Estimation Of Some Biological Properties On The Drink Water Of Duhok Governorate, KRG/ Iraq

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Abstract:
Consuming water can be obtained from a variety of sources, including waterways, pools, wells, and pretend reservoirs. A significant obstacle to human fitness is contamination of these water sources. To evaluate the value of inhaled water, additional physicochemical constraints and a few metal levels are required. As a result, the study's objective is to evaluate the quality of the water in Iraq's Kurdistan region's Duhok governorate.
Determining the bacterial adulteration that involves roughly the total number of coliform microorganisms (TC) fecal coliform is a part of the study. Water samples (1374) were gathered from various locations and springs in Duhok Governorate in the Kurdistan Region of Iraq and tested for MPNF, E. coli, and MPNT, between January 2019 and December 2021, they were gathered from the reservoir, deep well, spring, Duhok dam, and network.
The results As seen in (Tables 1, 2, 3, 4), regarding the microbial test, the total coliform microorganisms, the study's findings revealed that a few biological principles were not within the agreeable benefit of the Iraqi drink and WHO.

Keywords: Drinking water, bacteria, biological parameters, water resources, Duhok governorate.

Introduction:

Water and water sources are crucial for ensuring that all living things have access to a sufficient food supply and a productive environment. As the number of people and resources have increased, so have all-encompassing water-based tradition. A lack of water affects human feed supplies in addition to reducing variety in two simultaneously amphibious and terrestrial environments [1]. Particularly in less developed nations, the majority of countries depend on a water source that can occasionally meet 90% of their water needs. The demand for water is rising in Arab countries, particularly in those without open water beginnings and with a desert climate, along with an increase in business-related, agricultural, and urban development, which has shifted the majority of countries' current attention to water [2].
Water is a basic human strength requirement everywhere in the world. A variety of sources, including ponds, wells, waterways, and affected basins, may provide water for gulping. A serious health concern with this water equipment is contamination [3].
When offensive substances enter the water's domain and taint its purity, water becomes adulterated. When water contains undesirable substances, it may be harmful to human health, causing cholera, loose stools, asthma, tumors, heart failure artery hypertension, hepatitis, pneumonia, parasitic worms, and typhoid, in addition to many other conditions that affect the eyes, ears, and nervous system in living things [4].

Through human action, water pollution has spread quickly and precariously. They include fluoride, pesticides, viruses, pharmaceuticals, dyes, and heavy metals[5].Typically, ultimate Heavy metals known as hazardous contaminants pose a serious threat to human energy. They can grow in animals because they are not biodegradable. Additionally, even in small doses, their harmful effects have a significant impact on how drinkable water is classified. As a result of technological and human endeavors, household waste, soil interaction, and air pollution, which can degrade soils and release toxin-loaded down heavy metals into large volumes of water, heavy metals can contaminate water supplies [6].
Water is a more important raw material because it is always available by the grace of God Almighty and is necessary for all life forms. Water is an essential component of human tissue and serves as a global solid and a conduit for all of the chemical reactions that occur in living things [1]. It is also crucial to many occupations, including farming, industrialized activity, fisheries, and other occupations [2].
In addition to being a major source of drinking water for people and other mammals located all over the world, groundwater is also a very valuable source of water for the gulping, farming, and production industries. Snow and filling processes are dependent on water reservoirs, which make up a significant portion of the hydrological phase. The basis for groundwater thickness is its material, synthetic, and organic physiognomy [3].

pools and Wells are divots in the earth that collect the water table as rocks with water significance and springs cascading from them [4]. The primary sources of groundwater contamination in recent decades have been agriculture, industry, habitations, commerce, and native development. The synthetic, material limits of water determine the condition of the water. It is a measurement of the water accompanying respect for the necessities of human needs or purposes in the United States of America [5].

Microbiological risks are still connected to a number of things, including using water for domestic purposes and having recreational water contacts. By looking for and measuring bacterial indicators of contamination, water quality is traditionally monitored because their presence suggests that contamination may have occurred. Total coliforms, fecal coliforms, and fecal streptococci are the three indicators that are most frequently used today by both volunteer and professional monitors. These bacteria are typically found in the intestines and feces of warm-blooded animals, such as people, farm animals, pets, and wildlife. Typically, the indicator bacteria are not themselves pathogenic. [28].
Study issue: One issue that affects the various study areas is the phenomenon of groundwater pollution. Population growth, urbanization, and the diversification of human activity all contributed to an increase in water consumption in domestic, commercial, and industrial settings, which in turn increased the amount of wastewater and sewage that was not treated and leaked out. The levels of water pollution rise through faults and cracks into the aquifers, especially close to population centers and its liquid and solid waste. Additionally, well water contamination occurred in a number of study areas as a result of the expansion of the agricultural sector and the excessive use of fertilizers, pesticides, and irrigation water [29].
The fact that the majority of water sources are not protected and are not routinely inspected has made the issue worse. For the population's overall environmental health and the various uses of water, it is important to prioritize a qualitative evaluation of the most significant water sources. [30].
The aim of this research was to evaluate biological properties of the water that is used by people specifically if it is for drinking, Duhok governorate, Kurdistan region in Iraq.

Material and Method:
Multiple-tube fermentation for total coliforms
1 Purpose and Use:
1-1.The presence of a coliform group appendage in ground water and surface water is determined using this design..
1-2. According to the procedure used in this location, the coliform group is defined as all aerobic and optionally anaerobic, grandm-negative, non-starting, pole-formed microorganisms that ferment hydrogen-containing vapor composition in less than 48 hours at 35 EC. Multiple-tube fermentation for total coliforms..

2 Method Summary :
2-1.The three-stage diversified-hose effervescence method produces results that are statistically expressed in agreements of maximum Probable Number (MPN). The assumptive stage, rooted stage, and completed test are succinctly described below. (A five-hose test is required for the reasoning expected to be correct.)
*Presumptive Stage: A series of basic effervescence tubes containing lauryl tryptose soup are inoculated and arranged or marked in accordance with scale quantities of the sample.

2-1.1. Expectation confirmed; The immunized tubes are hatched for 24 + 2 hours at 35 + 0.5 EC, during which time the tubes are examined for smoke composition. The tubes, please resume development and testing for vapor establishment lasting 48 + 3 hours in the absence of smoke. A certain presumptive test is the production of smoke in a certain amount within 48 + 3 hours.

2-1.2. Confirmed Stage; During the 24- and 48-hour periods, the rooted stage is present on all fundamental effervescence tubes that exhibit smoke formation. Fermentation tubes containing exceptional green sweet substance bile soup are immunized with medium from the tubes that appear to have a positive impact on the presumptive test. Inoculation should be administered as soon as possible after vapor composition. The immunized tubes are hatched at 35 + 0.5EC for 48 + 3 hours. Any time vapor appears on a television, it has passed a certain habit test.

2-1.3. Completed Test; All samples are subjected to the achieved test, which has an advantageous influence on the rooted test. On 20% of all resolved samples, it can still be used as a control of product quality measurement. at least one plate are marked accompanying sample to be resolved of eosin methylene sky. The striate plates are hatched at 35 + 0.5EC for 24 + 2 hours. Transfer individual or more traditional communities (nucleated, accompanying, or outside silvery shine) to a lauryl tryptose soup fermentation hose and a food agar slant after the early development process. The agar slants and effervescence tubes are hatched at 35 + 0.5EC for 24 + 2 hours, or for 48 + 3 hours if no vapor is produced. Agar slants that match the effervescence are present 27].

Results and Discussion:

A group of bacteria known as total coliform bacteria are typically found in the environment, such as soil or vegetation, as well as the gastrointestinal tracts of mammals, including humans. Despite the fact that coliform bacteria are unlikely to result in illness, their presence suggests that your water supply may be prone to contamination by more dangerous microorganisms; and the water that is with E. coli contaminated indicates recent fecal contamination and could indicates the presence of bacteria, viruses, and parasites that cause disease. While the majority of E. coli bacteria strains are not harmful, others, like E. coli 0157:H7, can lead to illness [30].

Since testing for every known pathogen is a difficult and expensive process, total coliforms and E. coli are used as indicators to gauge the level of contamination and sanitation quality of well water. Pathogens are primarily found in drinking water that has recently been contaminated by domestic or wild animals, improperly treated sewage, animal manure leaching, or sewage discharges. Bacteria and other dangerous microorganisms can be washed from these sources into rivers, lakes, or groundwater during and after rainfall. Groundwater contamination risk can be increased by subpar well construction or poor maintenance. [28].

The test results revealed bacteria, indicating that the water is unsafe to drink because it contains E. coli, which indicates recent fecal contamination and the possibility of other pathogens. Take corrective action after looking into the bacteria's origin so acterial analysis Coliform bacteria in total (TC) The coliform family of bacteria was one of the most prevalent indicators of adulteration and pollution in water.[30].

The results in Table 1 showed that the total number of coliform microorganisms in the tap water was categorized 2019, 2020, and 2021, but the total number was more in 2021 and the less was in 2019. The precipitation, rising water levels, and the introduction of natural resources into bureaucracy as a result of water deepening are the reasons for the relative increase in the number of microorganisms in the water of these villages of the current study.

Table (1) Total coliform (TC): MPNF- coli, Ecoli , MPNTcoli in 2019, 2020, 2021 in Duhok city

Location	2019				2020				2021			
	Cl2	MPNF_ Coli	E. Coli	MPNT Coli	Cl2	MPNF_ Coli	E. Coli	MPNT Coli	Cl2	MPNF_ Coli	E. Coli	MPNT Coli
Alindk village										16	16	16
Avrike village										9.2	9.2	9.2
Besifk village										16	16	16
Betas village										5.2	5.2	5.2
Chamn village										5.2	5.2	5.2
Eikmal Khabir village	1	9.2	9.2	9.2								
Gre pte village	1	9.2	9.2	9.2								
Kamak village										9.2	9.2	9.2

Kora village										9.2	9.2	9.2
Peda village	1	16	16	16								
Pirmos village										9.2	9.2	9.2
Rashana Berwari village						9.2	9.2	9.2				
Rashanka Mizori village						16	16	16				
Shakftyan / Mahabad		1.5		0								
Talwa village										9.2	9.2	9.2
Zanisti / Sarheldan		1.5		0								
Zerhawa village	1	16	16	16								

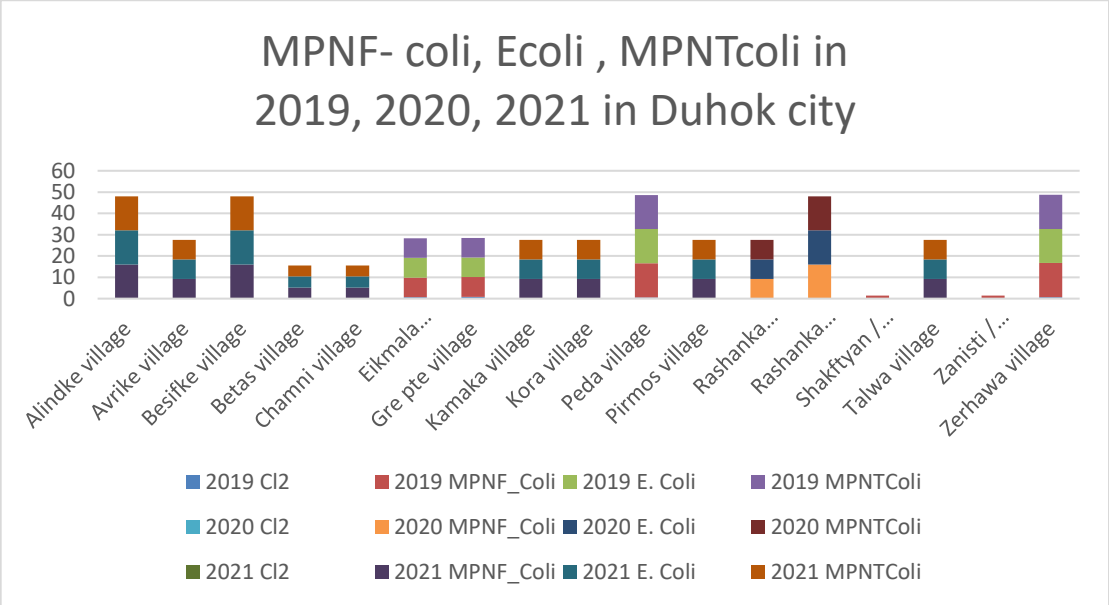


Table 2 the MPNF coli, E. coli and MPNT coli in 2019

Location	2019			
	Cl2	MPNF_Coli	E. Coli	MPNTColi
Alindke village				
Avrike village				
Besifke village				
Betas village				
Chamni village				
Eikmala Khabiry village	1	9.2	9.2	9.2
Gre pte village	1	9.2	9.2	9.2
Kamaka village				
Kora village				
Peda village	1	16	16	16
Pirmos village				
Rashanka Berwari village				
Rashanka Mizori village				
Shakftyan / Mahabad		1.5		0
Talwa village				
Zanisti / Sarheldan		1.5		0
Zerhawa village	1	16	16	16

In table 2 as it is shown that MPNF tests were found more common in some of taken villages and area of Duhok city such as you can see despite of To make sure that the water is free of harmful bacteria, chlorine levels are routinely checked using the Cl2 water test. However, in order to achieve optimum performance, both those variables must be tested and meticulously controlled because they are both very sensitive to pH and temperature. Ecoli and MPNT coli tests were less common than MPNF coli tests, however.

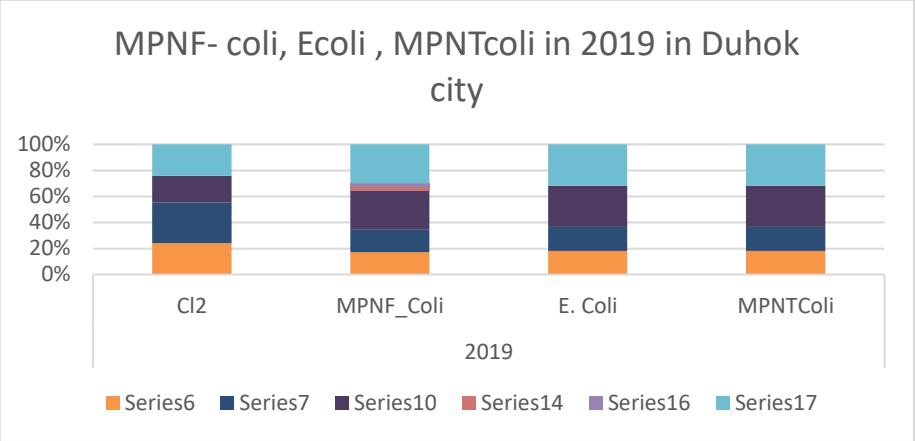


Table 3 the MPNF coli, E. coli and MPNT coli in 2020

Location	2020			
	Cl2	MPNF_Coli	E. Coli	MPNTColi
Alindke village				
Avrike village				
Besifke village				
Betas village				
Chamni village				
Eikmala Khabiry village				
Gre pte village				
Kamaka village				
Kora village				
Peda village				
Pirmos village				
Rashanka Berwari village		9.2	9.2	9.2
Rashanka Mizori village		16	16	16
Shakftyan / Mahabad				
Talwa village				
Zanisti / Sarheldan				
Zerhawa village				

In table 3 as it is shown that MPNF tests were found less common in the taken villages and area of Duhok city such as you can see except two villages Rashanka Berwari and Rashanka Mirozi may be the using of Cl2 water test was better used to kill the TC bacteria or maybe there are some other reasons.

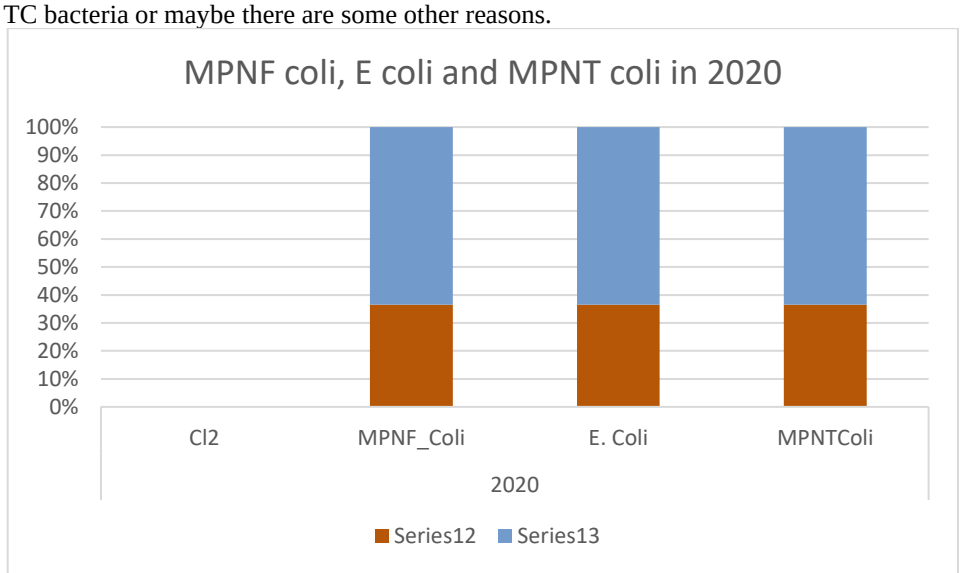
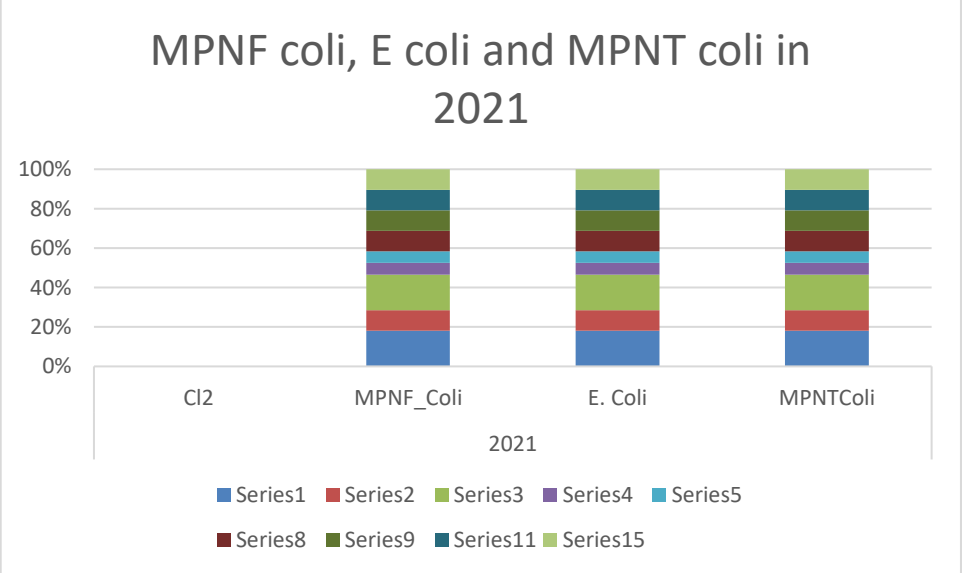


Table 4 the Total Coliform (MPNF coli, E coli and MPNT coli in 2021)

Location	2021			
	Cl2	MPNF_Coli	E. Coli	MPNTColi
Alindke village		16	16	16
Avrike village		9.2	9.2	9.2
Besifke village		16	16	16
Betas village		5.2	5.2	5.2
Chamni village		5.2	5.2	5.2
Eikmala Khabiry village				
Gre pte village				
Kamaka village		9.2	9.2	9.2
Kora village		9.2	9.2	9.2
Peda village				
Pirmos village		9.2	9.2	9.2
Rashanka Berwari village				
Rashanka Mizori village				
Shakftyan / Mahabad				
Talwa village		9.2	9.2	9.2
Zanisti / Sarheldan				
Zerhawa village				

In table 4 as it is shown that Ecoli, MPNF , MPNT tests were all found more common in some of taken villages and area of Duhok city such as you can see despite of the utilization of the Cl2 water examination,, the levels of chlorine are regularly observed to guarantee the absence of detrimental bacteria in the water.. Nevertheless;, due to its high sensitivity to both pH and temperature;, it is imperative to conduct tests and meticulously regulate these factors in order to attain the best possible outcomes/. Although the presence of Ecoli and MPNT coli tests was comparatively lower in comparison to the MPNF coli test.

The rise in pollution indicates that there can constantly be interruptions & imperfections in the distribution network pipeline; as we distance ourselves from the distribution point in the facility, amplifying the volume of seepage and escaping water from surrounding the pipe,, resulting in contamination,, particularly in situations of scarcity and the utilization of pumps to extract water directly from the network.. Consequently; this heightens the probability of pollutants infiltrating the low pressure system and entering the sewage or polluted groundwater[23]; also the high level of turbid water, which acts the effectiveness of disinfectants and offers a safe place for bacteria, aiding their movement through the distribution system. Furthermore, inadequate filtration quality due to contaminated filters, insufficient maintenance, and irregular filter cleaning.. [24].



Conclusion:

The water that we drink out to be devoid of disease-causing bacteria and safe for human being use… Based on the findings of this investigation,, it can be inferred that the drinking water in certain regions and villages within the Duhok governorate supply system is generally unsuitable for consumption according to Iraqi standards: (2270/14 in 2001) and; the drinking water standards set by the World Health Organization. This is because a majority of the physical; chemical; and biological; factors analyzed exceeded the maximum limits,, and the total number of coliforms detected was higher than (10/100) ml

MPN... However, the presence of fecal coliform bacteria and other bacterial species in certain samples indicated contamination caused by (humans or animals, as well as the accumulation of organic and inorganic substances) in the old pipes (such as asbestos), which facilitate the growth of microorganisms and lead to recontamination of the water that we drink with bacteria…

Acknowledgment:
For their assistance in the current work, the authors are grateful to the Directorate of the water in Duhok governorate-KRG in Iraq (the laboratory of water testing) specifically the biologist Mr. Adnan Ababakir Mostafa.

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