A STUDY ON PHYSICO CHEMICAL PROPERTIES OF GROUND WATER IN SELECTED PARTS OF VIJAYAPURA CITY, KARNATAKA.

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Abstract: The Physico-chemical properties of ground water in selected parts of Vijayapura city of Karnataka state were studied.Laboratory investigations were carried out for analysis like pH, TDS, turbidity, EC, iron, calcium, arsenic, fluoride, sulphate and total hardness. The results of this study were compared with the drinking water guidelines of Indian Standards (IS) and World Health Organization (WHO). The pH of the sample taken from 10 different locations 7.8, turbidity 1.5 NTU, electrical conductivity 1.75 µS, total dissolved solids434mg/l. The study results revealed that except calcium and hardness, rest all the parameters fall within the WHO range , but total calcium and total hardness contents were more than the WHO standards. These results revel that there is incidence of kidney stones and bone related disease are more prevalent in this area. According to the results the interventions are helpfull to improve access to safe water.

Keywords: Electrical Conductivity, Physicochemical parameters, Ground water, Indian standards.

I. Introduction

Water plays vital role in human life. It is extremely essential for survival of living organism. The Groundwater serves as the most suitable fresh water resource in comparison to the rest of fresh water resources because of its balanced concentration of the salts which are the most suitable for human consumption. The groundwater is the main source of water for drinking and other purposes of 90% of the Indian population from different states(Ramachandraiah,2004; Tank and Singh, 2010).

Because of the importance of water in the lives of all living organisms in the world. It can be said that "No water No life".

Water is as being good solvent, it dissolves some toxic and hazardous substance which are the cause of water pollution and poising many public parameters of interest for water quality assessment and nitrates out of them. The increase in use of fertilizers and pesticides or the poor sanitary activities will raise the nitrates content in water. If the water containing high concentration of nitrate is used to prepare infant formula then it increases the risk for infant methemoglobinemia, the symptoms of which are blue-gray skin colour and it may leads the affected infant to irritable or lethargic depending on the level of severity of their conditions. If not treated leads to coma and death. The nitrate content in drinking water also leads to Hodgkin lymphoma and colorectal cancer. In the 1986 world health organization (WHO) has put limitations on the contents of nitrate and nitrites in drinking water, taking guidance from which Indian standards were developed.

As the whole human population needs safe drinking water for healthful life, hence the government should have to make the provision to provide the safe and free from pollutant water to the humans. This provision serves as the essential factor that contributes in reducing the mortality and morbidity rate in developing country. The world health organization (WHO) reported that half of the population in the developing countries suffers from health problems which are associated with lack of pollutant free and safe drinking water.

Only 20% Groundwater is the world resource of fresh water and it is widely used for various purposes. And from which only 1% of all fresh water is available from rivers, ponds, lakes etc. The quality of water directly depends on the various chemical constituent and their concentration produced as by-products of fertilizers, industrial waste, garbage or domestic waste.

In nature water occurs in oceans, ice and glaciers, on land and underground. It is a good resource for the industrial and economic development. Water is used for the drinking, recreation, crops production and in industry. It also holds its important place in sustaining the natural system. More than two billion people worldwide depend upon ground water (Kortatsi 1994; Xu & Usher 2006). In many communities (rural-urban) in the Twifo Hemang Lower Denkyira District (THLDD) of the Central Region of Ghana, the Groundwater is used to full fill the need of water for domestic, irrigation and industrial purposes.

The provisions of Groundwater are sometimes unsustainable due to poor productivity of water by wells, well drying because of prolonged drought and also due to poor quality of water. The lack of knowledge or information to understand the hydrological regime is the is cause to raise these problems (Kortatsi 1994; Xu & Usher 2006).

Contaminated water resources are capable of putting great impact on human health and the environment (Peterson et al. 1971). So it becomes necessary to improvise the water quality to promote human health. The poor quality of drinking water and the unsanitary conditions are responsible for the 80% of all disease in the developing world (Olijire and Imeokparia, 2001).

Methemoglobinemia, gastric cancer, birth defects, tetragonal toxicity and hypertrophy of the thyroid can be caused by the high nitrate levels in the drinking water.

II. Methods and methodology:

This present study has done in the year 2018-2019 in the department of food processing and nutrition. The aim of this research is to study the Physico-chemical Properties of Ground Water in Selected Parts of the Vijaypura City. Fig.1

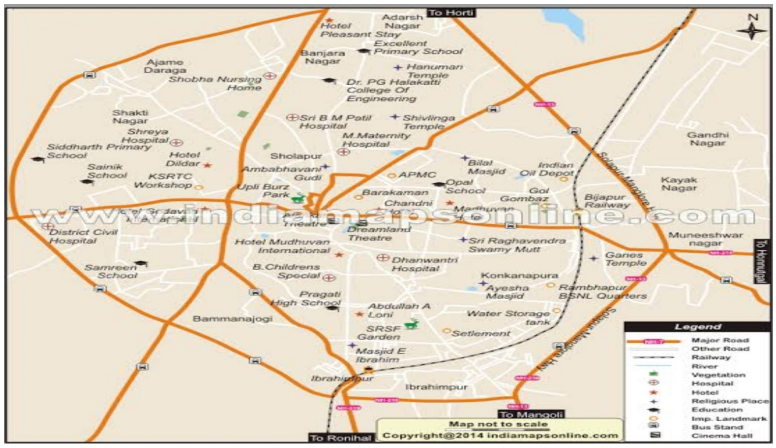

Fig.1: The Study Area's location map

Selection of area:

There are total 30 water locations in Vijayapura, among these 30 areas 10 areas were selected across the city.

Physico-chemical Analysis:

The water quality In the present stud the parameters such as pH, Total dissolved solids, Electrical conductivity, Total hardness, Turbidity, Iron, Calcium, Arsenic, Flouride and Sulphate of water are analysed by referring the Indian standard methods and methods as given by WHO to check the quality of collected water samples.

Statistical Analysis:

The correlation between tested parameters is checked by the simple linear correlation analysis.

III. Results:

The present study has been done in the year 2018-2019 in the Department of Food Processing and Nutrition, in order to study the Physio-chemical Properties of Ground Water of Selected Parts of Vijayapura City. The results are given below in table.1.

Table1: WHO drinking water limits ,2011.

SI.No	Parameters	WHO Limit
1	pH	6.5-8.5
2	Electrical Conductivity(EC)	0.5-3µs
3	TDS mg/l	112-956
4	Total Hardness mg/l	100
5	Turbidity NTU	0-5NTU
6	Calcium mg/l	1-135
7	Iron mg/l	0-0.3
8	Arsenic mg/l	0.010
9	Fluoride mg/l	0.43
10	Sulphate mg/l	0.5-228

Table 2: Classification of the degree of hardness

Total Hardness in mg/dl	Degree of hardness
0-75	Soft
75-150	Moderately hard
150-300	Hard
Above 300	Very hard

IV. DISCUSSION

(Figure 2: pH content of groundwater of selected areas of Vijayapura city)

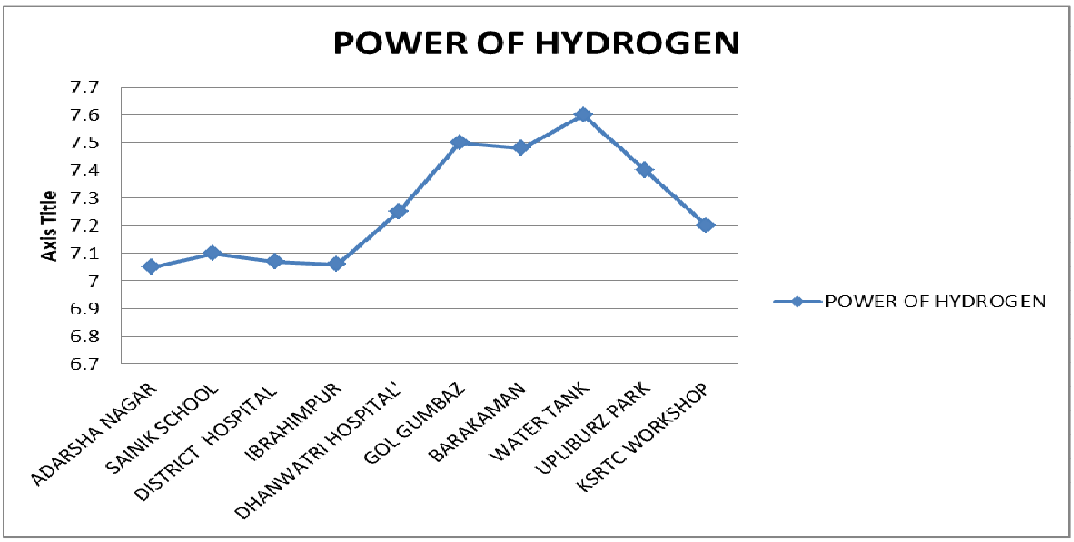

Fig-2. pH is an essential ecological factor and which gives neccessar information related to different types of geographical equilibirium or solubility calculation (Shyamala et.al.,2008). pH of the sample were in the range from 7.0-8.5. According to the (Fig.2), it is clear that all the sampling sites had pH level falling with the recommended range of 6.5-8.5 (W.H.O, 2011).

(Fig.3: TDS composition (mg/l) of groundwater in the selected areas of Vijaypura city)

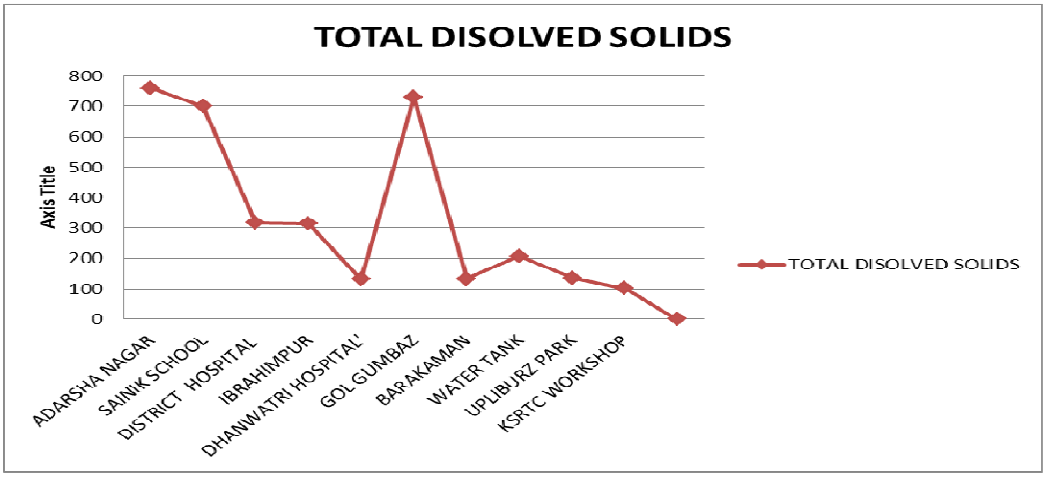

Fig-3. Total dissolved solids usually related to conductivity. The range of dissolved solids of water samples were in 112-756mg/l. All samples had the TDS within the permissible limit. One water sample (S10) showed less value than the limit prescribed by WHO.

(Fig.4: Groundwater Turbidity (mg/l) of the selected area of Vijaypura city)

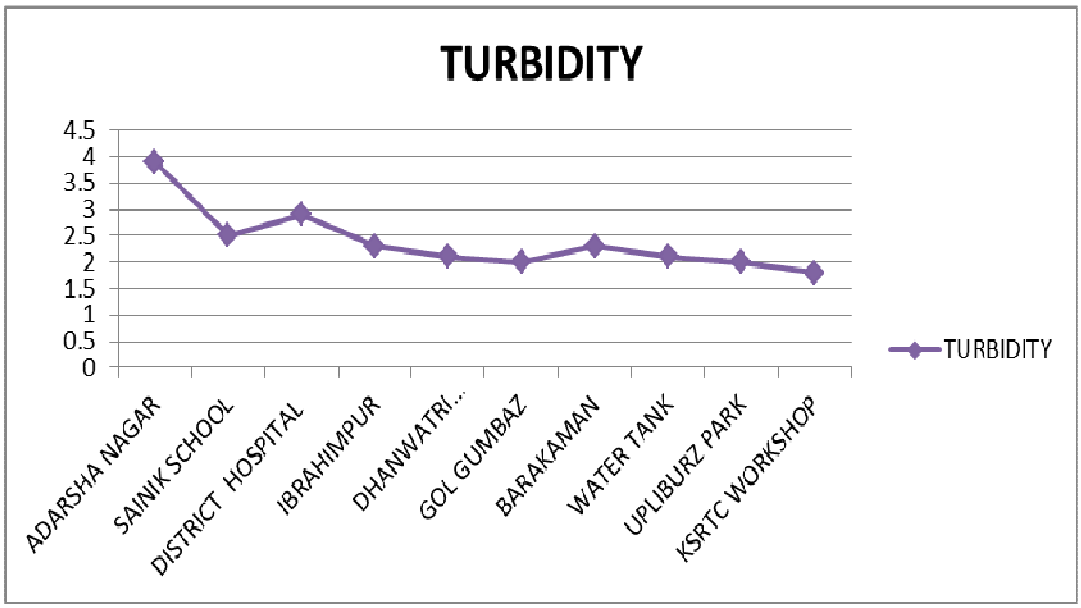

Fig-4. The colloidal and dispersions effects lead to turbidity in water. In most of the water sample, the values of turbidity varied between 0-5NTU of the total investigated samples; all water samples falling under the permissible limit of WHO.

(Fig.5: Groundwater Electrical conductivity (µs)of the selected area of Vijaypura city)

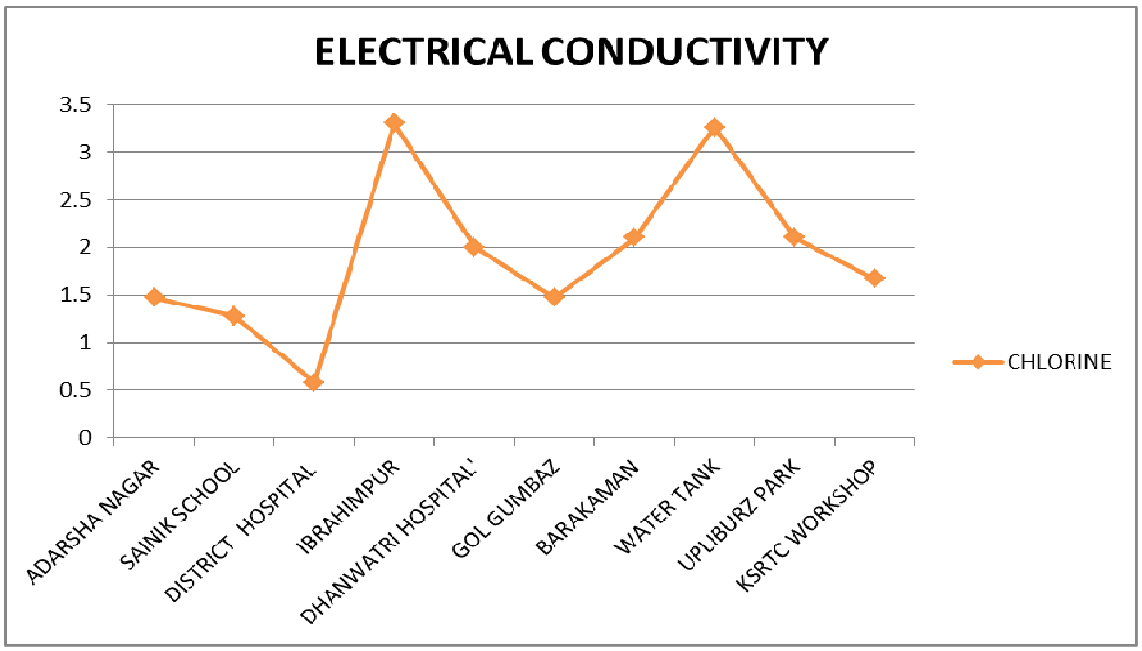

Fig-5. Electrical conductivity (EC) is a very useful tool through which the purity of water can be evaluated (Acharya et al., 2008). The values of electrical conductivity were in the ranged of 0.5-3µs. The EC values of all the samples are under WHO limits except S4 and S8. S4 and S8 had greater EC than the limitations of WHO. If the water sample contains high concentration of dissolved inorganic substances of ionized form indicates that the EC concentration of the sample is also high.

(Fig.6: Groundwater Iron content (mg/l) of the selected area of Vijaypura city)

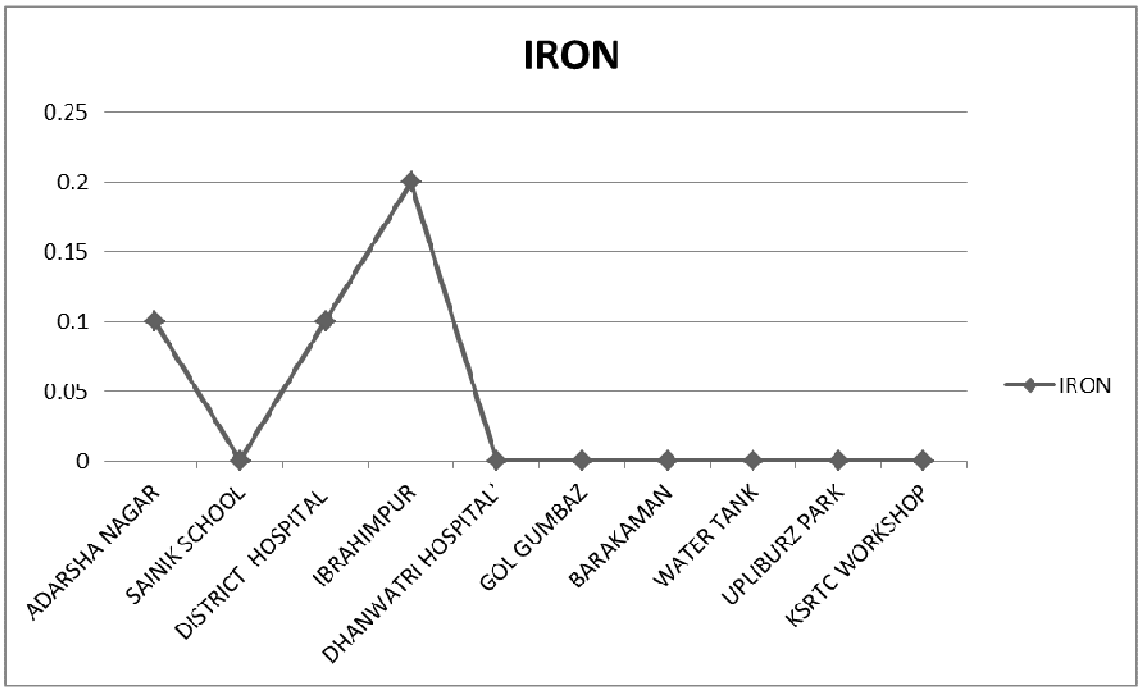

Fig-6. The high concentrations of iron leads to toxicity, The Iron content in the water samples ranged from 0-0.2 mg/dl. All the samples contain within the permissible limit. The recommendation of iron content of water is 0.3 mg/l (ppm), which depends on taste and appearance not on any health effect.

(Fig.7: Calcium content (mg/l)of groundwater in selected area of Vijaypura city)

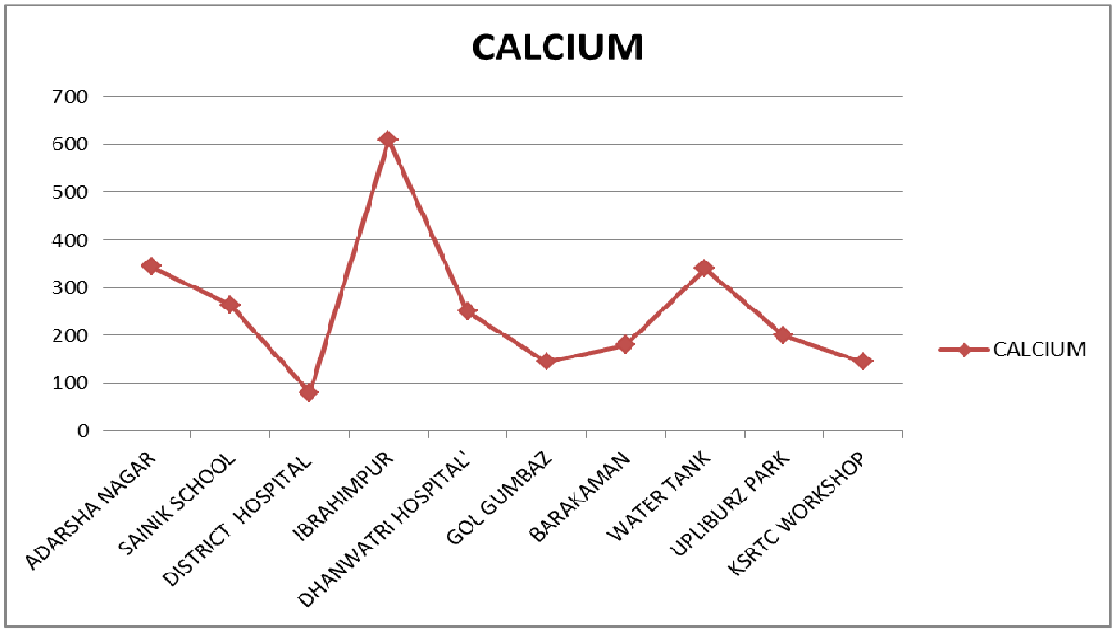

Fig-7. The defferent types of rocks, industrial waste and sewage are the sources of calcium in natural water (Trivedy and Goel, 1984). The values ranges from 98-611 mg/l. Only one sample S3 is within the permissible limit of WHO rest of all water sample indicates the values higher than the limitations of WHO.

(Fig.8: Groundwater Fluoride content (mg/l)of the selected area of Vijaypura city

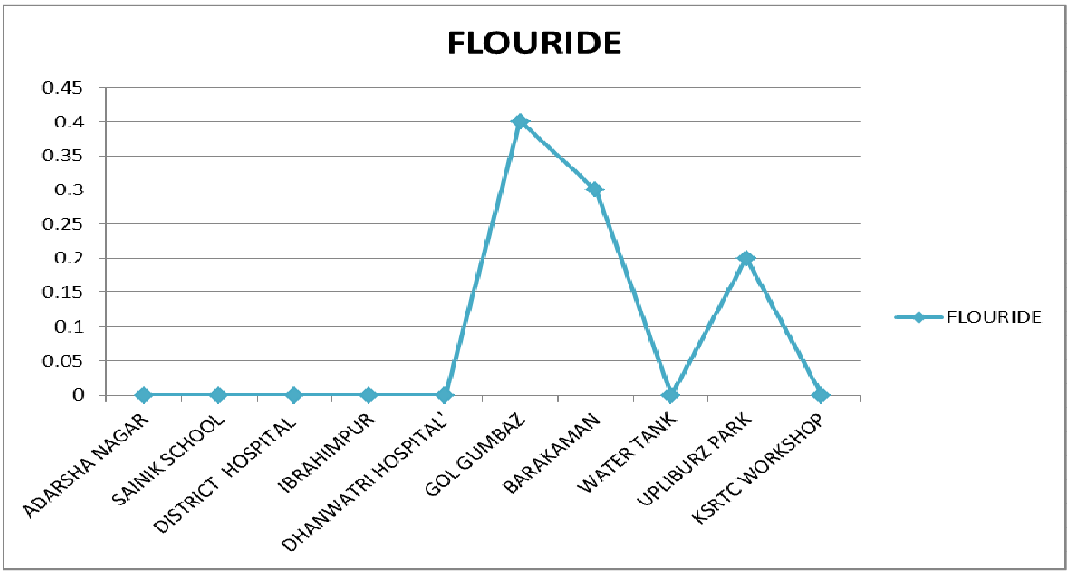

Fig-8. The concentration of fluoride of the water sample falls within the limits of WHO. High concentration of fluoride leads to dental fluorosis. While the low fluoride concentration leads to dental caries. Hence it is require to balance the fluoride concentration of drinking water.

(Fig.9: Groundwater Total hardness (mg/l) of the selected area of Vijaypura city)

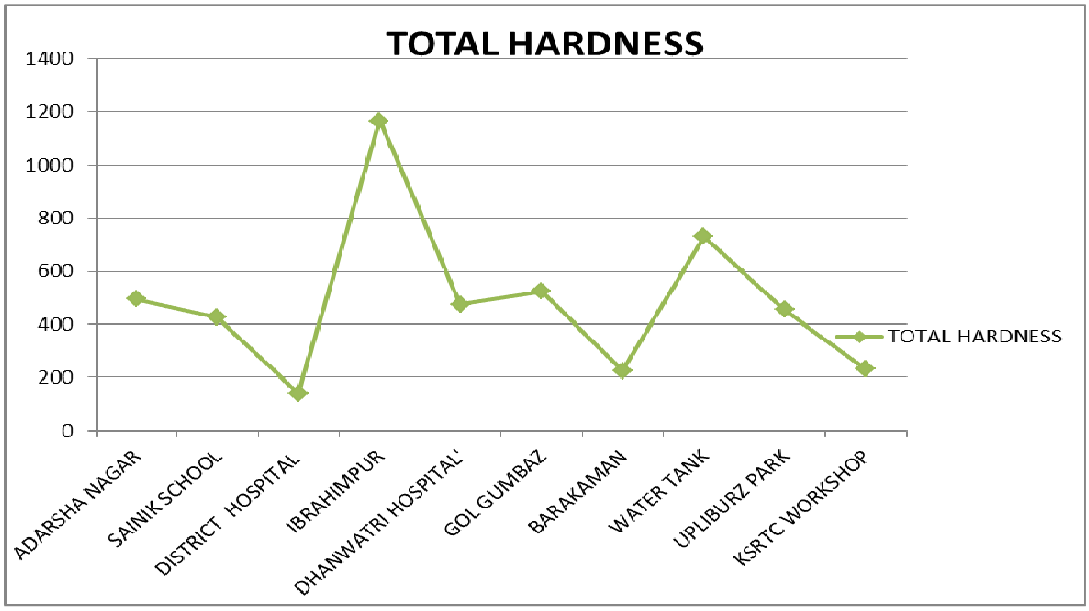

Fig-9. The total hardness ranged between 136-1198mg/l. The presences of certain salts in solution are responsible for Hardness in water. The hardness is usefull in certain conditions such as hardness of water forms a thin layer of scale in the pipe which limits entry of heavy metals from the pipe to the water (shrivastava et al., 2002). Sample S3 falls under the category of moderately hardness in water. Samples S7 and S10 are under the category of hard water and rest of all water samples showed the degree of very hard water, which is classified in form of degree of hardness as shown in the table 2.

(Fig 10: Groundwater Sulphate content (mg/l) of the selected area of Vijaypura city)

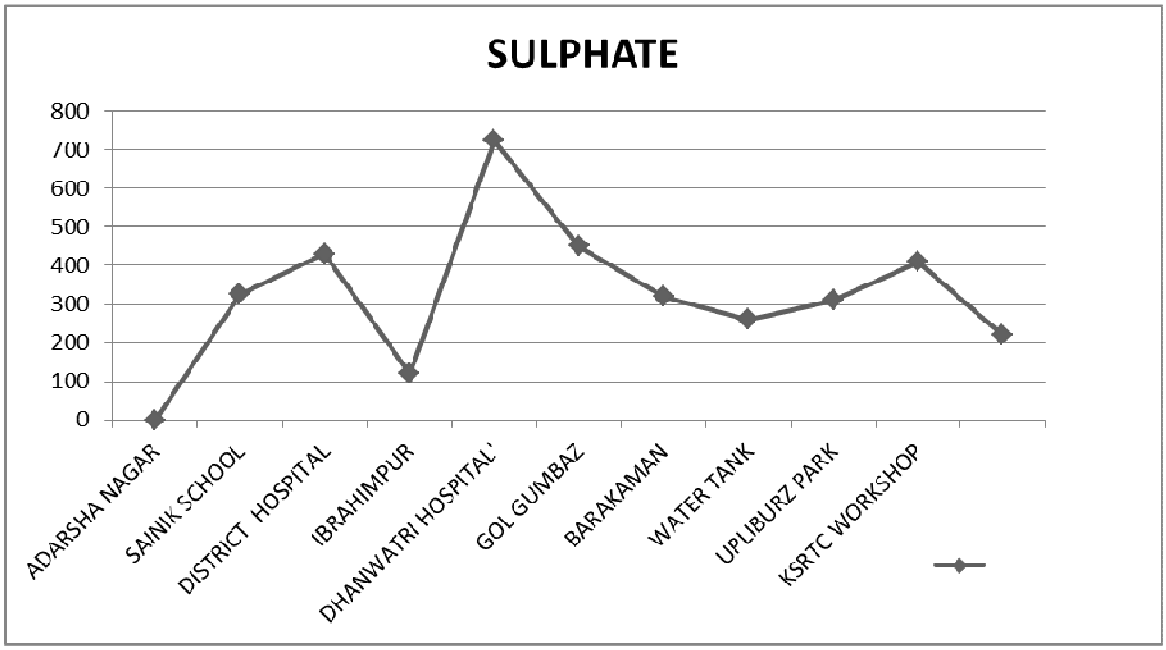

Fig-10. Sulphate content in water sample varied from 0.5-728 mg/dl. Sample S3 and S10 are within the stated limits and remaining of all samples has the values which are higher than permissible limit prescribed by WHO. Increased concentration of sulphate may leads to laxative which becomes sever if sulphate is consumed along with magnesium.

V. CONCLUSION:

The present research focuses on analyses of the Physico-chemical properties of ground water of the selected parts of Vijayapura city, North Karnataka. Among 10 water samples analysed except few samples are under limitations of WHO guidelines. Out of them all are moderately high in permissible limit. KSRTC Workshop area shows less in total dissolved solids. Ibrahimpur and Water tank water shows more Electrical Conductivity. Adarsh Nagar, District Civil Hospital and Ibrahimpur water shows more iron content. Hence these samples are unsuitable for drinking because higher amount of iron content in body leads to many diseases like cancer, infections or liver diseases. Calcium is more in all areas water except District civil hospital, hence majority of population here suffer from discolouration of tooth and incidences of kidney and gallbladder diseases are more common. Adarsh nagar, Sainik school, Ibrahimpur, Dhanwantari hospital, Gol gumbaz, Water tank and Upli burz park area's water shows more hardness. Hard water causes several health problems among which the most severe effects is an increased risk of cardiovascular diseases. So the district administration is under the process of supplying the water to city from the Krishna river basin nearby Vijaypura city. The supply of good quality drinking-water is essential for maintenance of health and development issue of population at a national, regional and local level. The investments done for the water supply and sanitation will give some good economic benefits. These interventions of suppling safe water help the poor in particular, whether in rural or urban areas and it can serve as good strategy to alleviation poverty.

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