

DETERMINATION OF METALS FROM DRINKING WATER OF DALBANDIN, DISTRICT CHAGHI BALOCHISTAN, PAKISTAN

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ABSTRACT

Water is very vital factor for all biological processes taking place in our environment. Without water life is unpredictable. Water is a universal solvent. Balochistan is the biggest territory of Pakistan. Following study was completed to decide the convergence of metals in surface and ground water of Chaghi (Dalbandin) district of Balochistan. Seven (7) water samples were collected for this purpose. Physicochemical parameters (PH, Electrical conductivity, Total dissolved solids, and salinity) were examined. Assurance of metals for example Iron (Fe), Manganese (Mn), Cobalt (Co), Lead (Pb) and Antimony (Sb) were completed utilizing Atomic absorption Spectrophotometer. From the following study it was analyzed that all water samples has pH, TDS, and Salinity values within the range of World Health Organization (WHO) and Environmental protection agency (EPA) range that is from 6.5 to 8.5, <1000mg/L, 500 mg/L respectively. The electrical conductivity of all water samples is higher than the WHO and EPA limits that is 1000 μ S/cm. It was also analyzed that water samples of K K Rahim bore, Sagesha, Sia jungle contain Fe in a range (0.2277, 0.2687, 0.2687) that is less than the WHO and EPA limit. The water sample collected from Laghap, Bypass Marble Factory, School bore Bypass, Bypass contain Fe higher than the recommended value of WHO and EPA limit that is 0.3. Concentrations of Pb, Sb and Co were higher than the standards set by WHO and EPA. All water samples contain Mn in a range of WHO and EPA limit that is 0.5 and <0.5.

KEYWORD: Ground Water, Atomic Absorption Spectroscopy, Metals, Physicochemical Parameters, Chaghi, Balochistan Pakistan.

INTRODUCTION

Balochistan is the biggest region of Pakistan.^[1] and around 54% region under is surface water system and the staying 46% is under groundwater water system.^[2] Dalbandin is a city in District Chaghi, Balochistan, close to the Iran and Afghanistan outskirts. It is situated at an elevation of 843 m (2769 ft). Dalbandin is a city of district Chaghi, near the Iran and Afghanistan border of Balochistan.^[3]

Water

Water is very necessary for all biotic factors of the environment. Life is impossible without it.^[4] Water is a universal solvent. It can dissolve many substances in it like salt, acids, bases and different gases. Some substances are water loving known as hydrophilic, and some are water hating known as hydrophobic.^[5]

Heavy metals

A heavy metal has relatively high density and even at low quantity it is lethal.^[6] Heavy metals naturally exist on the earth crust and cause uncleanness because they cannot be degraded.^[6] The heavy metals are persisting in the environment for a long time and disturb the food chain. Some heavy metals like Cu, Fe, and Zn are macronutrient but have lethal effect at high concentration.^[1,7,8] These metals exist naturally and their amount can be increases by human activities.^[9] Heavy metals have atomic weights from 63.5 to 200.6 and have specific gravity greater than five.

Water and heavy metals

Pure and clean drinking water is a right of human for their good health. Water gets polluted by the increase in the quantity of heavy metals and the main source of these heavy metals are the industries of textile dyeing,

fertilizer production, metal coating, metallurgy, and industry of the battery.^[10] The unsafe or contaminated water cause serious problem like nervous disorder, cancer, cardio vascular diseases, and also cause very toxic effect on infants and younger. It damages the development of fetus body system.^[11]

Iron is the fourth most abundant element and present in outer and inner core of the earth.^[12] The natural sources of iron leaf vegetables, chickpeas, beans, peas, poultry, and sea food,^[13] Iron in drinking water is soluble in and can spoil the water by adding colour and flavor to the water. It cause reddish brown tinge on utensils, glass wear, dishes. Iron also form black sludge on treatment with tannins in beverages tea and coffee.^[14,15]

Manganese is a metal. A Swedish chemist Johan Gottfried Gahn first recognizes this element. Manganese is used in alloys mainly in stainless steel.^[16] It is present in the body in fewer amounts. Human body contains 12 mg of Mn.^[13,17]

Cobalt is a transition metal with symbol Co. It was first introduced by Swedish chemist Georg Brandt in 1739. It is shiny and stable metal and not oxidized by air or water. It is a magnetic metal.^[18] It is a bluish white d-block element. It has single stable isotope Co⁵⁹ and its artificial isotope is Co-60 and it is a good source of gamma rays. It has high melting point (1495°C). It has two oxidation state +2 and +3. The first ionization potential of cobalt is 708 eV.^[19,20] Intense introduction to elevated levels of cobalt by inward breath in people and creatures brings about respiratory impacts, for example, a noteworthy decline in ventilator capacity, blockage, edema, and hemorrhage of the lung.^[21]

Lead is a heavy metal. It has amphoteric nature and relatively unreactive metal. Its oxides react with both

bases and acids.^[22] Presence of lead in drinking water is a major problem for the people living in developing or developed countries. In Pakistan it was studied that Karachi has some areas which have high concentration of lead in drinking water.^[23] It was hypothesized that people living in Pakistan have high concentration of lead in their blood which is the major cause of hypertension.^[24]

Antimony is also a heavy metal. Naturally it exist in its sulphide ore like stibnite (Sb₂S₃) and valentinite (Sb₂O₃). Its melting point is 631°C and its density is 6.684g/cm³. Antimony is refined by roasting its ore with charcoal or cock. Its trichloride (SbCl₃) is decompose into chlorine and oxide and it is very poisonous.^[25]

METHODOLOGY

The samples were collected from different areas of Dalbandin (city of district Chaghi). One liter sterilized reagent bottles were used for the collection of water sample, The samples were divided into two parts; for the detection of heavy metals and also for the determination of the various parameters like pH, salinity, electrical conductivity, total dissolved solids (TDS).^[26] In the research facility, the samples were sifted through Whatman no2 filter paper. One hundred milliliters of the separated water was blended in with 5mL concentrated nitric corrosive (HNO₃) and 5mL concentrated sulphuric acid corrosive (H₂SO₄).^[27] To enable the acids to get concentrated, the mixture was warmed until the volume was diminished to around 15 to 20mL.^[28] The processed sample was permitted to cool at room temperature. It was then sifted through Whatman's no2 filter paper. The last volume was acclimated to 100 mL with double refined water and put away for the investigation of metals by atomic absorption spectroscopy.^[27]

RESULTS AND DISCUSSION

Table: of physycoparameters.

S. No.	Samples	pH	TDS (mg/L)	Salinity (mg/L)	Conductivity (µS/cm)
	World Health Organization (WHO)	6.5-8.5	<1000	-	1000
	Environmental protection agency (EPA)	6.5-8.5	<1000	500	-
A	Distil water	7.1	0.005	0.011	0.35
B	Blank (Tap)	8	0.48	0.43	827
1	KK Rahim Bor	7.1	1.11	1.22	1560
2	Laghap	8.2	0.62	0.6	1167
3	Bypass Marble Factory	8.3	2.52	2.47	1981
4	School bore Bypass	7.8	2.24	2.13	4220
5	Sagesha	8	1.01	0.88	1405
6	Sia Jangle	8.2	0.74	0.61	1220
7	Bypass	8	2.20	2.10	2457

pH water Samples

pH is very vital parameter of water it tells us about the acidity or basicity of water. The pH of pure water is seven. Water having pH less than 6.5 is deliberate as acidic. This type of water commonly considered as soft

an eroded. It may have metal ions like Cu, Fe, Pb, Mn and Zn. Basic or alkaline water has a pH higher than 8.5. It is also known as hard water having ions that can deposit and forms scales in pipe.^[29]

pH of distill water and tap water is 7.1 and 8.0. pH of all water samples, K K Rahim bore 7.1, Laghap 8.2, Bypass Marble Factory 8.3, School bore bypass 7.8, Sagesha 8.0, Sia jungle 8.2, Bypass 8.0 ranged from 7.1 to 8.3. According to EPA and WHO the suggested pH for water is 6.5 to 8.5 correspondingly. The pH standard of all water samples was within the limits of WHO and EPA.^[30,31]

Total Dissolved Solids (TDS) of water samples

TDS of distill water and tap water is 0.005 and 0.48. TDS of all water samples K K Rahim bore 1.11, Laghap 0.62, Bypass Marble Factory 2.52, School bore bypass 2.24, Sagesha 1.01, Sia jungle 0.74, Bypass 2.20 ranged from 0.62 to 2.52. According to EPA and WHO the suggested TDS limit for water is <1000mg/L correspondingly. The TDS standard of all water samples was within the limits of WHO and EPA.

Salinity of Water Samples

Salinity of distill water and tap water is 0.011 and 0.43. Salinity of all water samples K K Rahim bore 1.22, Laghap 0.6, Bypass Marble Factory 2.47, School bore bypass 2.13, Sagesha 0.88, Sia jungle 0.61, Bypass 2.10 ranged from 0.6 to 2.47. According to EPA the suggested salinity limit for water is 500mg/L correspondingly. The salinity standard of all water samples was within the limits of EPA standard.

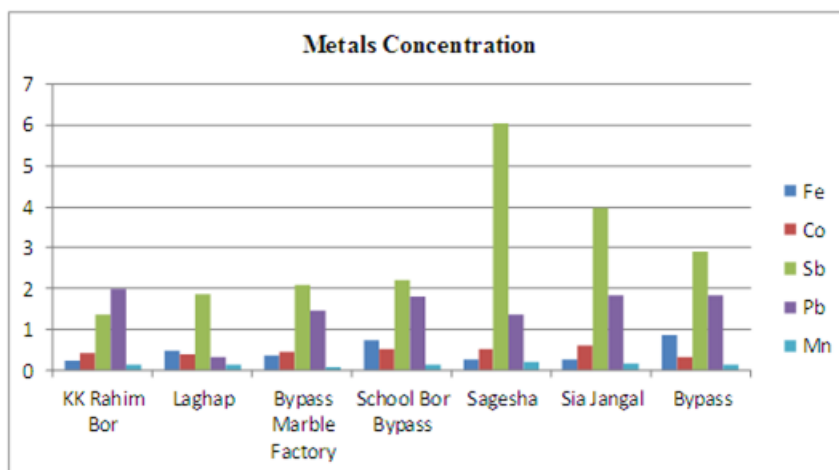
Electrical Conductivity of water samples

EC of distill water and tap water is 0.35 and 827. EC of all water samples K K Rahim bore 1560, Laghap 1167, Bypass Marble Factory 1981, School bore bypass 4220, Sagesha 1405, Sia jungle 1220, Bypass 2457 ranged from 1167 to 4220. According to WHO the suggested EC limit for water is 1000 µS/cm. The EC standard of all water samples was greater than the limits of WHO standard.

Detection of Heavy Metals

Table for Metals concentration.

S. No.	Samples	Fe	Co	Sb	Pb	Mn
1	KK Rahim Bor	0.2277	0.4321	1.3699	2.0102	0.1442
2	Laghap	0.4936	0.4054	1.8538	0.321	0.1478
3	Bypass Marble Factory	0.3622	0.4595	2.0811	1.4655	0.0862
4	School Bor Bypass	0.7397	0.5090	2.2220	1.8195	0.1353
5	Sagesha	0.2687	0.5252	6.0443	1.3791	0.2160
6	Sia Jangal	0.2687	0.6078	3.9649	1.8313	0.1653
7	Bypass	0.8527	0.3160	2.9101	1.8239	0.1419



Concentration of Fe in all water samples

It was analyzed that water samples of K K Rahim bore, Sagesha, Sia jungle contain Fe in a range 0.2277, 0.2687, 0.2687 that is less than the WHO and EPA limit. The water samples collected from Laghap, Bypass Marble Factory, School bore bypass, Bypass were higher than the recommended value of WHO and EPA limit that is 0.3. According to the study the determination of trace and heavy metals in drinking water samples of Jhal Magsi, Balochistan, Pakistan, it was found that Fe was below the WHO and EPA limits.^[32] According to the

study of analysis of heavy metals found in different sizes of tube wells of District Pishin Balochistan, Pakistan the concentration of iron is higher than the recommended value which is dangerous for public health.^[33]

Concentration of Co in all water samples

It was analyzed that all water samples K K Rahim bore 0.4321, Laghap 0.4054, Bypass Marble Factory 0.4595, School bore bypass 0.5090, Sagesha 0.5252, Sia jungle 0.6078, Bypass 0.3160 contain higher concentration of Co than the EPA limit that is 0.05mg/L. According to the

study of analysis of heavy metals found in different sizes of tube wells of District Pishin Balochistan, Pakistan it was found that concentration of Co is higher than the suggested value which is hazardous for public health.^[33]

Concentration of Sb in all water samples

It was analyzed that all water samples K K Rahim bore 1.3699, Laghap 1.8538, Bypass Marble Factory 2.0811, School bore bypass 2.2220, Sagesha 6.0443, Sia jungle 3.9649, Bypass 2.9101 contain higher concentration of Sb than the EPA limit that is 0.006 mg/L. It was analyzed that high concentration of Sb cause serious problems such as loss of appetite, mouth ulcer, migraine and various other diseases.^[34]

Concentration of Pb in all water samples

It was analyzed that all water samples K K Rahim bore 2.0102, Laghap 0.321, Bypass Marble Factory 1.4655, School bore bypass 1.8195, Sagesha 1.3791, Sia jungle 1.8313, Bypass 1.8239 contain higher concentration of Pb than WHO and EPA limit that is 0.01 and <0.05. According to the study the determination of trace and heavy metals in drinking water samples of Jhal Magsi, Balochistan, Pakistan, it was found that Pb was higher than the WHO and EPA limits.^[32] According to the study of determination of heavy metals adulteration in drinking water collected from different provinces of Pakistan it was found that the quantity of Pb in the water sample collected from Jaffarabad, Balochistan, was 0.000608 mg/kg.^[35]

Concentration of Mn in all water samples

It was analyzed that all water samples K K Rahim bore 0.1442, Laghap 0.1478, Bypass Marble Factory 0.0862, School bore bypass 0.1353, Sagesha 0.2160, Sia jungle 0.1653, Bypass 0.1419 contain Mn in a range of WHO and EPA limit that is 0.5 and <0.5. According to the study the determination of trace and heavy metals in drinking water samples of Jhal Magsi, Balochistan, Pakistan, it was found that Mn was below the WHO and EPA limits.^[30] According to another study of analysis of trace elements in the drinking water of Hassan Abdal, Punjab, Pakistan it was found that the Mn was present under the recommended value given by various national and international organizations.^[36]

CONCLUSION

From the following study it was analyzed that all water samples has pH, TDS, and Salinity values within the range of WHO and EPA range that is from 6.5 to 8.5, <1000mg/L, 500 mg/L respectively. The electrical conductivity of all water samples is higher than the WHO and EPA limits that is 1000 μ S/cm.

It was also analyzed that water samples of K K Rahim bore, Sagesha, Sia jungle contain Fe in a range (0.2277, 0.2687, 0.2687) that is less than the WHO and EPA limit. The water sample collected from Laghap, Bypass Marble Factory, School bore bypass, Bypass contain Fe higher than the recommended value of WHO and EPA

limit that is 0.3. All water samples contain higher concentration of Co, Sb and Pb than the WHO and EPA limit that is 0.05mg/L, 0.006 mg/L and 0.01 or <0.05 respectively. All water samples contain Mn in a range of WHO and EPA limit that is 0.5 and <0.5. Due to higher concentration of Co, Sb, and Pb in all water samples it was recommended that it may be harmful for the health of human on continuous use.

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