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Analysis of the Effect of the Solid Waste Landfill on Groundwater Wells in Ganfouda Area Located in Benghazi City

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Abstract:
Groundwater is an essential component for most people in the world. It meets the drinking water needs of more than fifty percent of the world's population. Unfortunately, groundwater can become contaminated. This occurs in cases where some man-made solid waste or several heavy metals such as nitrate, cadmium, chromium, lead, and mercury come into contact with underground water. This paper aims to evaluate the quantity of groundwater contamination in the Ganfouda area, west of the city of Benghazi, where some samples of water were collected from eight from several underground wells in the Ganfouda area. The results of this work showed high concentrations of dissolved solids, Sodium ion, Cadmium, lead and Bacteria Leachate in all collected samples. Through the results of the study that indicated groundwater contamination in the selected areas, we urge local authorities to monitor the quality and content of groundwater in landfills in the Ganfouda area in particular and in cities with high population density in general and to monitor water quality periodically.

Keywords: Solid Waste, Groundwater, Heavy Metals, Concentrations, Ganfouda Area, Benghazi.

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تحليل تأثير مكب النفايات الصلبة على آبار المياه الجوفية في منطقة قنفودة الواقعة في مدينة بنغازي

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الملخص
تعتبر المياه الجوفية عنصرًا أساسيًا بالنسبة لمعظم الناس في العالم، ويلبي احتياجات مياه الشرب لأكثر من 50 بالمائة من سكان العالم. لسوء الحظ، يمكن أن تصبح المياه الجوفية ملوثة، ويحدث ذلك في الحالات التي تتلامس فيها بعض النفايات

الصلبة التي من صنع الإنسان أو عدة معادن ثقيلة مثل النترات والكادميوم والكروم والرصاص والزئبق مع المياه الجوفية. يهدف هذا البحث إلى تقييم كمية تلوث المياه الجوفية في منطقة قنفودة الواقعة غرب مدينة بنغازي، حيث تم جمع بعض عينات المياه من ثمانية آبار جوفية في منطقة قنفودة. أظهرت نتائج هذا البحث وجود تراكيز عالية من المواد الصلبة الذائبة وأيونات الصوديوم والكادميوم والرصاص وعصارة البكتيريا في جميع العينات التي تم جمعها، ومن خلال نتائج الدراسة التي أشارت إلى تلوث المياه الجوفية في المناطق المختارة، نحث السلطات المحلية على مراقبة جودة ومحتوى المياه الجوفية في مدافن النفايات في منطقة قنفودة بشكل خاص وفي المدن ذات الكثافة السكانية العالية بشكل عام ومراقبة جودة المياه بشكل دوري.

الكلمات المفتاحية: النفايات الصلبة، المياه الجوفية، المعادن الثقيلة، تركيزات، منطقة قنفودة، بنغازي.

Introduction

Managing the consequences of solid waste dumping on groundwater boreholes requires taking into account the amount of heavy metals in groundwater contaminants in subterranean wells. [1]. The concentration of heavy metals in groundwater wells may vary depending on the physical, chemical, and bacteriological features of the samples. It can spread infection and be bacterially harmful [2]. The groundwater well samples contained high concentrations of lead and cadmium, above the permitted limit for inorganic drinking water in Ganfouda (0.005-0.003 mg/l). Lead, cadmium, chromium, and mercury concentrations varied from 0.005 to 0.017%, 0.005 to 0.013%, 0.010 to 0.027, and 0.001 mg/L, respectively, while those for nitrate ranged from 1.260 to 8.150 mg/L, compared to information about drinking water that is inorganic. It was finished. Lead and cadmium levels were examined in water samples since they were unwanted minerals in drinking water compared to standard, [4]. Furthermore, the level of heavy metals in groundwater wells close to a solid waste landfill was significantly higher than the level in drinking water samples. The number of heavy metals in the groundwater is influenced by its location. It can be explained in terms of the kind and volume of solid waste landfill present as well as how the landfill influences groundwater samples. [5] Lead and cadmium concentrations were higher in this study than in Ganfouda records, even though zinc and chromium levels were also found [6]. Groundwater samples were analyzed for Ph, EC, TDS, and other important ions in the studies by [7] authors on evaluating the quality of groundwater for drinking purposes in the city of Sorman, Libya. In [8], the authors examined the pollution of groundwater with toxic heavy elements and their carcinogenic and non-carcinogenic effects on health in the study area and analyzed the content of the elements (Pb, As, and Cr) using the ICP-MS device in the ACME laboratory in Vancouver, Canada. In [9], the authors detected coliform, faucal coliform, and pseudomonas aeruginosa bacteria and the pollution of toxic ions (No^{3-}, B^{+3}, pb+2, and Cd^{+2}) in well water that was contaminated by coliforms and Aeruginosa bacteria that affected the quality, but chemical pollution isn't found in well water because constrictions of toxic ions lower them to World Health Organization (WHO) standards. In [10], the authors discuss some groundwater sources and problems, including hot and mineral waters that become very important in our lives and to our health due to their chemical and radioactive characteristics. In [11], the level of heavy metals chromium, cadmium, copper, lead, zinc, manganese, and iron was estimated in the water of Sulphur wells located in northwestern Libya, and this study was represented in the concentrations of elements that were within the permissible limit compared to the Libyan, while the iron element was high during the summer. In [12], Aziz's study aims to apply the Canadian water quality model to water and estimate the following: PH, total dissolved solids, total hardness, total alkalinity, and cation concentrations. In [13], this research included conducting periodic physical and chemical analyses and measurements of heavy elements in the water of surface and groundwater sources and comparing them with the approved standard specification. In [14], the author's study aims to apply a quality model to water to be evaluated for drinking purposes. Monthly water samples were collected from each well to estimate the following: PH, total dissolved solids, total hardness, total alkalinity, and anions and cations concentrations. In [15], the authors study the possible impact of leachate percolation on groundwater quality. Concentrations of various physicochemical parameters, including heavy metals (Cd, Cr, Cu, Fe, Ni, Pb, Fe, and Zn), were determined in leachate samples and are reported. In [16], the authors studies reported in this special issue focus on contaminants in groundwater of geogenic and anthropogenic origin distributed over a wide geographic range. In the study [17], the quality of ground water around a municipal solid waste disposal site was evaluated, and chemical analyses were carried out on the water and leachate collected from the site, which showed the presence of heavy metals. In [18], the authors investigated the effects of solid waste disposal sites on underground water quality through the examination of some physical and chemical properties of water.

- This work is set up like follows: In Section 1, we collected eight groundwater samples from the vicinity of the Benghazi landfill's Ganfouda solid waste disposal facility. The chemical, physical, and bacteriological experiments mentioned in Section (2) were carried out by the food laboratory of the Arab Medical University. In Section (3), we carried out bacterial testing and identified bacteria in one of the samples. We also learned that the total salt level was high and that chemical testing revealed significant percentages of heavy metals including cadmium and chromium. Section (4) of the study also examined diseases caused by heavy metals and bacteria, while Section (5) concentrated on a bacteriological analysis.
- The objective of this study: Study of the quality of household wells in neighbourhoods close to a solid waste dump in the Ganfouda neighbourhood of Benghazi by performing physical, chemical, and bacteriological analyses (odour, colour, TDS, sodium ion, chromium metal, cadmium metal, nitrate metal, mercury metal, lead metal, and total number of bacteria and coliform bacteria), as well as assessing the suitability of groundwater sources for drinking and contrasting them with the app.
- Proposed Solution Mythology: Study and evaluate the physical, chemical, and bacteriology tests of the groundwater sources in Khi Ganfouda, close to the solid waste dump, and create the best strategies and tactics to address the issue of groundwater contamination and its effects on human health. This will help people and reveal the threat that the Ganfouda landfill poses to the quality of nearby water. The drilling industry's workers will identify and handle the issues from the locals.
- Problem formulation: The color, taste, smell, and T.D.S. of the groundwater in the Ganfouda region have all changed as a result of pollution. Residential portions were near to a solid waste landfill, and the region also relied on underground boreholes for domestic drinking water. Locals have expressed concern over the lack of a water system, the prevalence of bacterial illnesses including gastroenteritis, and the smelly nature of the water. Concern among the people has been raised by the lack of a water system, the high prevalence of bacterial infections including diarrhea, and the presence of an unpleasant scent in the water.
- Consequently, to accomplish our objective, the following issues must be resolved: Rapid population growth, unacceptable urban expansion, and unwelcome economic growth are all indicated by the effect of a solid waste landfill on groundwater wells in the Ganfouda neighborhood of Benghazi City. Consequently, unclean open landfills and dumps It is a pressing matter. Household, medical, and industrial trash are all included in municipal solid waste; nevertheless, they are not separated and are all disposed of in the same landfill. [19] The main site for disposing of solid waste is a landfill, which has caused pollution, a dangerous environment, and the spread of illnesses. [20]; [21] Groundwater flow or precipitation seepage may affect the garbage dumped in landfills, particularly with Water picks up a range of inorganic particles when it filters through garbage. The resultant contaminated water is referred to as a "solid matter dump". via the soil leaks. However, environmental quality may be seriously threatened by landfills. Even though it was completely secure, it was being used improperly. Perhaps it is hazardous to treat surface water and groundwater. This danger is about the size of a hand. It depends on the kind, volume, and proximity of the leachate to the water sources and the landfill. the landfill [22] A highly concentrated, complicated wastewater known as solid waste comprises dissolved organic matter as well as inorganic substances like ammonium, calcium, magnesium, sodium, potassium, iron, sulphates, and chlorides. The heavy metals cadmium, chromium, lead, and zinc were found in high proportions in the salt we investigated for our research. [23]; [24], which demonstrates that due to the physical, chemical, and microbiological processes that occur in sedimentary waste, each is present in varying amounts [25]. The composition of the filtered material is influenced by a variety of parameters [26], [27], and landfill concentrations are influenced by several variables, including the type of waste, the size of the particles, the degree of compaction, the hydrology of the site, the age of the landfill, the humidity, temperature, and oxygen levels. The stabilization of buried garbage occurs during the procedure. Preservative materials persist for a very long period after the occurrence of waste stabilization, but non-preserving landfill components—which are mostly organic in nature—tend to breakdown and become stable over time [28].

Materials and methods
Study area details

The study area is situated in the western neighborhood of Ganfouda in Benghazi. It is next to the landfill, which was built in 1970. It is roughly 17 km away and is owned by the public works company for services; it is regarded as the city's primary dump. The institution is situated on terrain with fertile, saline soil, covering a total area of around 35 hectares. The landfill is located 3 km from the closest populated centre, and the target is no more than 2 km from the sea. Its borders are the sea to the north, Carrefour to the south, the Qaryounis region to the east, and Mankato Al-Halis to the west. Even though the landfill has been in use for 53 years, just around half of its overall space has been utilized.

Figure 1 Study area with locations of samples.

Sample Collection Method
Then they took 8 water samples from household wells in the Quanfouda neighborhood of Benghazi. The samples were from residential buildings close to the Quanfouda landfill and were taken at random. They were maintained at room temperature until the necessary laboratory tests were run on them during the collecting period in May 2023 (see Table 1 below). The data, sizes, locations where the test samples were collected and tested are depicted in the diagrams and figures in the Arab Medical University water and food analysis laboratory.

Table (1) Description of the location of the selected groundwater sampling sites and the water level of the waste site

Sample	Sample NO	Volume(ml)
Fire at the landfill versus vnfodh	1	0.5
Against the landfill	2	0.5
Ganfouda is to the left of the office, across from the landfill.	3	0.5
Village of al muroos (A)	4	0.5
Village of al muroos (C)	5	0.5
Immigration tool	6	0.5
The region across from the landfill	7	0.5
Village of Al muroos (B)	8	0.5

Analytical methods
Absorption Spectroscopy analysis

- Atomic absorption spectroscopy was used to measure the amount of heavy metals in drinking water. Zn, Pb, Cd, Cr, and Hg contents in groundwater samples using an atomic absorption spectrophotometer with a blank Then precisely weigh the sample, averaging 1 gram and 10 mL of concentrated nitric acid (heat the dish's contents using a gentle flame, such as a Bunsen burner, until any flammable or easily combustible elements have been eliminated). Then, transfer the solution to the volumetric flask and dilute with water to volume.

- By utilising the same steps as for the sample and the same amounts of reagents, including water, for the sample and the blank, one can make a sample solution blank. giving the sample and sample blank the same treatment (such as the amount of time in heat, etc.).
- Adjust the device in accordance with the present ideal circumstances or with the recommendations in the instruction manual (included with the device). Below are the recommended settings for an atomic absorption spectrophotometer. and m n Find the absorbance of the sample solution(s) and the blank, determine the mineral content from the standard curve, and then, after positioning the instrument optimally, read the absorbance of a series of the standard mineral solution(s) in the atomic absorption spectrophotometer. Plot of absorbance against metal solution/ml.

Bacteriological tests

- A microscope was used to calculate the quantity of direct bacterial cells in a water sample. This is done by determining the average number of bacteria in each square on a microscope slide (a red blood cell counting slide) after placing a tiny portion of the mixed sample on it in squares with defined dimensions and areas. We may calculate the number of bacteria in one cubic centimeter of the sample by multiplying the value by the microscopic coefficient. This value is multiplied by the reciprocal of the dilution ratio in the case of diluted samples.
- Bacteria count per milliliter is equal to ((number of bacteria counted in the fields * 2000* reciprocal of dilution)).
- This examination is carried out to look for coliform bacteria.

Discussion

The physicochemical characteristics of the leachate depend primarily upon the waste composition and water content of the total waste. The characteristics of the leachate samples collected from landfill sites are presented in the Ganfouda region. Typically regarded as a major pollutant, TDS is used as an indicator of both the general characteristics of drinking water and the presence of a variety of chemical contaminants. The current range of water sample concentrations is 21560 mg/L to 4735 mg/L. TDS should not exceed 1000 mg/L, which is also the acceptable maximum in the absence of a source. A substitute is 2000 mg/L. The Food and Nutrition Board of the National Research Council recommends that the healthiest adults consume at least 500 mg of sodium per day and that sodium intake be limited to no more than 2,400 mg per day. M agrees with this low level of anxiety. Due to legitimate criticism of the EPA's 20 mg/L (Drinking Water Equivalent Level (DWEL) or Guideline Level) for sodium, the maximum allowed sodium content is 200 mg/l according to WHO guidelines**.** Nitrates, lead, cadmium, chromium, and mercury concentrations ranged from 1.260 to 8.150, 0.005 to 0.017%, 0.005 to 0.013%, 0.010 to 0.027, and 0.001 mg/L, respectively. High levels of lead and cadmium were found in the groundwater well samples, above the permitted limit for inorganic drinking water in Ganfouda (0.005-0.003 mg/l). For inorganic drinking water, **[3]** Analysis of water samples for cadmium, chromium, and lead concentrations since it was successfully identified as a mineral heavy in water for drinking **[4]** compared to the water system.

The analysis of the lead metal values for all samples It was discovered that every sample complied with the requirements for drinking water, with the exception of the first, fourth, and eighth samples, which did not, and the second sample, which was entirely at the maximum level. The brain, liver, kidneys, and bones are all affected by lead, which is dispersed throughout the body. It is kept in the bones and teeth, where it builds up over time. The usual method for determining human lead exposure is to measure blood lead levels. During pregnancy, lead enters the blood from the bones, where it is then exposed to the developing foetus.

The comparison of the results for cadmium metal for all samples to the requirements for drinking water All of the samples were discovered to contain cadmium metal. Cadmium can induce kidney failure, pulmonary crises, inflammation, and chronic emphysema leading to lung cancer in amounts greater than the maximum allowable level of cadmium pollution. Blood, bones, liver, and damage Based on the analysis of the results for coliform bacteria for all samples in comparison to drinking water standards, Sample 3 was discovered to have colon-specific bacteria.

The results for coliform bacteria for all samples to drinking water standards illustrate the analysis. There were bacteria unique to the colon in the sample (3), it was found. The following are some indicators that a person may be infected with the E. coli bacteria: Acute diarrheal: Diarrhoea can become painful and bloody during ache. In addition to cramps, stomach aches, and a lot of gas, flatulence also involves these symptoms. Loss of appetite is a symptom of anorexia. Fever: An infection with coliform bacteria may result in a fever. Vomiting and nausea are caused by illnesses that have an impact on the digestive system and intestines. Exhaustion, particularly when hunger and eating habits decline.

Results and Analysis
A-Physical Examinations
1-PH analysis

Results in Table (2) below and Figure (2) below. indicate that the samples were within the permitted ranges, which are the pH concentrations for groundwater boreholes between 6.5 and 8.

Table 2 Compares the results of PH measurements to the permitted drinking water standards.

Sample	Sample No	Result	permitted range
Fire at the landfill versus vnfodh	1	7.3	6.5-8
against the landfill	2	7.1	6.5-8
Ganfouda is to the left of the office, across from the landfill.	3	7.3	6.-8
Village of al muroos (A)	4	7.7	6.5-8
Village of al muroos (C)	5	7.2	6.5-8
Immigration tool	6	7.5	6.5-8
The region across from the landfill	7	7.5	6.5-8
Village of al muroos (B)	8	7.4	6.5-8

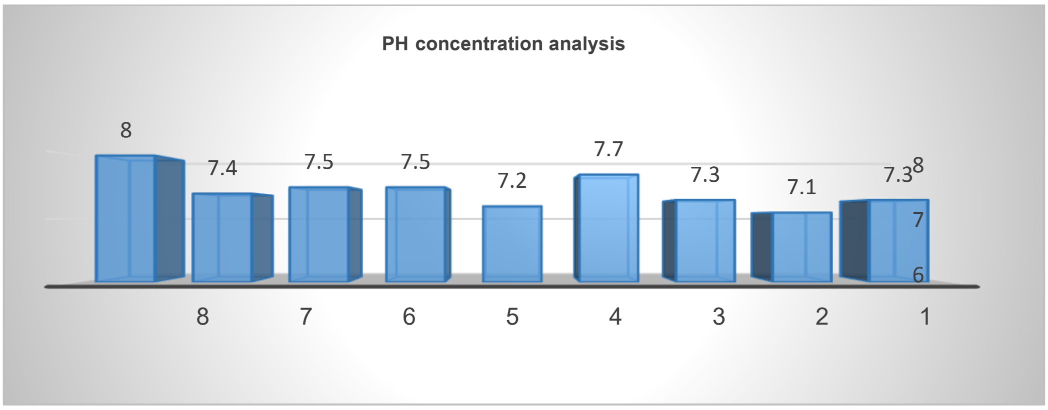

Figure 2 Analysis PH in comparison to the permitted maximum level for drinking water **.**

2- Dissolved salts total T.D.S

Results in Table (3) below and Figure (3) below showed that the samples did not satisfy Libya's standards for drinking water. Additionally, it was found that the lowest sample concentration is (6) Immigrating tools, with a concentration of 1560 ppm, which is brought on by the ground's vicinity. Three samples were taken: (1) Fire at the landfill versus vnfodh, which had a concentration of 4560 ppm; (2) Against the landfill, which had a concentration of 4270 ppm; as well as (3) Ganfouda, which was across from the landfill and to the left of the office.

Table 3 Compares the results of T.D.S measurements to the permitted drinking water standard

Sample	Sample No	Result	Permitted range
Fire at the landfill versus vnfodh	1	4560	1000
Against the landfill	2	4270	1000
Ganfouda is to the left of the office, across from the landfill.	3	4735	1000
Village of al muroos (A)	4	2250	1000
Village of al muroos (C)	5	3600	1000
Immigration tool	6	1560	1000
The region across from the landfill	7	3165	1000
Village of al muroos (B)	8	3895	1000

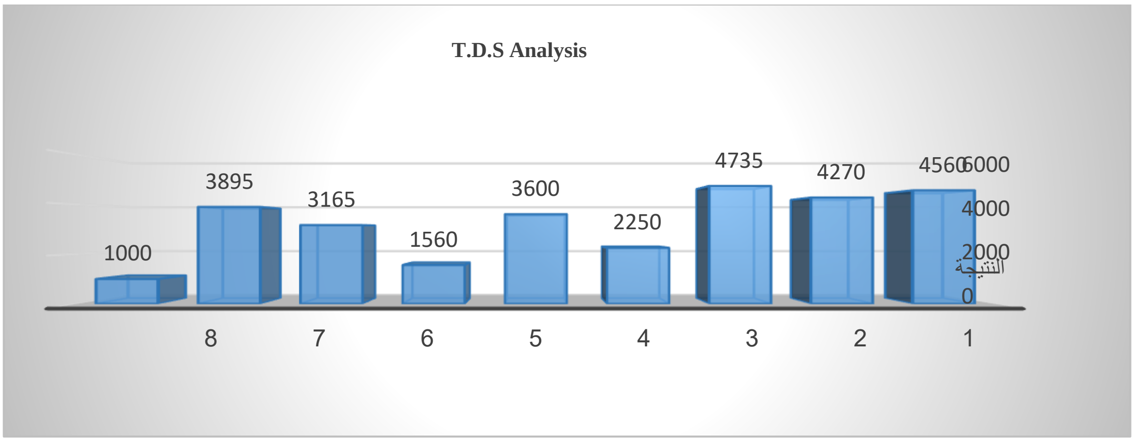

Figure 3 Analysis T.D.S in comparison to the permitted maximum level for drinking water.

3- Odour

Samples are within the allowed limit, according to the data in Table (4) below and Figure (4) below. With the exception of Sample No. 3 (Ganfouda), which is situated to the left of the office and across from the dump. include the proximity to the sewage system that detected coliform bacteria.

Table 4 Compares the results of smiling testing to the permitted drinking water standard.

Sample	Sample No	result
Fire at the landfill versus vnfodh	1	Acceptable
against the landfill	2	Acceptable
Ganfouda is to the left of the office, across from the landfill.	3	Unacceptable
Village of al muroos (A)	4	Acceptable
Village of al muroos (C)	5	Acceptable
Immigration tool	6	Acceptable
The region across from the landfill	7	Acceptable
Village of al muroos (B)	8	Acceptable

4. Color

All samples, except for sample No. 3, which is grey in color, are transparent and range within the permitted distances, as shown by the results in Table (5) below.

Table 5 The results of the color tests in relation to the standards of drinking water.

Sample	Sample No	Result
Fire at the landfill versus vnfodh	1	Transparent
Against the landfill	2	Tansparent
Ganfouda is to the left of the office, across from the landfill.	3	Grey
Village of al muroos (A)	4	Transparent
Village of al muroos (C)	5	Transparent
Immigration tool	6	Transparent
The region across from the landfill	7	Transparent
Village of al muroos (B)	8	Transparent

B- Chemical Test

1. **Sodium element (Na)**

Based on the results in Table (6) below and Figure (6) below, it was found that samples No. 2 (Against the landfill) and No. 4 (Village of al muroos (A)) had values of 215.070 and 202,862, respectively. The remaining samples, which are samples (1/3/5/6/7/8), were found to satisfy the standards for drinking water, which are, respectively, (169.120/188.001/179.500/153.244/191.111/170.109). The two samples were determined to be in excess of the maximum limits for the inorganic content of drinking water.

Table 6 Results of comparing the Sodium element concentration to the drinking water's permissible limits

Sample	Sample No	Result	Permissible limit
Fire at the landfill versus vnfodh	1	169,120	200
Against the landfill	2	215,070	200
Ganfouda is to the left of the office, across from the landfill.	3	188,001	200
Village of al muroos (A)	4	202,862	200
Village of al muroos (C)	5	179,500	200
Immigration tool	6	153,244	200
The region across from the landfill	7	191,111	200
Village of al muroos (B)	8	170,109	200

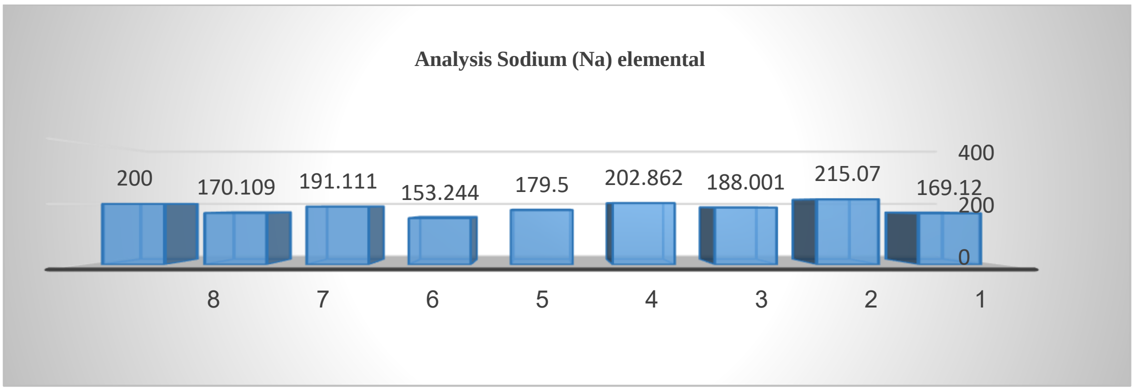

Figure 4 Analysis of Sodium (Na) element compared to the permitted drinking water concentration.

2- Results and Analysis of heavy metals
A- Nitrate metal (NO^-_3)

Firs sample from the dump against vnfodh had the lowest concentration, while the sample from the village of Al Muroos (A), which had a concentration of 8.150 ppm, had the highest. These data are shown in Table (7) below and Figure (7) below. The inorganic concentration of each sample was within the permissible ranges. The value for samples is (1.190 ppm/1.260 ppm/ 3.605 ppm/4.560 ppm/6.200 ppm/ 6.850 ppm, and 8.150 ppm) for Borehole NO are (1/5/7/3/6/2/8/4).

Table 7 Results of comparing the Nitrate metal (NO_3^-) concentration to the drinking water's permissible limits

Sample	Sample No	Result	Permissible limits
Fire at the landfill versus vnfodh	1	1,190	10
Against the landfill	2	6,850	10
Ganfouda is to the left of the office, across from the landfill.	3	4,560	10
Village of al muroos (A)	4	8,150	10
Village of al muroos (C)	5	1,260	10
Immigration tool	6	6,200	10
The region across from the landfill	7	3,605	10
Village of al muroos (B)	8	6,890	10

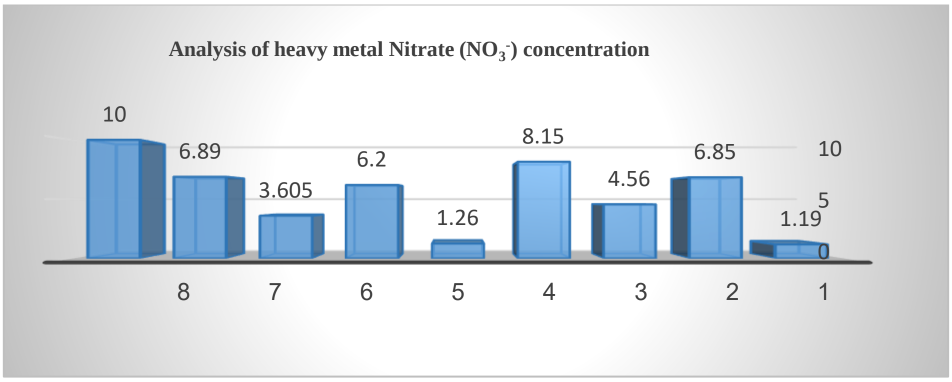

Figure 5 Analysis of Nitrate metal (NO_3^-) was compared to the permitted drinking water concentration.

B-. Lead (Pd)

Three samples, (1) (fire at the dump versus VNFODH), (4) (Village of al muroos (A)), and (8) (Village of al muroos (B)), were found to have concentrations of (0.00.014%, 0.017%, and 0.015%) that were higher than what was permitted based on the results given in Table (8) below and Figure (8) below, and the concentration of samples No. 2 against the landfill No. 3 Ganfouda is to the left of the office, across from the landfill. And No. 6, the immigration tool, was (0.010/0.008, and 0.009). Two samples, from the Village of al muroos (C) and the region across from the dump, were below the allowed limits for inorganic levels in drinking water.

Table 8 Results of comparing the lead metal (Pb) concentration to the drinking water's permissible limit

Sample	Sample No	Result	Permissible limits
Fire at the landfill versus vnfodh	1	0.014	0.005
Against the landfill	2	0.010	0.005
Ganfouda is to the left of the office, across from the landfill.	3	0.008	0.005
Village of al muroos(A)	4	0.017	0.005
Village of al muroos(C)	5	0.005	0.005
Immigration tool	6	0.009	0.005
The region across from the dump	7	0.005	0.005
Village of al muroos(B)	8	0.015	0.015

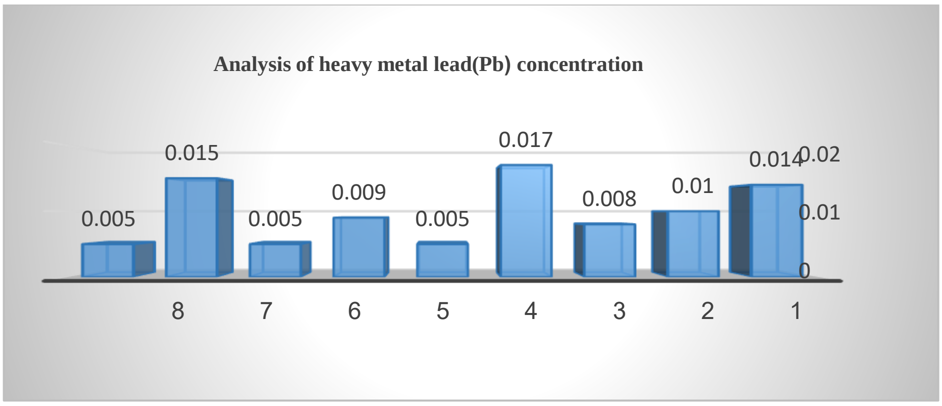

Figure 6 Analysis of Lead metal (Pb) was compared to the permitted drinking water concentration.

C- Cadmium (Cd)

Based on the results shown in Table (9) below and Figure (9) below, sample analysis for all samples tested showed that the concentrations were higher than the permitted limits. The sample result for the landfill fire vs. Ganfouda had a concentration of (0.009). The highest concentration of inorganic contents for drinking water, which is 0.013, was found in sample No. 7 (The area next to the landfill). The inorganic contents for samples, which are correspondingly (0.009/0.012/0.005/0.008/0.005/0.010/0.013/0.005), Paraphrase Three samples (3/5/8) (Ganfouda is to the left of the office, across from the landfill / Village of al muroos(C)/ Village of al muroos(B)) were outside the maximum permissible limits.

Table 9 Results of comparing the Chromium metal (Cd) concentration to the drinking water's permissible limit

Sample	Sample No	Result	Permissible limits
Fire at the landfill versus VNFODH	1	0.009	0.003
Against the landfill	2	0.012	0.003
Ganfouda is to the left of the office, across from the landfill.	3	0.005	0.003
Village of al muroos(A)	4	0.008	0.003
Village of al muroos(C)	5	0.005	0.003
Immigration tool	6	0.010	0.003
The region across from the dump	7	0.013	0.003
Village of al muroos(B)	8	0.005	0.003

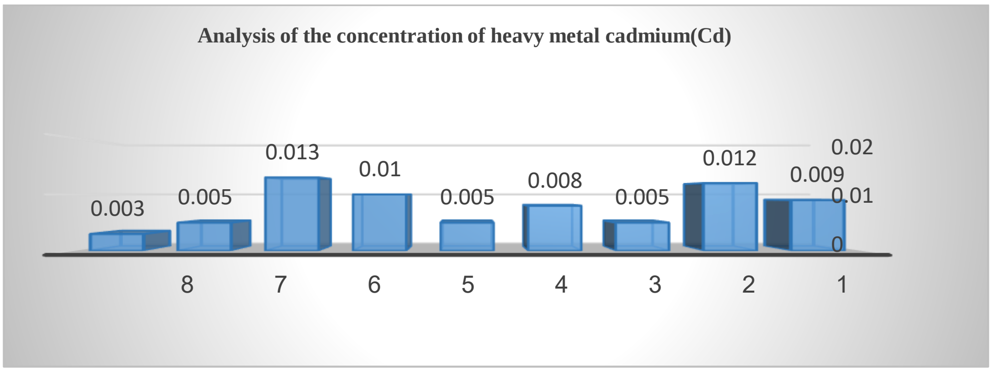

Figure 7 Analysis Cadmium metal (Cd) was compared to the permitted drinking water concentration**.**

D- Chromium (Cr)

Results in Table (10) below and Figure (10) below show that sample No. 6 (Immigration Tool) had the lowest value at 0.010 and sample No. 5 (Village of al muroos (C)) had the greatest concentration at 0.027 (0.10/0.011/0.012/0.125/0.016/0.019/0.020/0.027) for samples (6/3/4/8/1/2/5).

Table 10 Results of comparing the Chromium metal (Cr) concentration to the drinking water's permissible limit

Sample	Sample No	Result	Permissible limits
Fire at the landfill versus vnfodh	1	0.016	0.05
Against the landfill	2	0.020	0.05
Ganfouda is to the left of the office, across from the landfill.	3	0.011	0.05
Village of al muroos(A)	4	0.012	0.05
Village of al muroos(C)	5	0.027	0.05
Immigration tool	6	0.010	0.05
The region across from the dump	7	0.019	0.05
Village of a muroos(B)	8	0.0125	0.05

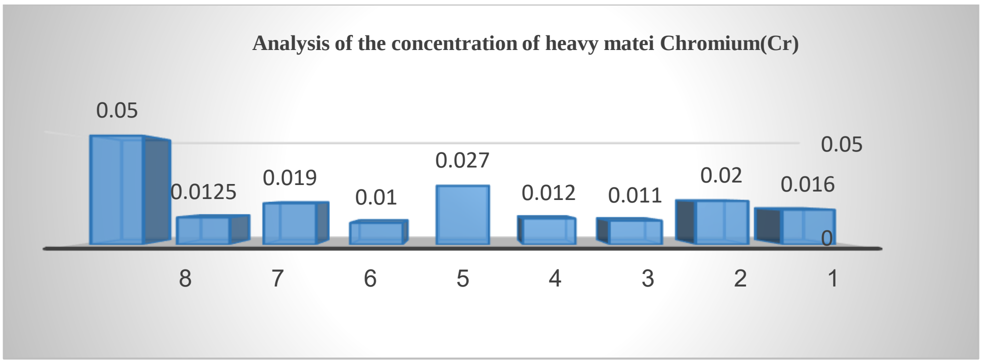

Figure 8 Analysis of Chromium metal (Cr) was compared to the permitted drinking water concentration.

E- Mercury (Hg)

Results are shown in Table (11) below and Figure (11) below. It was found that all samples were less than 0.001. The samples were found to be within the permitted limits for the inorganic content of drinking water and devoid of mercury.

Table 11 Results of comparing the Mercury metal (Hg) concentration to the drinking water's permissible limit

Sample	Sample No	Result	Permissible limits
Fire at the landfill versus vnfodh	1	0.001	0.01
Against the landfill	2	0.001	0.01
Ganfouda is to the left of the office, across from the landfill.	3	0.001	0.01
Village of al muroos(A)	4	0.001	0.01
Village of al muroos(C)	5	0.001	0.01
Immigration tool	6	0.001	0.01
The region across from the dump	7	0.001	0.01
Village of al muroos(B)	8	0.001	0.01

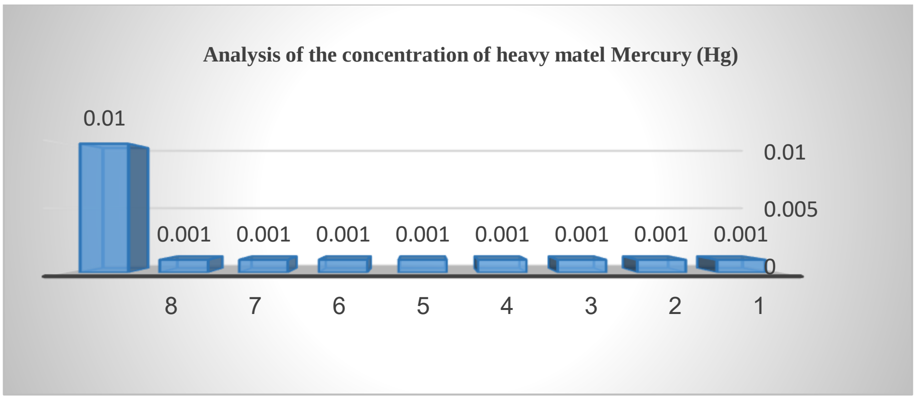

Figure 9 Analysis of Mercury metal (Hg) was compared to the permitted drinking water concentration.

Bacteriological Examinations

1. Determine how many Bacteria are present overall.

Based on the results in table (12) below and figure (12) below, the samples (1/3/4/5/7) were taken from the locations Fire at the landfill versus vonfodh, Ganfouda is to the left of the office, across from the landfill., Village of al muroos(A), Village of al muroos(C), and the region across from the dump. While the other samples satisfied the standards for drinking water, which are, respectively, (2/6/8), which is Against the landfill, Immigration Tool/Village of al muroos (B), the samples that were tested did not reach the permissible limits for bacteria in drinking water.

Table 12 Results of comparing the Total Bacteria concentration to the drinking water's permissible limit

Sample	Sample No	Result	100X Score convertible to ml	Permissible limits
Fire at the landfill versus VNFODH	1	Colony/1m	100 ml	100 ml
against the landfill	2	There is no growth	There is no growth	100 ml
Ganfouda is to the left of the office, across from the landfill.	3	C olonies/69 mL	690 ml	100 ml
Village of al muroos(A)	4	Colonies/4 ml	400 ml	100 ml
Village of al muroos(C)	5	Conoly/1 ml	100 ml	100 ml
Immigration tool	6	There is no growth	There is no growth	100 ml
The region across from the dump	7	Colonies/3 ml	300 ml	100 ml
Village of al muroos(B)	8	There is no growth	There is no growth	100 ml

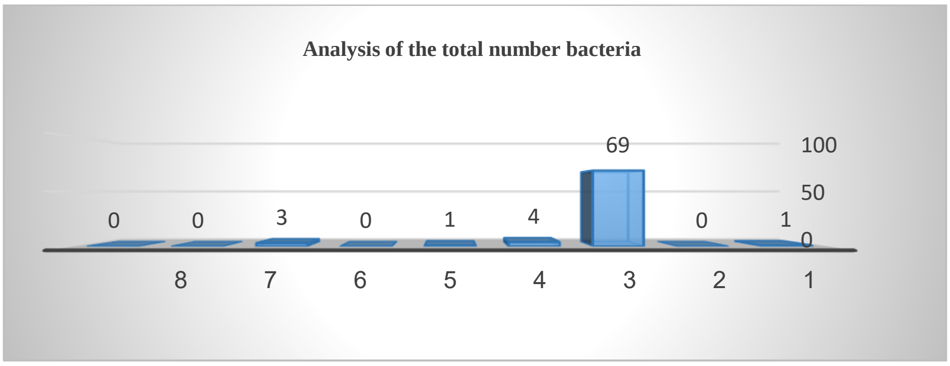

Figure 10 Analysis of Total Bacteria compared to the permitted drinking water concentration.

2. Estimation of the Coli Bacterium

Based on the results in Table (13) below and Figure (13) below, the sample (3) (Ganfouda is across from the dump and to the left of the office) had Coliform Bacteria at a level of 16 colonies/ml, above the permitted limits for coliform bacteria in drinking water. The remaining samples, which are (1/2/4/5/6/7/8), that is, Fire at the landfill versus vnfodh, Against the landfill, Village of al muroos (A), Village of al muroos (C), Immigration tool, and the Area across from the dump, Village of al muroos (B), permissible standard drinking water

Table 13 The results of Total Coli Bacteria concentration compared to the allowable limits for the inorganic components of drinking water

Sample	Sample No	Result	Permissible limits
Fire at the landfill versus vnfodh	1	There is no growth	0/100 ml
Against the landfill	2	There is no growth	0/100 ml
Ganfouda is to the left of the office, across from the landfill.	3	Colonies /16 ml	0/100 ml
Village of al muroos(A)	4	There is no growth	0/100 ml
Village of al muroos(C)	5	There is no growth	0/100 ml
Immigration tool	6	There is no growth	0/100 ml

The region across from the dump	7	There is no growth	0/100 ml
Village of al muroos(B)	8	There is no growth	0/100 ml

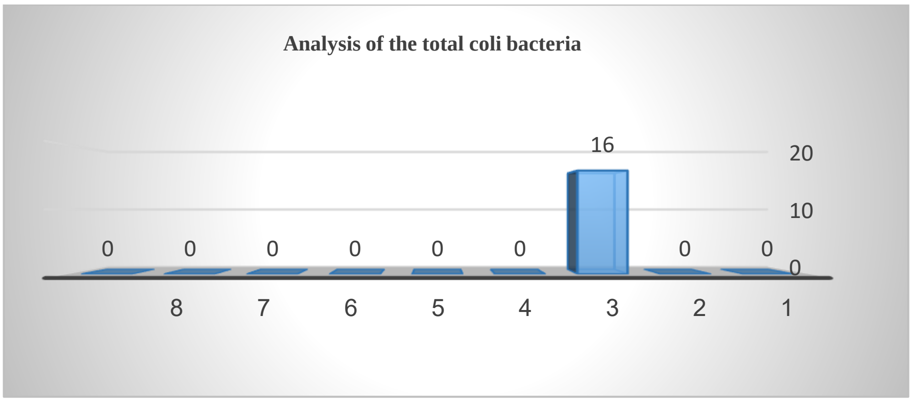

Figure 11 Analysis Total Coli Bacteria compared to the permitted drinking water concentration**.**

Conclusion

Groundwater quality for drinking and other household applications was shown to be diminished in areas close to landfills due to TDS, Cd, Pd, and bacterial concentrations that were found to be rather high. It can be concluded that leachate has a significant impact on groundwater quality in the vicinity of all three dump sites because there is no natural explanation for the high concentration of these contaminants. The depth of the well and its distance from the disposal site were both found to improve the quality of the groundwater. Yet some pollutants do not exceed the limits for drinking water in the concentrations found in groundwater. It was discovered that a certain set of dissolved salts included in all domestic well water tests was above the maximum permissible level of pollutants. Samples Nos. 1, 4, and 8 were found to contain more lead metal than is permitted, which is bad for the kidneys, neurological system, bones, liver, and blood. In excess of the permitted amount for pollutants in domestic well water, all samples contain levels of cadmium metal, which damages the kidneys, bones, liver, and blood.

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