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### RESEARCH ARTICLE

## EVALUATION ZULFI GROUND WATER QUALITY USING INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETER (ICPMS).

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Spectrometer.

### Abstract

Some of the heavy metal such as Cadmium ( Cd ), lead ( Pb) and Zink (Zn) etc. are strongly poisonous meals it affects the enzymes. In this study the means concentrations of Cadmium ( Cd ), lead ( Pb) and Zink (Zn), Aluminum (Al), and Chromium (Cr) were measured using Inductively Coupled Plasma-Mass Spectrometer .to find it concentrations limits prescribed by World Health Organization (WHO) for drinking water. Mean concentrations measured for all samples of Cadmium ( Cd ), lead ( Pb) and Zink (Zn), Aluminum (Al), and Chromium (Cr) are not exceed the drinking water specified limits prescribed by World Health Organization (WHO).

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### Introduction:-

water shortage Saudi Arabian has great problem because water demand is exceeding the sustainable yields of natural resources. The only reliable water resources used for municipal are desalinated water and brackish groundwater.[1].

Zulfi is considered to have a desert climate.[2]

The total population in 2017 was 32.613731 million[3] Fig.1 of which 76 percent were Saudi nationals. Some 80 percent live in the towns and cities. Between 2000 and 2005 the annual population growth rate was 2.7 percent. In 2006, 97 percent of the urban population had access to improved water sources and the whole urban population had access to improved sanitation. The agriculture sector used about 70%-80% from fresh water [4,5]. Groundwater quality is most important for drinking water or in domestic , and irrigations; its quality affected by different factors such as geochemical processes, and human activities5 . polluted Water is threats human health and economic development [6, 7, 8]. The key tool to estimate the water quality and its suitability for drinking, irrigation, or domestic is the Physical and chemical properties of groundwater[ 9, 10]. Groundwater is an important source of acceptable water for drinking the Saudi Arabia where it is the sole water source for drinking, also used in irrigation.

seasonal rainfall through surroundings, mountains as well as valleys Zulfi province is located at the bottom of a valley between two huge dunes of special composition red sand. The surrounding mountains of this valley play major role of replacing water of groundwater [11]

A heavy metals like heavy metal such as Cadmium ( Cd ), lead ( Pb) and Zink (Zn) etc. ,are useful metals , e.g. Cobalt is used to treat anemia with pregnant woman [12] , however , in high concentrations it became very dangerous to health.[17]. The health hazard of this elements is as such :

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kidney dysfunction hypertension and cancer, while lead cause nerves system disorder , and Chromium cause skin ulceration . the excess zinc can be cause Zinc toxicity [17] [12,13,14]

The graph displays the population of Saudi Arabia from 1950 to 2017. The x-axis represents years from 1960 to 2010 in 10-year increments. The y-axis represents population in millions, ranging from 0 to 30,000,000. The population shows a steady increase over the period, with a more rapid growth rate starting around 1980.

Year	Population (Millions)
1950	~2.0
1960	~3.0
1970	~4.5
1980	~10.0
1990	~16.0
2000	~21.0
2010	~27.0
2017	~32.0

**Figure 1:-** progressing in Saudi Arabia population(1950-2017)[3]

Study Area: Ground water samples were collected from wells (n=10) located in the Zulfi province . The Zulfi province about 260 kilometres northwest of Riyadh.[15] lies in the northern-central region of the Najd and to the south of the sheayb samnan (samnan Valley), which is the longest valley on the zulfi. It is surrounded by sand dunes to its north and west, which are known locally as the Al-Thoyr Sands. The Al-sabalh Woods are located to the north of the city. Fig 2. The sampling was carried out over four month period in 2015 . The location of the wells was recorded using Geological Positioning System (GPS).



**Figure(2):-** Location of Zulfi province

The samples were collected in 0.25-liter plastic bottles. These were immediately acidified to pH 2 with HNO<sub>3</sub> in order to keep metals in solution and prevent precipitation. All samples were transported to the laboratory in iceboxes and refrigerated at 4°C until analyzed. The analytical determination of trace metals was carried out by ICP-MS (Inductively Coupled Plasma-Mass Spectrometer): NexION 300D (Perkin Elmer, USA).

### Results and discussion:-

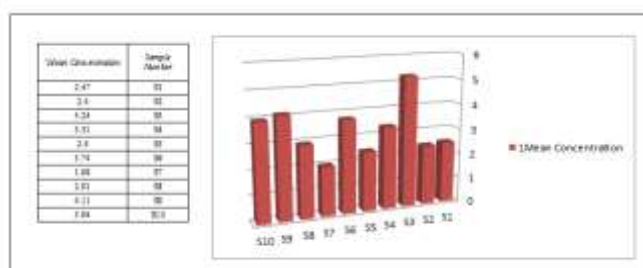
The acceptable limits of concentrations of heavy elements are shown in Table 1. [12, 16, 18 , 22]

**Table 1:-**The prescribed limits of heavy elements

Metal	Highest desirable concentrations mg/L	Maximum permissible concentrations mg/L
Cd	75	200
Al	0.03	0.2
Zn	5	15
Cr	0.05	0.05
Pb	0.1	13.4

Aluminum (Al) Concentration in Water Samples ( $\mu\text{g/L}$ ):-

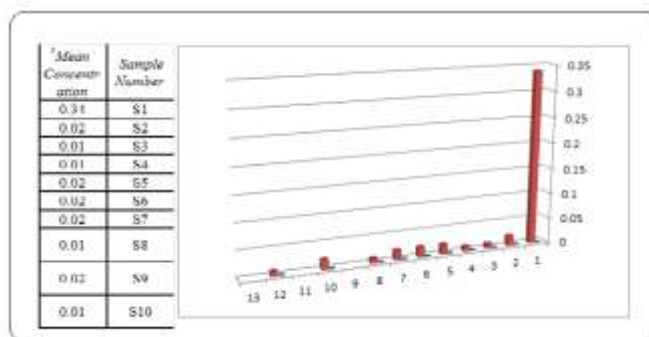
Fig.4 The mean concentrations of (Al) , maximum and minimum concentrations of concentrations are 0,005 mg/L and 0.00198 mg/L respectively. Table 2 .and Fig.4.The World Health Organization has recommended that aluminum levels in community water supplies should not exceed 0.2 mg/L. [19].



**Figure 3:-** Aluminum (Al) Concentration in Water Samples ( $\mu\text{g/L}$ )

### Cadmium (Cd) Concentration in Water Samples:-

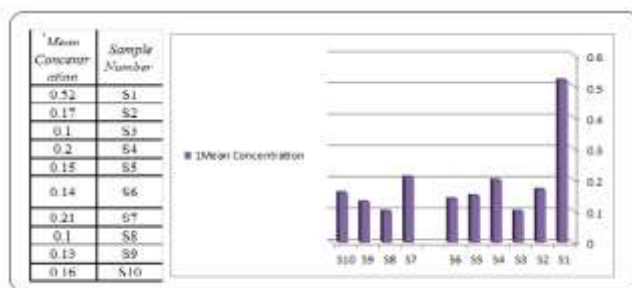
In natural water the Permissible Cadmium concentrations are usually below 1  $\mu\text{g/l}$ [20 , 21]. the concentrations of Cadmium in Zulfi ground water as measured is 0.34 $\mu\text{g/l}$  as maximum concentration and 0.01  $\mu\text{g/l}$ as minimum concentration .Fig.4



**Figure 4:-** Cadmium (Cd) Concentration in Water Samples ( $\mu\text{g/L}$ )

### Lead (Pb) Concentration in Water Samples:-

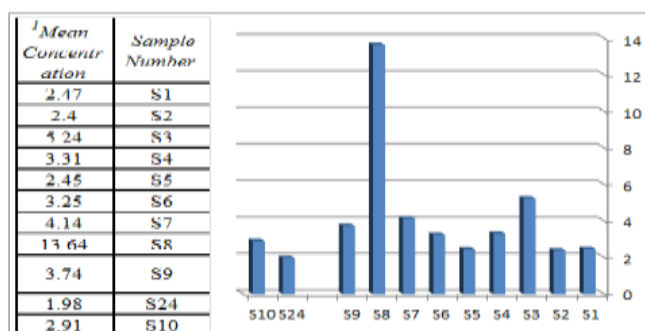
The source of lead in the environment is combustion of gasoline with lead. In environmental fund as ions  $\text{Pb}^{2+}$ . it harm soft tissues is one month, and of liver is 50 years [22, 23]. Maximum permissible limit for lead in drinking water is 0.01 mg/l [24]. Maximum and minimum concentrations of Pb was 0.52  $\mu\text{g/L}$  and 0.1  $\mu\text{g/L}$  respectively Fig.5.



**Figure 5:-** Lead (Pb) Concentration in Water Samples

#### Chromium (Cr) Concentration in Water Samples:-

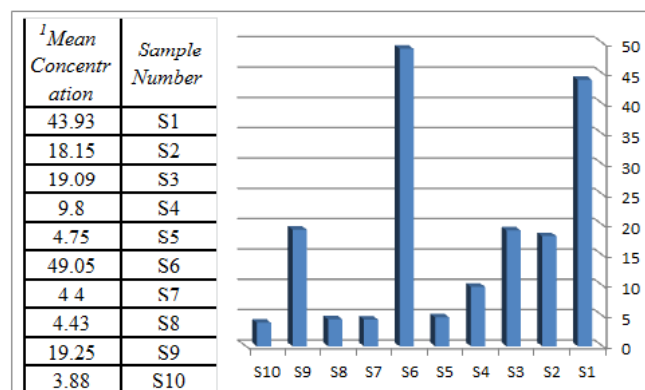
It reviewed , that maximum acceptable concentration of with chromium in drinking water is 0.1 mg/L (100 µg/L).[25].Chromium (Cr) Concentration is acceptable for drinking n Zulfi ground water Fig.(6) .



**Figure 6:-** Chromium (Cr)Concentration in Water Samples (µg/L)

#### Zinc (Zn) Concentration in Water Samples:

ground water will be polluted if the Concentration of Zn is greater than 5.0 mg/l[26] . No samples exceed the permissibly value Fig.(7)



**Figure 7:-** Zinc (Zn)Concentration in Water Samples (µg/L)

#### Conclusion:-

The main goal of this study was evaluate the groundwater quality of Zulfi province for drinking . The study indicates that the concentrations of the samples of wells and springs samples in Zulfi province below acceptable for drinking.

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