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ASSESSMENTS OF PHYSICO-CHEMICAL PARAMETERS AND CONCENTRATION OF HEAVY METALS OF GROUND WATER (WELL & HAND PUMP) LOCATED AT HOTGI VILLAGE DIST: SOLAPUR.

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Abstract:-Assessments of Physico-Chemical Parameters and Concentration of Heavy Metals of selected Tube wells in Hotgi village Dist: Solapur. In this analysis the various Physico-chemical parameters such as PH, Dissolve oxygen, TDS, Chloride, total alkalinity, calcium, magnesium hardness, sulphate, fluoride, nitrate and total hardness etc., were determined using standard procedures. Because the use of fertilizers, pesticides and insecticides in rural area manure, lime, septic tank, refuse dumps etc. are the main source of Tube wells water pollution in result & discussion the most of the ground water samples are of good quality and within the permissible limit prescribed by WHO and Indian Drinking Water Standard for pH, Turbidity, TS, Total hardness, Ca, Mg, Total alkalinity, Chloride, Sulphate. & some of the heavy metals are found below the permissible limit. The area and a total of 10 water samples from different 10 locations were collected and analyzed.

Keywords: Physico-Chemical Parameters, Tube wells, Heavy Metals.

INTRODUCTION

Water sources available for drinking and other domestic purpose must possess high degree of purity, free from chemical contamination and micro-organism. The potential and quality of Tube well water, is an economic resource and essential component of our life, It is getting deteriorated in major rural centers due to pollution caused by population explosion, realization, Agriculture and industrialization. (1,2) Studies on Tube well water(1,2) hear, the concern report on the physicochemical studies of Tube wells water of Hotgi Village, solapur District Maharashtra and its some interior area of Hotgi Village. Because of the growing population and over utilization of water, people residing in the Hotgi area, mostly not have access to safe drinking water In the absence of fresh water supply, In most of interior of Hotgi area, the Tube well water is used for drinking purpose, Agriculture and other domestic purpose, Tube well water is generally good quality and it is difficult to pollute open well water. (3.1)

Ground water is generally considered as a safe source of fresh drinking water but rapid population growth, increasing living standards in urban as well as rural areas and industrialization have resulted in greater demand of quality water on one hand, and while on the other hand, pollution of water sources is increasing steadily.

Therefore the ground water is getting polluted and among which wells are generally considered as the worst type of ground water sources in the term of Physico-chemical contamination due to the lack of concrete plinth and surrounding drainage system.

There are various factors, which are responsible for ground water contamination such as use of fertilizer in farming seepage from effluent bearing water body.

Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source. Therefore it becomes imperative to regularly monitor. The surface water sources, in general, are not acceptable for drinking purpose as these are often loaded by various organic, inorganic and biological constituents. The use of fertilizers, pesticides and insecticides in rural area manure, lime, septic tank, refuse dumps etc. are the main source of Tube wells water pollution. (1, 3)

Majority of the rural people do not have access to potable water and therefore, depend on well, stream and river waters for domestic use. Excessive use of limited water resources, disposal of various industrial effluents, human wastes into water

may release heavy metals, which harm both human and animals health [3]. Continuous exposure to heavy metals to animals and humans cause hepatotoxicity and nephrotoxicity. So, periodical estimation of level of heavy metals in water is necessary.

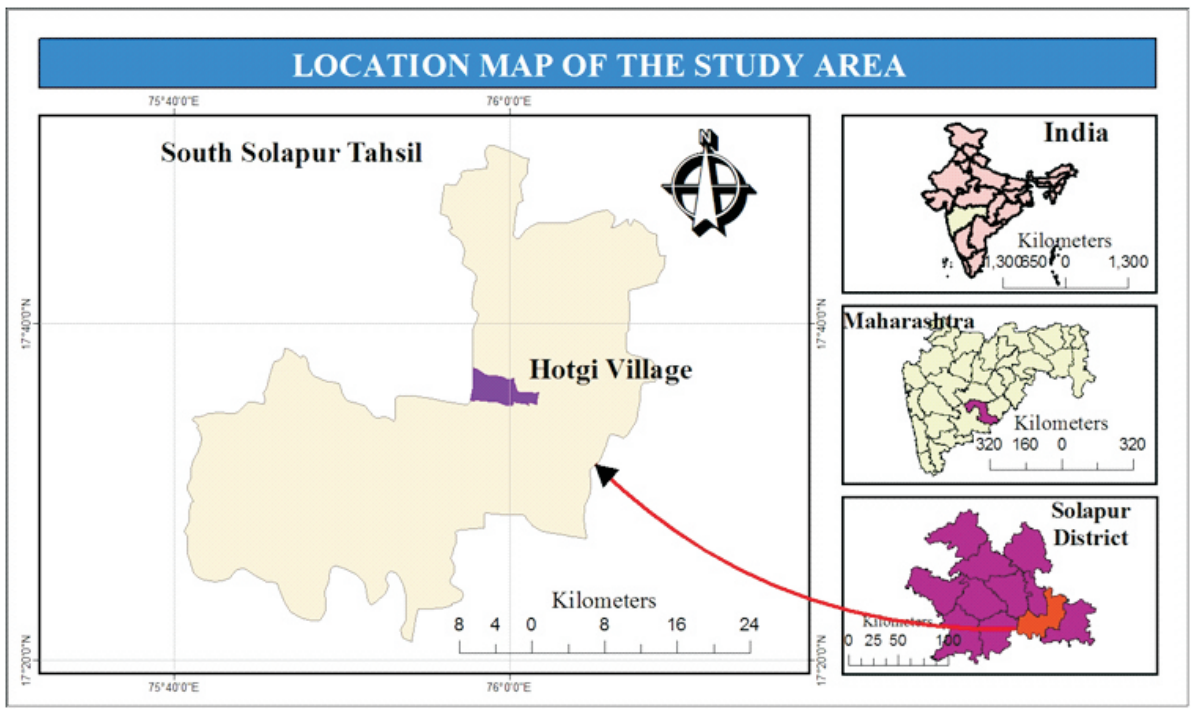
The Aim Of the present study is Assessments of Physico-Chemical Parameters and Concentration of Heavy Metals of Ground Water (Well & Hand pump) Located at Hotgi village Dist: Solapur

OBJECTIVE

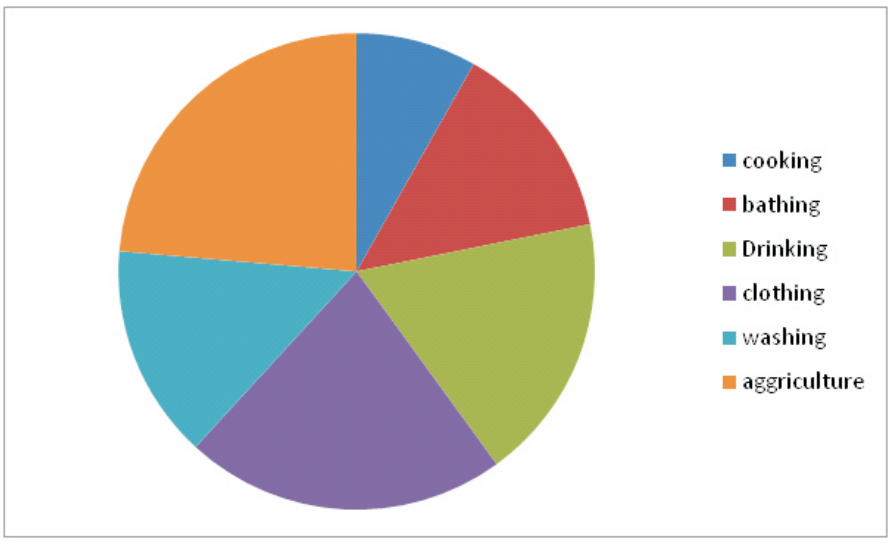
To study Physico-Chemical Parameters.
To study Concentration of Heavy Metals.
Experiments using standard procedures.
Compare with Standards provided by Indian Drinking Water.

STUDYAREA

To Study the Physico chemical characteristic & heavy metal concentration of tube well water Hotgi Village is selected. Hotgi village is situated near about 15 km away from Solapur city. The population of Hotgi village is 12,000. Agriculture is Main occupation of people living in Hotgi. There are near about 45% people are farmer in Hotgi.Aggriculture is the main occupation in Hotgi village hence there is much more use of chemical fertilizer & pesticides for more productivity.



There are so many industry is located near the Hotgi village. Water is used for various activities like Domestic i.e. Drinking, washing, bathing, clothing, etc agriculture activities i.e. use of pesticide, Fertilizer, inorganic composting material etc. that all are leading to ground water pollution at Hotgi region. Effect of these ground water pollution is causing adverse impact on human health (Cholera, malaria, dephtria, helminthes, chicken gunia, dysentery etc).



Due to all above reason the ground water of Hotgi village polluted by domestic, commercial and agricultural processes .hence I have selected Hotgi as my project area .I have collected sample from different location of Hotgi where people use tube well water for their daily life process including (Drinking). I have taken 10 tube well samples from diff. location and analyze Physico chemical parameter & heavy metals in selected samples.

MATERIALS & METHODS

Collection of Sample: The selected study area, Hotgi village is situated in 15 km away from Solapur City. 10 samples were collected from the Tube wells & well of various places around of Hotgi Village. Various samples were collected in clean and dry polyethylene bottle from Tube wells & well after running them from 5 minutes [6]. All the collection of samples are immediately preserved in dark boxes and processed for the different analysis within 6 to 12 hours after collection. In this present study various physical and chemical parameters of water samples were determined and the result was compared with the values of various water quality standards such as World Health Organization (WHO) and Central Public Health and Environment Engineering Organization. (CPHEEO)

Analysis of Physico Chemical Parameter

The Temperature, pH, EC and Dissolved oxygen were measured immediately. The water samples were stored in refrigerator to avoid any microbiological decomposition. Various Physico-chemical parameters like Total solids (TS) , Total dissolved solid (TDS), Total hardness (Th), Total alkalinity, Calcium , Magnesium, Chloride, Sulphate were analyzed by standard procedures described in APHA (1992) [1] and Trivedy and Goel(2)

Temperature: The temperature was recorded in Celsius (0C) with the help of mercury thermometer. Temperature is basically important for its affects on certain chemical and biological activities in the organisms attributing in aquatic media. In the Indian subcontinent the temperature in most of water bodies ranges between 7.8 to 38.50C. The temperature was recorded in Celsius (0C) with the help of mercury thermometer.
pH: pH of the water was determined with the help of pH meter.

Dissolved oxygen (DO):

DO is one of the important parameter in water quality assessment. It reflects the physical and biological processes prevailing in the water. Non polluted surface water is normally saturated with DO. The DO varies from 2.21 to 7.0 mg/L during pre-monsoon; and 3.11 to 6.11 mg/L during post-monsoon. These values indicate relatively large organic pollution. The high temperature and low DO during pre-monsoon (summer) create favourable conditions for development of blue-green algae. Dissolved oxygen of water was determined as per method [18] and expressed in terms of mg/lit.

Alkalinity: Alkalinity was determined as per the method [20] and expressed in terms of mg/lit.

Conductivity:

The conductivity of water was determined with the help of Conductivity meter and expressed in terms of mohs/cm.

Total dissolved solids (TDS): The total dissolved solids of water was determined by Conductivity meter and expressed in mg/lit.
Total Hardness: In most of the fresh water TH is imparted mainly by the calcium and magnesium ions, which apart from Sulphate, Chloride and Nitrates are found in combination with carbonates and bicarbonates.
The total hardness of water sample were determined by EDTA titration method and expressed in mg/lit.
Calcium Hardness: It is also determined by EDTA method and expressed in mg/lit.
Magnesium Hardness: It is determined by calculation and expressed in mg/lit.
Sulphate: Sulphate is determined by Gravimetric method and expressed in mg/lit.
Nitrate: Nitrate reacts with Brucine reagent to produce yellow colour. The intensity of which can be measured at 420nm. The reaction is highly dependent upon that generating during test. It can be controlled by carrying out the reaction for fixed time at constant fixed temperature. This method is suitable for sample having range 420-520nm. Nitrate is determined by colorimetric method and expressed in mg/lit.
Chloride: Chlorides are found in practically all natural waters. This is the most common inorganic anion present in water. Man and animals excrete high quantities of chlorides therefore it indicates sewage contamination. Variation observed is usually associated with the hydrology of the basin.
Heavy metal estimation: The estimation of Lead (pb) , Zink (Zn) , Ferrous (Fe) , Copper (Cu) Cobalt (Co) & Cadmium (Cd) of the water samples was done as per method Double beam atomic absorption spectrophotometer.

Table No.1:

Sr,No.	Parameter	Desirable limit	Permissible limit
1.	Temperature	-	-
2.	pH	6.5-8.5	No relaxation
3.	Electrical conductivity	5	10
4.	Total Hardness	300	600
5.	Dissolved Oxygen	30	100
6.	Calcium	75	200
7.	Magnesium	30	100
8.	Total Dissolved solids (TDS)	200	400
9.	Alkalinity	200	-
10.	Sulphate	400	-
11.	Nitrate	45	-
12.	Chloride	250	1000

Table No.:2

Sr.No.	Element	Desirable limit (mg/l)	Permissible limit (mg/l)
1.	Lead (Pb)	0.05	-
2.	Cadmium (Cd)	0.01	-
3.	Zink (Zn)	5	-
4.	Ferrous (Fe)	0.30	-
5.	Copper (Cu)	0.05	1
6.	Cobalt (CO)	0.30	-
7.	Nickel (Ni)	0.05	-
8.	Manganese (Mn)	0.1	0.5

(Table No.1 & 2: Desirable drinking water quality standards by WHO IS: 10500, 1991(4, 5)

RESULT & DISCUSSION

The values of hydro chemical characteristics of drinking water samples collected from Five Different wells and six different tube wells situated at Hotgi Village are represented in Table 3, 4, & 5.

These characteristics were examined in light of the IS: 10500, 1991 standards represented in Table 1 & 2 prescribed by WHO for portability of water wholly accepted by the ministry of health, Government of India. (4)

Table No 3. Well Sample Analysis

Sr.No.	Parameter	1	2	3	4	5
1	Temperature C^0	27	37	30	28	30
2	pH	7.6	7.4	8.7	8.4	8.6
3	Conductivity mohs/cm	1.82	1.28	1	1.04	-
4	Total Dissolved Solids (TDS) mg/l	100	60	98	180	34
5	Alkalinity mg/l	43	43	39	29	32
6	Total Hardness mg/l	127	168	154	135	134
7	Calcium mg/l	142	142	64	47	54
8	Magnesium mg/l	15	20	96	135	80
9	Dissolved Solids mg/l	3.8	4.2	4.48	5.1	3.9
10	Sulphate mg/l	26.96	29.71	21.65	17.34	7.39
11	Nitrate mg/l	10	08	14	-	-

Table No 4. Tube Well Samples Analysis

Sr.No.	Parameter	1	2	3	4	5
1	Temperature C^0	31	28	28	30	32
2	pH	7.4	7.45	7.5	7.1	7.8
3	Conductivity mohs/cm	0.1	1	1	1.01	1
4	Total Dissolved Solids (TDS) mg/l	180	88	56	72	142
5	Alkalinity mg/l	57	34	68	70	96
6	Total Hardness mg/l	32	172	64	94	108
7	Calcium mg/l	18	134	28	32	76
8	Magnesium mg/l	14	38	36	62	32
9	Dissolved Solids mg/l	3.6	6.5	7.84	7.2	6.4
10	Sulphate	1.10	2.63	1.10	1.80	3.12
11	Nitrate	3.4	12	14	15.6	16.2

(Table No.3, 4, & 5 Showing the result observed in Well & Tube well Samples)

Table No.:5 Heavy Metals Analysis:
pH The overall pH of Well & Tube Well Sample ranged from 6.2 to 8.6 with the values ranged within

Element	Mn	Pb	Cd	Zn	Ni	Fe	Cu	Co
Tube Well Sample 1	0.1311	BDL	0.1689	0.0701	0.0361	0.1843	0.5164	0.0186
Well Sample 2	0.0235	0.03	0.0915	0.0913	0.0458	0.0196	0.0598	0.0145

the limits for drinking purpose .The pH value of drinking water is an important index of acidic , Alkalinities, and resulting values of acidic basic interaction of number of its mineral and organic components.pH of collected samples shows normal pH.

Dissolved Oxygen:

The Dissolved Oxygen ranges from 3.2 to 7.4 mg/l. According to WHO and Indian Standard.D.O values are showing the very lower values in Well & Tube Well samples.

Total Dissolved Solids:

According to the Indian Standard TDS value should be less than 500 mg/l for drinking water and present study shows TDS value ranges from 60 to 180 mg/l .Hence the TDS is within the range.

Total Alkalinity:

Alkalinity leads to corrosion and influence the chemical and biochemical reactions. Alkalinities observed in Hotgi Village Well and Tube Well Samples ranges from 32 to 92 mg/l. these values are within the limits of Indian standard.

Calcium:

The high concentration of Ca may be due to deposit of lime stone; dolomite etc. (4) Water congaing high calcium is not suitable for Washing Bathing etc. It linked to the formation of concretion in the body and may cause gas to intestinal disease and stone formation. So, calcium is need for the body in small quantities though water provides only part of total requirement.

Magnesium:

Magnesium is beneficial element and but it has toxic effect in high concentration it causes hardness of exertas and diuretic action.(4) The concentration of Mg. ranges from 14 to 62 mg/l.

Total Hardness:

Total Hardness indicates calcium and magnesium .It ranges from 30 to 172 mfg/l. Hardness of water is not health hazard but its value should remain below permissible limit to restore the test of water.(4)

Nitrate:

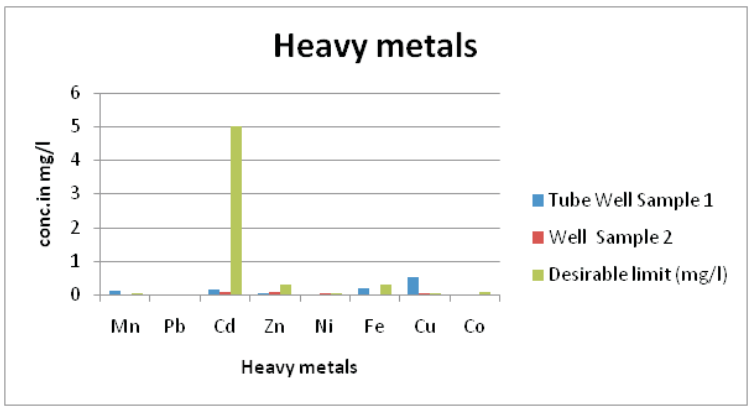
Nitrate is one of the major constituent of organism along with carbon and Hydrocarbon as Amino acid, Protein and organic compounds present in Tube Well samples. The Nitrate concentration is observed in analysed samples are lower than prescribed limit by Indian standard index.

Sulphate:

Sulphate concentration is ranges from 1.10 to 29.71. High concentration of SO4 along with sodium and magnesium in drinking water can leads to gastrointestinal irritation. This increase in sulphate concentration may be due to discharge of industrial wastes and domestic sewage. All samples of collected of analysis are free from Sulphate pollution.

Heavy Metal Estimation:

In the present study, the concentrations of lead and cadmium were found within the prescribed permissible limits of WHO. The increased levels may cause damage to brain, kidney if taken in high concentration. The accumulation of these heavy metals might be due to anthropogenic activities and important in public health point of view.



CONCLUSION

P^H:

PH values of all Well and tube well samples are recommended range of drinking water prescribed by Indian standard .lower pH values increases at higher depth.

Conductivity:

The conductivity of all analyzed samples are in desirable range prescribed by World Health Organization (WHO) & Indian Drinking Water standard.

Dissolved Oxygen:

DO values of all Samples are in desirable limit. The higher values of DO may lead to High Temperature pollution lead to organic matter & photosynthetic activity.

Total Hardness:

Total Hardness i.e. Calcium, & Magnesium are leads to corrosion of utensil and metal body of tube well in presence of mg^{2+}

Sulphate & Nitrate:

Sulphate concentration is beyond the desirable limit. And the concentration of Nitrate is within the limit of Indian drinking standard.

Heavy Metals:

Concentrations of Heavy metals are observed in tube well samples because of Disposal of house hold, commercial, and domestic activity. the Well and tube well samples are having 0.01 to 0.03 mg/l. Pb, Ni, Co, Cd all heavy metals are within range of drinking water standard. Leading concentration of these element cause the brain damage and intestinal disease.

To avoid the contamination of these elements in drinking water Sewage carrier drainage should be of cement concert.
Over the entire water sample collected from six different wells and tube well of Hotgi Village, Solapur District, is good for Agriculture purpose, While drinking water of tube well & well needs to be pre-treatment.

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