ASSESSMENT OF WATER QUALITY INDEX FOR THE HOLALKERE AREA, CHITRADURGA DISTRICT, KARNATAKA, IN SOUTH INDIA.

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Abstract - The present study was intended to calculate water quality index (WQI) of Holakere area, Chitradurga, district, Karnataka. In order to ascertain to the quality of water for the public consumption, irrigation , agriculture, in the present study area sixteen water samples were collected and analyzed the different physico-chemical characters like PH, Total dissolved solids, Hardness, Fluoride, Iron, Nitrite, Chlorides, Calcium and Magnesium, Sulphates. Most of the components were in permissible limits. Based on the analyzed values calculated the water quality index for the all samples. The water quality index lies between 21.90 to 63.73. Major of the samples fall excellent to good category.

Key words: Ground water samples, physico-chemical analysis, water quality index,

1. INTRODUCTION

Water is an essential commodity with an un paralleled value after air and plays significant role in the biosphere (in animals and plants kingdoms),atmosphere (air) and lithosphere (rock units).It represents a unique feature in every settlement for drinking, sanitation, washing, fishing, recreation and industrial uses (Nagaraju and veeraswamy et al.,2017). The WQI was first developed by Horton in the early 1970s, is basically a mathematical means of calculating a single value from multiple test results. The index result represents the level of water quality in aim study area, such as Bore wells, ponds or stream. After Horton a number of workers all over the world developed WQI based on rating of different water quality parameters. Basically a WQI attempts to provide a mechanism for presenting a cumulatively derived, numerical expression defining a certain level of water quality (Miller et al., 1986).

2. Study area

In the present study area lies between the14°3'1.65"N and longitude 76°10'52.58"E values and it is faced a deficit of rain fall last three years with a 668mm and the major rivers drained generally gently sloping from South-West to East and the majority of the area occupied by the peninsular gneissic complex like granite, gneisses and the schist and water bearing formation occurred in weathered formations and structural geological disturbance like faults only. Ground water occurs under water-table condition and semi-confined condition. Ground water exploration reveals that aquifers were encountered between 25 mbgl to 169 mbgl. In Holalkere taluk bore wells were drilled from a minimum depth of 123.66 mbgl to a maximum of 200mbgl. Depth of weathered zone ranges from 11.5 to 30.3 mbgl. Yield ranges from 0.04 to 6.3 lps. The major portion of the study area were occupied deep & shallow black soil, mixed red & black soil, red loamy & sandy soil(CGWB).

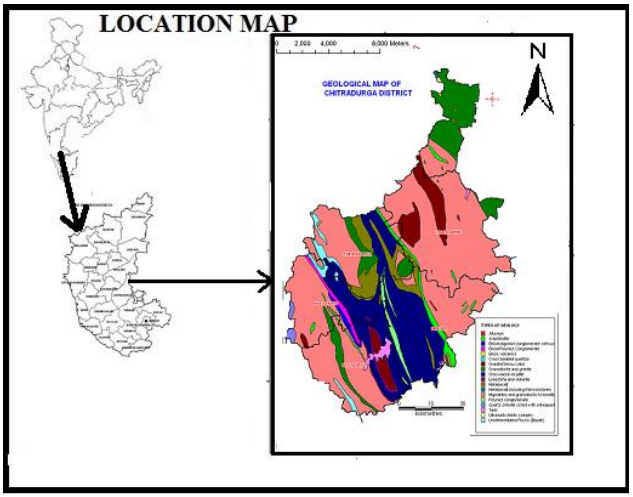

Fig 1: Location Map of the Study Area

3. Materials and Methods

The water samples from the water bodies were collected at an interval of 30 days and analyzed, for 16 samples physico chemical parameters by following the established procedures. P^H, Electrical conductivity, Total dissolved solids, Bicarbonate, Chloride, Sulphate, Calcium, Magnesium, Iron, Nitrate, Alkalinity and Total hardness. The results were evaluated and compared with world health organization (WHO), Indian council of medical research and Bureau of Indian standard (BIS) water quality standards.

In this study, for the calculation of water quality index, eleven important parameter were chosen, the WQI has been calculated by using the standards of drinking water quality recommended by the world health organization, bureau of Indian standards and Indian council for medical research. The weighted arithmetic index method has been used for the calculation of WQI of the water body. Further quality rating

or sub index was calculated using the following expression (Yogendra et al., 2007).

$$qn=100[Vn-Vio]/[Sn-Vio]$$

(Let there be n water quality parameter and quality rating or sub index (qn) corresponding to nth parameter is a number reflecting the relative value of this parameter in the polluted water with respective its standard permissible value.)

qn = Quality rating to the nth water quality parameter

Vn=Estimated value of the nth parameter at a given sampling station

Sn= Standard acceptable value of the nth parameter

Vio = Ideal value of nth parameter in potable water (i.e.,0 for all other parameter except the parameter pH and dissolved oxygen(7.0 and 14.6 mg/l respectively)

Unit weight was calculated by a value inversely proportional to the recommended standard value Sn of the corresponding parameter

$$Wn = K/Sn$$

Wn= unit weight for the nth parameters

Sn= standard value of the nth parameter

K=constant for proportionality

the overall water quality index wax calculated by aggregating the quality rating with the unit weight linearly.

$$WQI=\sum qn\ Wn/\sum Wn$$

Table-1 status of water quality based on water quality index (WQI)

WQI range	**Status**
< 50	Excellent
50-100	Good
100-200	Poor
200-300	Very poor
>300	Unfit for drinking

Table -2 Drinking water standards recommending agencies and unit weights (all values except pH and electrical conductivity are in mg/l.

S.No	Parameter	ICMR Standrd(Sn)	Unit Weight(Wn)
1	pH	8.5	0.141
2	Total Hardness	600	0.002
3	Sulphate	250	0.005
4	Flouoride	1	1.200
5	Chloride	250	0.005
6	Total Dissolved Solids	500	0.002
7	Calcium	75	0.016
8	Magnesium	50	0.024
9	Iron	0.03	0.006
10	Nitrate	45	0.012
11	Alkalinity	100	0.012

Table -3 Physico chemical analysis and of different constituents of water samples

S.no	pH	Hardness	Sulphate	Fluoride	Chloride	Tds	Calcium	Magnesium	Iron	Nitrate	Alkalinity
1	8.1	60	35	0.43	30	290	70	20	0.04	9	178
2	7.7	90	108	0.43	84	700	68	30	0.04	20	176
3	7.6	92	84	0.27	112	820	64	32	0.01	25	226
4	7.5	210	46	0.36	55	820	80	70	0.01	15	510
5	7.5	202	46	0.37	56	520	40	80	0.07	14	196
6	7.3	200	45	0.09	80	480	63	79	0.08	14	210
7	7.4	118	63	0.16	125	760	65	69	0.03	30	242
8	7.6	276	63	0.51	83	680	62	89	0.01	21	176
9	7.9	266	63	0.58	19	190	72	82	0.04	6	54
10	7.6	278	22	0.52	84	690	70	89	0.01	20	174
11	7.6	278	48	0.52	52	52	92	276	0.04	20	82
12	8.1	394	109	0.18	125	680	40	112	0.03	29	236
13	7.7	382	109	0.14	44	340	46	120	0.11	15	112
14	7.3	382	109	0.39	114	850	49	129	0.01	27	234
15	8.1	200	84	0.12	33	220	52	130	0.08	8	80
16	7.5	200	84	0.38	103	470	60	120	0.07	23	124

Table 4 Water Quality Index

S.No	WQI=∑qn Wn/∑Wn	Status
1	49.10613877	Excellent
2	49.36212915	Excellent
3	36.25540587	Excellent
4	47.48953233	Excellent
5	45.3274906	Excellent
6	21.90867498	Excellent
7	28.16174929	Excellent
8	57.90867498	Excellent
9	62.61254433	Good
10	58.80676891	Good
11	63.73747306	Good
12	31.82280637	Excellent
13	26.91304537	Excellent
14	49.26238862	Excellent
15	25.66189028	Excellent
16	47.37116102	Excellent

3. RESULT:

The WQI for16 samples ranges from 21.90 to 63.73.Almost ninety nine percent of the samples fall in excellent and the remaining fall in good category, As per the ICMR limit for drinking water all water fall in permissible limit. The high value of WQI at these stations has been found to be mainly from the higher values of total dissolved solids, calcium, hardness, fluorides, bicarbonate, chloride and manganese in the groundwater

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