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"PHYSIOCHEMICAL GROUND WATER ANALYSIS OF VIJAYAPUR (OLD AND NEW) TALUKA'S, AND ENVIRONMENTAL IMPACTS AT VIJAYAPUR DISRTICT, KARNATAKA,INDIA"

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ABSTRACT :

An investigation was under taken in 12 talukas (36 samples) of Vijayapur District to assess pH, conductivity fluoride, iron and other physicochemical parameters. And also assess the clinical symptoms like dental and skeletal fluorosis, joint pains and gastrointestinal diseases and to find out the severity of the disease. A check list developed with the help of available literature and in consolation with nutritionists was used to record clinical symptoms. A sample survey was made after examination for both sexes between the ages of 9- 60 years at all Vijayapur (old and new) talukas.

KEYWORDS : *Fluoride, clinical symptoms, dental and skeletal fluorosis, gastrointestinal discomfort.*

I)INTRODUCTION:

The analysis of water is extremely important as it contains a large number of impurities which are necessary to be checked before the water is used for any specific purpose.

As the whole human population needs drinking water for sustaining life the provision of a safe supply is a high priority issue for safeguarding the health and well being of human. The production of adequate and safe drinking water is the most important factor contributing to a decrease in mortality and morbidity in developing country. The world health organization (WHO) reported that nearly half of the population in these countries suffers from health problems associated with lack of drinking water are the presence of micro biologically contaminated water.

Water is a very good solvent, hence it dissolves some toxic and hazardous substances producing water pollution problem, poising many public parameters of interest for water quality assessment and nitrates out of them. An increase nitrates in water is obtain associated with forming fertilizer, pesticide or poor sanitary activities. The use of nitrate contaminated drinking water to prepare infant formula is a well known risk factor for infant methemoglobinemia. Affected infants develop a peculiar blue-gray skin colour and may become irritable or lethargic depending on the severity of their condition. The condition can be progress rapidly to cause coma and death. If it is not recognized and treated appropriately. There is a positive association between nitrate in drinking water and Hodgkin lymphoma and colorectal cancer. In 1986 world health organization (WHO) fixed the limit of the contents of nitrate and nitrites in drinking water, taking guidance from which Indian standards were developed.

High nitrate may cause methemoglobinemia, gastric cancer and birth defects. Other health effects on human that are potentially influenced by elevated levels of nitrate in drinking water include tetragonal toxicity and hypertrophy of the thyroid.

Nitrate in high concentration has been observed in ground water of Rajasthan. In an effort to prevent the

decease ICMR has recommended concentration of 2mg/L nitrate in water to be used for infant feeding, while more than 100mg/Litre was not recommended for human consumption. Moreover, the increased nitrate level in drinking water may adversely affect the central nervous system. Twenty three incidents of ground water arsenic contamination have been reported so far in deferent parts of the world.

EXPERIMENTAL

The study was conducted in 12 taluka's of Vijayapur district. A sample survey was made after examination for dental, skeletal joint pains and gastrointestinal diseases of both sexes between the ages of 9 to 60 years. The permanent teeth were the only ones examined. The examinations were carried out by one dentist to standardise the readings. The Jockson index method of dental fluorosis was used. There are no major surface water sources in the study area however, main sources of drinking water in all taluka's are open well, hand pumps, lakes, bore wells.

SAMPLE ANALYSIS

A total of 36 samples from the all taluka's (each taluka's having 3 samples of different sources) of Vijayapur district of water sources were collected in polythene bottles, which were cleaned and finally washed with acid water, followed by rinsing twice with distilled water. The water samples collected were chemically analysed. The analysis of water was done using procedure of standard methods given by World Health Organization (WHO).The results of the analysis water samples are given in table1. The pHs of the samples were in the range from 6.6-8.1. So that all taluka's shows alkaline except Sindagi, Indi, Chadachan, and Nidagundi show the acidic nature. But all values are within the range (6.5 to 8.5). Higher pH value impact bitter taste to the water. The lower the value of pH may be due to the dilution of alkaline substances or atmospheric CO_2.

The best particles are rich in calcium carbonates/bicarbonates which are the measure of buffering agent for acidity generated by SO_4^{2-} and NO_3- in Vijayapur district it the indicator of hydrology and aesthetic quality of water.

During study the electrical conductance of the sample were in the range from 0.34ms/cm to 3.72ms/cm which is under permissible limit of BIS standards. Sample (BB2)having lowest EC of 0.37ms/cm while (TL) showing highest EC 3.72ms/cm. there are no prescribed standard by WHO for parameters of EC, no comparison can be made from the observed value. However, the EC indicates the content of soluble and high conducting salts.

Total dissolved solids in the water samples were in the range from 112mg/L to 956mg/L. all value of TDS is in desirable limit. Turbidity of water samples were in the range from 0.12 to 8.80NTU. Samples (DH2), (T3), (BB2) showed the turbidity above the permissible limit (5NTU). While rest of sample showed within the desirable limit.

The value for total alkalinity for water samples varied from 215 to 660mg/L. except (I2), (I3), (CH1),(CH2),(CH3). Alkalinities of all the samples were within the WHO permissible limit. Alkalinity in many surface water in due to carbonate, bicarbonate and hydroxide content. The large quantity of alkalinity impacts bitter taste to water.

Total hardness is the indicator of hydrogeology and aesthetic value of the water. TH of water samples were in the range from 30 to 1720 mg/L, (S2),(N3),(V2) contain TH within the desirable limit while rest of the sample contain within the highest permissible limit of WHO. But (I2),(DH2),(DH3),(T1) ,(TL1),(MB2), (BB2),(N1),(N2),(K1),(K2). Shows out of permissible limit it shows the water samples were moderately hard. Total hardness is imparted mainly by calcium and magnesium ions which apart from sulphate, chloride and nitrate are found in combination with carbonates.

The mostly iron were not detected in the studied water sample. Then the calcium value ranged from 14-660 mg/L. out of all value 50% shows within the limit and 50% are moderately high in limit according to WHO.

The fluoride concentration of water sample ranges from 0.2 to 2.2 mg/L but (S1), (S3), (T1), (N3) which are out of permissible limit. And rest of all within or near the desirable limit. high fluoride concentration causes dental fluorosis, while low concentration causes dental caries. Hence it is essential to maintain moderated concentration of fluoride in drinking water. The chloride content in water samples varied from 12 to 900mg/L. but sample (BB2),(K2). Are within the permissible limit according to WHO, rest of all sample contain moderately high the chloride content indicates pollution status of water body due to contamination of animal and woman waste. Chloride is common constituent all natural water and is generally not classified as harmful constituent.

Concentration of sulphate ion was in the range of minimum 50mg/L and maximum 210mg/L. sulphate concentration in sample (BB2), (T1),(I3) are within the range and rest of all are out of permissible limit of WHO guidelines. Higher concentration of sulphate has laxative effect which is enhanced when sulphate is consumed with magnesium.

Then nitrate of water samples collected lie in the range from 1 to 98mg/L About, 20% of collected sample have high value of nitrate and exceeds the permissible limit proposed by BIS and WHO. Due to its solubility and anionic form nitrate is very mobile can easily leach into the water. Generally the nitrate contamination in our water samples reaches high levels as results of agriculture runoff, refuse, dump runoff or contamination with human are animal waste.

The biochemical oxygen demand ranges from 0.1 to 1.1 and the dissolved oxygen the value ranges from 0.8 to 2.1 gm/L. the dissolved oxygen plays an important role in water quality determination. The introduction of oxygen demand in materials either organic or inorganic into well and causes duplex of the dissolved oxygen in the water this poses a threat to fish and other higher form of aquatic life in the concentration of oxygen this below criteria there exist better general indicators of water quality then DO. Then COD value ranges from 59.9 to 1108. The COD is direct measure of organic compounds in water.

The Vijayapur district is faced a serious problem of potable water supply. Sanitation is even worst in villages. Which lack of public water distribution system. There is a need to evaluate these waters and develop strategies to reduce and prevent there contamination.

STANDARDS OF WHO GUIDELINES

Parameters	Permissible Limits	Excessive Limits
pH	6.5 to 8.5	6.5 to 9.2
EC	Not Prescribed	Not Prescribed
TDS	500	2000
TURB	5	10
ALK	200	600
TH	300	600
Fe	0.3	1.0
Ca	75	200
F^-	1.0	1.5
Cl^-	250	1000
SO_4^-	200	400
NO_3^-	45	No Relaxation
BOD	-	5
DO	-	5
COD	-	250

Table1: Overview Of Ground Parameters

Taluka's	Source	pH	EC Ms/cm	TDS Mg/L	TURB NTU	ALK mg/L	TH Mg/L	Fe
Sindagi (S)	LK(S1)	7	0.36	190	1.20	278	455	NILL
	HP(S2)	8.1	1.26	731	0.34	355	222	NILL
	W(S3)	7.6	1.1	662	0.25	340	450	NILL
Indi (I)	BW(I1)	7.5	0.83	503	0.12	275	600	NILL
	W(I2)	7	0.94	586	0.22	655	1020	NILL
	HP(I3)	6.8	0.62	385	1.20	660	570	NILL
Devara Hipparagi(DH)	BW(DH1)	6.6	0.75	465	0.55	309	420	0.1
	W(DH2)	6.6	1.40	871	8.80	275	1092	NILL
	BW(DH3)	6.7	1.31	816	0.12	265	820	NILL
Chadachan (CH)	BW(CH1)	7.3	2.17	149	0.22	520	525	NILL
	W(CH2)	6.9	1.94	133	1.30	605	375	NILL
	LK(CH3)	6.8	1.07	660	0.25	565	152	NILL
Tikota (T)	LK(T1)	6.6	1.13	693	0.23	375	690	NILL
	BW(T2)	6.7	1.70	112	0.83	495	452	NILL
	W(T3)	6.8	2.40	169	7.20	410	577	NILL
Babaleshwar (BL)	BW(BL1)	6.7	1.26	802	0.75	312	525	NILL
	LK(BL2)	6.7	1.22	768	1.15	385	570	NILL
	W(BL3)	6.7	0.85	535	0.23	290	407	NILL
Talikoti (TL)	LK(TL1)	6.9	3.72	244	0.62	395	1055	NILL
	BW(TL2)	6.7	2.22	152	0.12	440	509	0.19
	BW(TL3)	6.7	1.89	131	0.21	420	481	NILL
Muddebihal (MB)	BW(MB1)	6.7	0.62	374	0.21	225	337	NILL
	LK(MB2)	6.7	1.47	940	0.19	385	1200	NILL
	W(MB3)	6.7	1.35	831	0.15	212	375	NILL
Basavan Bagewadi(BB)	BW(BB1)	6.7	1.48	956	0.22	302	487	0.3
	LK(BB2)	6.6	0.34	194	6.95	275	690	NILL
	W(BB3)	6.7	2.25	154	0.45	215	375	NILL
Nidagundi (N)	BW(N1)	7.3	3.17	218	1.31	410	625	NILL
	LK(N2)	7.4	0.81	501	1.05	440	1502	NILL
	W(N3)	7.4	0.44	258	0.95	391	180	NILL
Kolhar(K)	BW(K1)	6.9	2.67	185	0.21	315	820	NILL
	LK(K2)	6.6	0.61	348	0.12	290	1720	NILL
	W(K3)	6.7	0.76	476	0.45	255	442	NILL
Vijayapur(V)	BW(V1)	6.6	0.62	374	0.55	265	325	NILL
	LK(V2)	6.7	0.57	338	0.25	302	30	NILL
	W(V3)	6.7	1.25	781	0.34	295	645	NILL

Table2: Overview of Ground Parameters

Taluka's	Source	Ca Mg/L	F^- Mg/L	Cl^- Mg/L	SO_4^- Mg/L	NO_3^-	BOD	DO Mg/L	COD
Sindagi (S)	LK(S1)	52	0.4	75	150	10.5	0.5	1.6	72.3
	HP(S2)	30	0.5	120	180	2.5	0.4	1.8	89.6
	W(S3)	56	0.48	65	100	45	0.9	1.2	97.1
Indi (I)	BW(I1)	160	1.4	250	50	35	0.3	2	65.9
	W(I2)	255	1.3	31	100	40	0.2	1.9	67.2
	HP(I3)	215	0.9	135	200	42	0.4	1.7	110
Devara Hipparagi(DH)	BW(DH1)	29	0.5	NILL	25	1	0.7	1.9	67.2
	W(DH2)	32	1.2	70	NILL	12	0.1	1.6	65.9
	BW(DH3)	50	2	120	15	25	1.0	1.3	81.3
Chadachan (CH)	BW(CH1)	51	0.8	40	55	98	0.6	1.5	97
	W(CH2)	660	0.9	53	50	45	0.1	1.5	100.9
	LK(CH3)	175	1.5	900	100	50	0.4	1.2	61.9
Tikota (T)	LK(T1)	51	2.2	115	210	10	1.1	1.9	89.3
	BW(T2)	14	1.8	80	150	35	0.2	1.8	102.3
	W(T3)	120	1.9	53	85	25	0.3	2	80.9
Babaleshwar (BL)	BW(BL1)	29	0.5	40	90	35	0.3	1.9	68.3
	LK(BL2)	190	1.5	105	NILL	9.3	0.3	2	91.7
	W(BL3)	98	1.8	190	155	12	0.5	1.8	75.1
Talikoti (TL)	LK(TL1)	95	0.5	12	185	1.8	0.8	1.3	102.1
	BW(TL2)	260	0.8	80	110	10	0.2	1.5	98.5
	BW(TL3)	180	1.0	108	10	38	0.9	1.4	109.7
Muddebihal (MB)	BW(MB1)	75	2.2	135	25	25	0.2	0.9	102.3
	LK(MB2)	33	0.5	75	100	54	0.1	1.4	91.9
	W(MB3)	45	0.8	90	150	28	0.1	1.1	75
Basavan Bagewadi(BB)	BW(BB1)	90	1.4	NILL	180	4.5	0.3	1	80.3
	LK(BB2)	56	0.9	330	210	25	0.3	1.3	79.9
	W(BB3)	33	1.8	53	175	10	0.5	0.8	88.3
Nidagundi (N)	BW(N1)	98	0.2	100	120	51	0.6	2	62.4
	LK(N2)	123	1.9	NILL	100	54	0.1	1.9	110.5
	W(N3)	169	2.1	128	80	35	0.5	1.8	72.1
Kolhar(K)	BW(K1)	48	0.3	250	75	25	0.2	1.9	95.9
	LK(K2)	40	0.5	1.9	55	10	0.2	1.7	65.5
	W(K3)	35	1.2	50	NILL	25	0.3	2.1	90.8
Vijayapur(V)	BW(V1)	50	0.8	20	180	16	0.4	1.4	70.3
	LK(V2)	58	0.7	135	150	45	0.2	1.6	87.2
	W(V3)	60	1.1	150	170	52	0.1	1.5	77.1

BW- bore well, LK- lake, W-well, HP-hand pump

CONCLUSION

Among 36 waters samples analysed except few samples are under permissible limits of WHO guidelines out of them all are moderately high in permissible limit. In that Sindagi, Nidagundi taluka's water shows more acidic in nature. And Sindagi, Indi, Devarhipparagi, Babaleswar and Muddebihal Taluka's water shows more in total dissolved solids. And Devarahipparagi Taluka water shows more hardness. Calsium is more in Indi water, Flouride content is more in Tikota water. And Chadachan , Nidagundi Taluka's water shows more nitrate content. Hence it shows that they are not suitable for drinking in the accessible state.The effect maintenance of water quality of local resources through appropriate control measures continuous monitoring of their quality parameters and the after suitable treatment, the use of local resources as a supplementary to river water, will reduce the water crisis of all taluka's of Vijayapur district. Totally this project study shows Vijayapur district water falls in toxic categories.

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