



Original Research Article

Assessment of Heavy Metals in Potable Ground Water of Olpad Taluka, Surat, Gujarat, India

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ABSTRACT

Keywords

Heavy metals,
Drinking
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Ground water that present in the rocks beneath the earth's surface, is the major source of global fresh water. The local peoples of villages are normally consuming ground water. This study is conducted to assess the heavy metals in drinking water with respect to Ni, Cd, Pb, Cr, Mn, Zn in Olpad Taluka, Surat Dist, Gujarat. Water samples were collected from different sources of four villages of this area and heavy metals is estimated by using Atomic Absorption Spectrometer. The data assess statistically and found the concentration of heavy metals. The study revealed that the water sources were contaminated with Ni, Cd, Pb, Mn and Cr metals. The higher concentration of metals leads to bioaccumulation of it in human body and carcinogenic for human health. The study indicates the states of the water, that it is potable or not.

Introduction

Water is indispensable for all living organisms. Life, as we know it, is impossible without water. It is considered as a "Gift of God", as something that human beings are as naturally entitled to as the air they breathe (Pandey, 2003). The presence of water on earth serves as functional medium for life. Water is most precious and important natural resources on the earth that used in day by day activities like drinking, bathing, washing, recreating, irrigation and industrial purposes. Drinking water is derived from two basic sources, surface water and ground water. Ground water is one of the major sources of drinking water in villages. But for good health quantity and quality of water is must required. Human

activities are constantly adding industrial, domestic and agricultural wastes to ground water reservoirs at an alarming rate. Increased urbanization and industrialization are to be blamed for an increased level of trace metals, especially heavy metals in our waterways (Seema Singh *et al.*, 2011). Above 40% disease outbreaks were attributed to polluted ground water consumption. This study is conducted for assessment of heavy metals in potable ground water of Olpad taluka, Surat, Gujarat. Olpad is one of the fastest developing towns nearest the Surat. Around 105 villages and sub villages are covered in this taluka. The local peoples of this area consume the water from their different

sources like tube well, open well and hand pump. Majority labour community that not afford a mineral water cost, they continue drink that water. Heavy metals have a property to accumulate in the body. If the concentration of heavy metals is increases, the health risk is also increases. For present study four villages selected for sampling the water. In this water heavy metals like Ni, Cd, Mn, Zn, Pb and Cr are assess. Some trace metals like Zn and Co are essential in body but shoe toxicity if it is present in high concentration in drinking water. The long term exposure of heavy metals results physical, muscular, neurological degenerative processes that cause Alzheimer's disease, Parkinson's disease, muscular dystrophy, multiple sclerosis. The purpose of the study it that the peoples that consume the water without treatment is actually potable or not.

Materials and Methods

The determination of heavy metals concentration in drinking water was determined by authors with the help of standards procedures of the book APHA (2012). The method consists of atomic absorption spectroscopy. Sample was taken from four villages named Jothan, Talad, Atodara and Sithan of Olpad Taluka with different sources. The drinking water samples were collected in prewashed (with detergent, dilute HNO₃, doubly deionised distilled water respectively) double capped polythene bottles collected from February to June 2015. Most of the samples were directly taken from tap allowing to run for at least 5 min so as to stabilize the variation in EC and temperature. The samples were acidified to 1 % with Nitric Acid and stored in 500 ml in double capped polythene bottles. The digest sample is directly aspirated into an air -C₂H₂ flame of an AAS and measured the metals at absorbance like cadmium (229nm), chromium (358nm),

lead (283nm), manganese (279.5nm), zinc (213.9nm) and nickel (232 nm). By capillary the sample was passed and the metal was detected.

Results and Discussion

Work done on heavy metals in drinking water by using standard methods of APHA has been studied. The quantity of heavy metals found in this research was compared with standards limit of BIS for drinking water. In this drinking water the metals like Cd, Cr, Pb, Ni and Mn were found beyond the permissible limit of drinking water. But Zn found in less concentration. Sample 1 and 2 are from Jothan villages (hand pump), Sample 3 is an open well sample of Talad village, Sample 4 and 5 are from Atodara village (Tube well) and Samples 6 and 7 are from Sithan village (bore well).

The results indicate that the high concentration of Ni is found 0.105 mg/l from the sample No- 3 in June 2015 and lowest concentration was found 0.004mg/l in the same sample in April. According to BIS limit of drinking water specification the acceptable limit of Ni is 0.02 mg/l. But Ni concentration is found high than acceptable limit in almost samples. Higher concentration of Ni in drinking water can cause chronic rhinitis and sinusitis, respiratory cancer, dermatitis etc. High concentration of cadmium was found 0.0058 mg/l in March 2015 in third sample and lowest concentration was found < 0.001 in sample 4 and 7 in June 2015. The BIS limit of Cd is 0.003 mg/l. The cadmium concentration increases in agricultural areas due o pesticides. Cadmium normally accumulates in liver, kidneys, pancreas and thyroids in humans. It causes famous disease "itai itai". The maximum concentration of Pb was found 0.072 mg/l in sample 6 in Feb 2015 and minimum value was found 0.01 mg/l in sample 1 and 6 in june 2015. BIS

limit for Pb is 0.01 mg/l. High concentration of Pb causes anaemia, disruption of haemoglobin synthesis, damage to nervous system and kidney, brain damage etc. The maximum concentration of Mn was found 0.26 mg/l in June 2015 from the sample 2 but in sample 2, 5, 6 and 7 in March and sample 6 in June the Mn was not found. The BIS limit of Mn is 0.01 mg/l. Manganese does not appear to have any toxicological significance in drinking water but in some cases chronic poisoning by Manganese results deterioration of central nervous system, lethargy and symptoms of Parkinson's syndrome.

High concentration of Cr was found 0.056 mg/l in sample 4 in Feb 2015 and it is not found in sample 2, 5, 6 and 7 in March 2015 and in sample 1 and 6 in June 2015. The BIS limit of Cr is 0.05 mg/l. High concentration of Cr cause damage of CNS, damage blood composition, affect kidney, liver and other vital organs. The maximum concentration of zinc was found 1.08 mg/l in sample 2 in June 2015 and minimum concentration was found 0.008 mg/l in April 2015 in sample 3. The BIS limit of Zn is 5 mg/l. So all samples content low amount of Zn. Zn is required in body for functional processes.

Table.1 Concentration of Ni (mg/l) from Feb 2015 to June 2015

Samples	Months				
	Feb Ni (mg/l)	Mar Ni (mg/l)	Aprl Ni (mg/l)	May Ni (mg/l)	June Ni (mg/l)
s-1	0.034	0.034	0.007	0.026	0.1
s-2	0.024	0.043	0.013	0.03	0.1
s-3	0.035	0.032	0.004	0.008	0.105
s-4	0.062	0.064	0.016	0.027	0.095
s-5	0.029	0.052	0.011	0.013	0.104
s-6	0.008	0.045	0.005	0.007	0.077
s-7	0.015	0.044	0.005	0.02	0.07

Table.2 Concentration of Cd (mg/l) from Feb 2015 to June 2015

Samples	Months				
	Feb Cd (mg/l)	Mar Cd (mg/l)	Aprl Cd (mg/l)	May Cd (mg/l)	June Cd (mg/l)
s-1	0.0018	0.0052	0.002	0.0015	0.0021
s-2	0.0016	0.006	0.003	0.002	0.0012
s-3	0.0016	0.0058	0.003	0.001	0.0011
s-4	0.0014	0.005	0.003	0.0016	<0.001
s-5	0.0016	0.006	0.004	0.003	0.002
s-6	0.0032	0.0048	0.004	0.0024	0.001
s-7	0.0016	0.0052	0.004	0.0025	<0.001

Table.3 Concentration of Pb (mg/l) from Feb 2015 to June 2015

Samples	Months				
	Feb Pb (mg/l)	Mar Pb (mg/l)	Aprl Pb (mg/l)	May Pb (mg/l)	June Pb (mg/l)
s-1	0.036	0.07	0.05	0.02	0.01
s-2	0.034	0.07	0.038	0.031	0.018
s-3	0.036	0.068	0.042	0.028	0.008
s-4	0.028	0.052	0.044	0.031	0.02
s-5	0.038	0.05	0.042	0.036	0.012
s-6	0.072	0.06	0.048	0.02	0.01
s-7	0.038	0.058	0.058	0.04	0.03

Table.4 Concentration of Mn (mg/l) from Feb 2015 to June 2015

Samples	Months				
	Feb Mn (mg/l)	Mar Mn (mg/l)	Aprl Mn (mg/l)	May Mn (mg/l)	June Mn (mg/l)
s-1	0.034	0.025	0.032	0.021	0.04
s-2	0.03	ND	0.232	0.06	0.26
s-3	0.03	0.011	0.024	0.012	0.02
s-4	0.014	0.015	0.059	0.016	0.1
s-5	0.013	ND	0.013	0.025	0.02
s-6	0.012	ND	0.0118	0.0113	ND
s-7	0.011	ND	0.042	0.009	0.02

Table.5 Concentration of Cr (mg/l) from Feb 2015 to June 2015

Samples	Months				
	Feb Cr (mg/l)	Mar Cr (mg/l)	Aprl Cr (mg/l)	May Cr (mg/l)	June Cr (mg/l)
s-1	0.017	0.004	0.003	0.006	ND
s-2	0.018	ND	0.007	0.003	0.002
s-3	0.027	0.03	0.004	0.016	0.002
s-4	0.056	0.026	0.006	0.009	0.006
s-5	0.021	ND	0.001	0.035	0.0068
s-6	0.046	ND	0.0006	0.026	ND
s-7	0.02	ND	0.002	0.004	0.013

Table.6 Concentration of Zn (mg/l) from Feb 2015 to June 2015

samples	Months				
	Feb Zn (mg/l)	Mar Zn (mg/l)	Aprl Zn (mg/l)	May Zn (mg/l)	June Zn (mg/l)
s-1	0.036	0.059	0.021	0.065	0.081
s-2	0.106	0.168	0.245	0.213	1.08
s-3	0.014	0.019	0.008	0.015	0.049
s-4	0.0175	0.041	0.009	0.084	0.06
s-5	0.012	0.028	0.009	0.064	0.06
s-6	0.012	0.032	0.08	0.026	0.04
s-7	0.014	0.026	0.011	0.0114	0.05

In conclusion, Present study represents an attempt to evaluate present state of ground water of Olpad area, surat, Gujarat used for drinking purpose. The work has been carried out for 5 months from Feb'2015 to June' 2015. The selection of drinking water of Olpad area was done to evaluate the quality of drinking water and to know that it is potable or not. Ground water is main source of potable water in most parts of country mainly villages. But human activities like, disposal of agricultural waste, manure, spreading over the vicinity of human habitat, housing live-stock, septic systems, faecal contamination of rural areas decline the quality of drinking water. Mainly agricultural activity and industrialization cause heavy metal pollution. This process is also occurred naturally but the rate is lower than manmade activities. After studied the results it is conclude that the water of this area is polluted with heavy metals like Cd, Cr, Pb, Ni etc. The quality is decrease due to metal contamination. The consumers not used it after treatment so they may be suffering from chronic disease that cause through heavy metals.

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