Plos One*, 17(1): e0262881, 2022, doi:10.1371/journal.pone.0262881.

[19] Mir Kashem, M. d. Kawser Ahmed, Sayeed Mahmood Belal Haider, and Talokder M. d. Abdur Rouf. Assessment of total coliform and faecal coliform in the recreational beach water and offshore water of saint martin island, cox's bazar, bangladesh. 2022, doi:10.21203/rs.3.rs-1864126/v1.

[20] Happiness Anold Moshi, Daniel Abel Shilla, Ismael Aaron Kimirei, Catherine O'Reilly, Wim Clymans, Isabel Bishop, and Steven Arthur Loiselle. Community monitoring of coliform pollution in lake

tanganyika. *Plos one*, 17(1):e0262881, 2022, doi:10.1371/journal.pone.0262881.

[21] Roopali Roychowdhury, Madhumita Roy, Sufia Zaman, and Abhijit Mitra. Study on the health of hooghly estuary in terms of coliform load. *Techno o International Journal of Health, Engineering, Management Sci*, 2:40–47, 2022.

[22] A. P. Annachhatre and J. Jeganaesan. Sulfate reducing bacteria in wastewater treatment. *ARRRET) Asian Institute of Technology*, 1(1):2–3, 2001.

[23] Reem A. Al-Shanona and Abdulaziz Y. T. Al-Assaf, Azhar Y. R.and Al-Saffawi. Assessment of the health safety of bottled drinking water in iraqi local markets using the wqi model. AIP Conference Proceedings, 2213(1): 020096, 2020, doi:10.1063/5.0000357.

[24] N. N. A. Puspitasari and M. P. Hadi. Effects of land use on the number of coliform bacteria in boyong river, sleman. IOP Conference Series: Earth and Environmental Science, 1089(1): 012075, 2022, doi:10.1088/1755-1315/1089/1/012075.

[25] Rossitah Selamat, Ismail Abustan, Mohd Rizal Arshad, and Nurul Hana Mokhtar Kamal. Removal of escherichia coli using low-frequency electromagnetic field in riverbank filtration. *Water and Wastewater Treatment*, 95, 2019, doi:10.5772/intechopen.85296.

[26] Muhammad Muhammad, Arsalan Hamid Khan, Muhammad Musab Sheth, Shanzar Butt, Asadullah Shakeel, and Syed Saboor Tariq. Prevalence of e. coli and coliform bacteria in the dental unit waterlines of private clinics of islamabad and rawalpindi: E. coli and coliform bacteria in the dental unit waterlines. *Pakistan BioMedical Journal*, pages 121–124, 2022, doi:10.54393/pbmj.v5i6.585.

[27] Patrick Gwimbi, Maeti George, and Motena Ramphalile. Bacterial contamination of drinking water sources in rural villages of mohale basin, lesotho: exposures through neighbourhood sanitation and hygiene practices. *Environmental health and preventive medicine*, 24(1):1–7, 2019, doi:10.1186/s12199-019-0790-z.

[28] Kwestan Hassan Sdiq, Layla Aladdin Mohamed Aladdin, Bakhtyar Abullah Othman, and Sewgil Saaduldeen Anwer. Limnological study in upstream and downstream degala basin water body within erbil city-iraq. *Kirkuk University Journal-Scientific Studies*, 17(1):16–29, 2022, doi:10.32894/kujss.2022.131488.1046.

[29] Thomas Kwame Boateng, Francis Opoku, Samuel Osafo Acquaah, and Osei Akoto. Groundwater quality assessment using statistical approach and water quality index in ejisu-juaben municipality, ghana. *Environmental Earth Sciences*, 75(6):1–14, 2016, doi:10.1007/s12665-015-5105-0.

[30] Ehsan Kamali Maskooni, Mehran Naseri-Rad, Ronny Berndtsson, and Kei Nakagawa. Use of heavy metal content and modified water quality index to assess groundwater quality in a semiarid area. *Water*, 12(4):1115, 2020, doi:10.3390/w12041115.

تقسم تأثر المحتوى البكتري في نوعية مياه الشرب المنتجة من محطة إسالة الحويجة.

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الخلاصة

قيم تلوث مياه الشرب المنتجة في محطة تصفية قضاء الحويجة / 1 محافظة كركوك بالبكتيريا القولونية والبكتيريا البرازية اختيرت 10 مواقع تقع على القناة المغذية وفي محطة التصفية وشبكة التوزيع في القضاء بهدف التأكد من خلو المياه المنتجة من الملوثات البكتيرية. نتائج عينات المواقع المختارة بشكل شهري من شهر تشرين الثاني 2021 الى شهر نيسان 2022 وثقت عمل المحطة بكفاءة عالية وانتاجها مياه صالحة للاستخدام الصحي خالي من الملوثات البكتيرية عدا نتائج بعض المواقع. الموقعان 5 و 6 سجلا معدلات غير محسوسة لأعداد البكتريا الكلية وسجل الموقع 9 أدنى القيم وكانت 8.33 خلية / 100 ملليلتر تقريبا. قدم شبكة التوزيع في بعض احياء القضاء كان السبب في تلوث المياه المنتجة وبالأخص في الموقعين 7 و 8 سجلتا 17 خلية / 100 ملليلتر و 17.7 خلية / 100 ملليلتر على التوالي. استنادا الى نتائج معامل جودة مياه الشرب فان المياه المنتجة كانت ضمن المحددات العراقية لمياه الشرب

الكلمات الدالة: البكتريا المعوية، التعداد الكلي للبكتريا، معامل جودة المياه، محطة تصفية المياه، الحويجة.

التمويل: لايوجد.

بيان توفر البيانات: جميع البيانات الداعمة لنتائج الدراسة المقدمة يمكن طلبها من المؤلف المسؤول.

اقرارات:

تضارب المصالح: يقر المؤلفون أنه ليس لديهم تضارب في المصالح.

الموافقة الأخلاقية: لم يتم نشر المخطوطة أو تقديمها لمجلة أخرى، كما أنها ليست قيد المراجعة.