Research Open Journal of Water
Vol. 1, No. 2, July 2013, PP: 25 - 34
Available online at http://www.scitecpub.com/Journals.php

Research article

Ground Water Quality Assessment of Kodipalya, Bangalore

Rekha H B*, Rashmi Naik, Srinivasa P A, Subhash Jadhav, Vinay Kumar N K

*Asst Professor, Dept of Civil Engg., UVCE, Bangalore University, Bangalore-560056, Karnataka, India.

E-mail: rekhahb@gmail.com

Abstract

Protection and management of ground water quality has emerged as a great concern in India. In Karnataka ground water is the major source for drinking purpose specially, in rural areas it is estimated that about 95% of water is drawn from ground water for different uses. Kodipalya is one of the suburban area in Bangalore and selected for the study in which major source of water is groundwater. A total of twelve samples were collected and analyzed for various physic-chemical parameters in order to know the quality of the water. All the samples are within the permissible limits as per IS 10500-1991. Hence it can be concluded that the groundwater of Kodipalya is fit for drinking purpose.

Keywords: ground water, fluoride, nitrate, hardness.

I. Introduction

About 97% of world's water occurs as salt water. Of the remaining 3%, 2/3rd occurs as snow and ice in polar and alpine regions. So, only about 1% of global water occurs as liquid fresh water. More than 98% of fresh water occurs as ground water, while less than 2% available in streams and lakes. Hence the liquid fresh water is a finite and limited resource (Garg, 2003).

The water which gets stored in the ground water reservoir through infiltration, etc., is known as underground water. This water is generally pure, because it undergoes natural filtration during the percolation through the soil pores. Moreover, they are less likely to be contaminated by bacteria. However, they are generally rich in dissolved salts, minerals, gases, etc. The extent of salts and minerals present in the ground water depends upon the type and extent of geological formations through which the water is passing before joining the water table (Garg, 2008).

Groundwater makes up about twenty percent of the world's fresh water supply, which is about 0.61% of the entire world's water, including oceans and permanent ice. Global groundwater storage is roughly equal to the total amount of freshwater stored in the snow and ice pack, including the north and south poles. This makes it an

important resource which can act as a natural storage that can buffer against shortages of surface water, as in during times of drought.

1.1 Origin

Most groundwater originates as meteoric water from precipitation in the form of rain or snow. If it is not lost by evaporation, transpiration or to stream runoff, water from these sources may infiltrate into the ground

1.2 Status of ground water utilization in Karnataka state

The ground water assessment for Karnataka state is done on watershed basis and the same have been re-appropriated to taluks. Details are shown in table 1.

- Net annual ground water availibity-15.29lakh hectare meter
- Existing ground water draft for all users-10.71lakh hectare meter
- Ground water available for further irrigation development-6.47lakh hectare meter

Table 1: Different district of Karnataka and critical semi and over exploited taluks within the state

Si No.	District	Over Exploited Taluks	Mixed Category Taluks (Oover exploited, Critical and Semi Critical)
1.	Bagalkot	Badami, bagalkot&hunagund	Bilgi, Jamakhandi and Mundhol
2.	Banglore (Rural)	DevanalliDoddaballapur , Hoskote and Nelamagla	
3.	Banglore (Urban)	Anekal, Bangalore , North & Bangalore South	
4.	Belgaum	Athani&Ramadurg	Bailhongal, Chikkkodi ,Gokak, Hukkeri, Raibagh and Soundatti
5.	Bellary	Hadagli	Bellary,H.B.Halli, Kudiligi, Sirguppa
6.	Bidar		Bhalki and Bidar
7.	Bijapur		Bagewadi, Bijaapur ,Indi, Muddebihal and Sindagi
8.	Chamrajnagar		Chamrajnagar,Gundlupet and Kollegal
9.	Chikkaballapur	Chikkaballapur, Chintamani, Gouribidanur, Gudibande&Shidlaghatta	Bagepalli
10.	Chikkamaglur		Chikkamagalur, Kadur and Tarikere
11.	Chitradurg	Holakereand, Chitradurg	Challakere, Hiriyur and Hosdurga
12.	Dakshina Kannada		Bantwal and Mangalore
13.	Davanagere	Chennagiri, Davanagere,Haraanahalli, Harihar&Jagalur	Honnali
14.	Dharwad		Navalgund
15.	Gadag	Naragund& Ron	Gadag and Mandaragi
16.	Gulbarga		Afjalpur and Shorapur
17.	Hassa		Arasikere,Belur, C.R.Patna, Hassan and Holenarasipura

18.	Haveri	ByadagiandRannebennur	Haveri and Hirekerur
19.	Kolar	Bangarpet,Kolar,Malur, Mulabagilu&Srinivasapur	
20.	Koppal	Yelburga	Gangavati , Koppal and Kushtagi
21.	Mandya	K.R.Pete&Malavalli	Maddur, Pandavapur and Srirangapattana
22.	Mysore		H.D.Kote, Hunusur , Mysore , Nanjanagud, T. Narasipur
23.	Raichur		Lingasugur
24.	Ramanagar	Channapattana, Kanakapur&Ramanagar	Magadi
25.	Shimoga		Shikaripur and Shimoga
26.	Tumkur	Koratagere, Madhugiri&Tipur	C.N.Halli, Gubbi, Kunigal, Pavagad, Shira, Tumkur and Turuvekere
	Total	District: 15, Taluks:43	District:23 , Taluks:67

(Source: http://pubs.usgs.gov/gip/gw/quality.htm)

In recent years, the growth of industry, technology, population, and water use has increased the stress upon both our land and water resources. Locally, the quality of ground water has been degraded. Municipal and industrial wastes and chemical fertilizers, herbicides, and pesticides not properly contained have entered the soil, infiltrated some aquifers, and degraded the ground-water quality. Other pollution problems include sewer leakage, faulty septic-tank operation, and landfill leachates. In some coastal areas, intensive pumping of fresh ground water has caused salt water to intrude into fresh-water aquifers. www.lentech.com/water). To ensure safety to public health, economy and utility in the industry and other uses, it, therefore, becomes imperative upon the planners and designers of the public water supply schemes, to thoroughly check, analyze and treat the raw available water to safe and permissible limit before public use (www.wikipedia.org).

The ground water are sometimes associated with various parameters like pH, Total Dissolved Solids(TDS), Total Hardness, Iron(Fe), Magnesium(Mg), Calcium(Ca), Fluorides(F), Nitrates(NO_3),in these parameters when not within the permissible limits causes various problems to the people who consume/ utilize it. This necessitates the present study to analyze the ground water for various parameters and to suggest suitable remedial measures (www.wikipedia.org).

2. Study Area Description

The area selected was Kodipalya, which is a sub urban area in which ground water is used for drinking and domestic purposes. Kodipalya is located at Latitude: 12°54'04.21"N and longitude of 77°29'20.27"E with an geographical average elevation of 2618ft above the mean sea level. Kodipalya is situated 15km west to Bangalore. Main road length of the Kodipalya place is 3.5km and the area is 0.50km away from Kengeri bus stop on the route of Uttarhalli . As of 2011 Indian census, Kodipalya had population of 3600.

2.1 Climate Condition

In recent times the highest recorded temperature in temperature in January has been 33 °C that's 91 F, with the lowest recorded temperature 16 °C, about 61 °F. Throughout the month of January daytime temperatures will generally reach highs of around 29 °C. At night the average minimum temperature drops down to around 20 °C. The average daily humidity for January is around 60%. The overall average temperature for summer is around 29 °C and for winter is 19 °C.

Research Open Journal of Water
Vol. 1, No. 2, July 2013, PP: 25 - 34
Available online at http://www.scitecpub.com/Journals.php

3. Materials and Methodology

Total twelve samples were collected from different places of Kodipalya, Kengeri, Bangalore west. The sampling stations are shown in fig.1. The ground water samples were collected at a random order from a water source viz bore wells. Samples were collected for the analysis of elements like pH, total hardness, total dissolved solids, alkalinity, chlorides, calcium magnesium, fluorides and Nitrates. The samples were collected in polystyrene bottles having 2000 ml capacities for the purpose of analysis. The objective of sampling is to collect a portion of material small enough in volume to be conveniently transported, and handled in the laboratory while still accurately representing the material being sampled. This implies that, the relative portions of the concentrations of all permanent components must be the in the samples as in the material being sampled and that the sample must be handled in such a way that significant change in composition of the water at the time or over the period of sampling do not changed.

The collected samples were carried to the "Environmental Engineering Laboratory", Department of Civil Engineering, JB-Campus, Bangalore University, Bangalore-56 for the analysis. All the analysis was done as per the standard methods for the examination of water and wastewater analysis.

Figure1: Study area and sampling stations

Research Open Journal of Water
Vol. 1, No. 2, July 2013, PP: 25 - 34
Available online at http://www.scitecpub.com/Journals.php

4. Results and discussions

4.1 Results

In the present study various parameters influencing ground water quality were selected for laboratory analysis. Variation of each parameter with respect to all the twelve sampling stations are shown in fig 2 to fig 10 in the order of pH, total hardness, TDS, calcium hardness, magnesium hardness, total alkalinity, fluoride, nitrate, chlorides respectively.

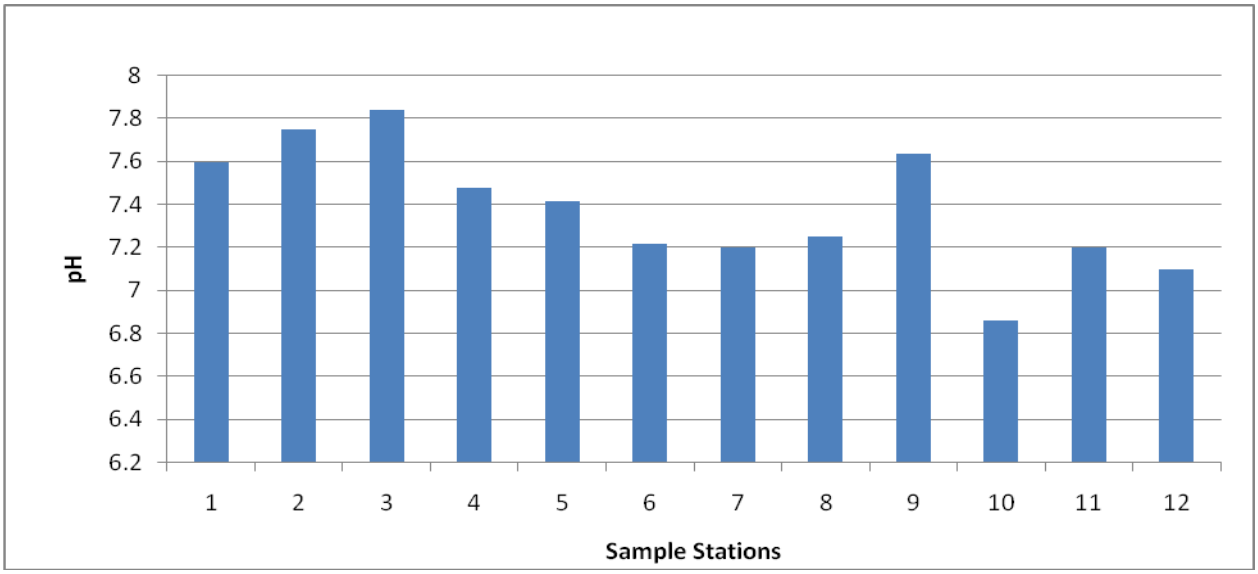

Figure2: Variation of pH

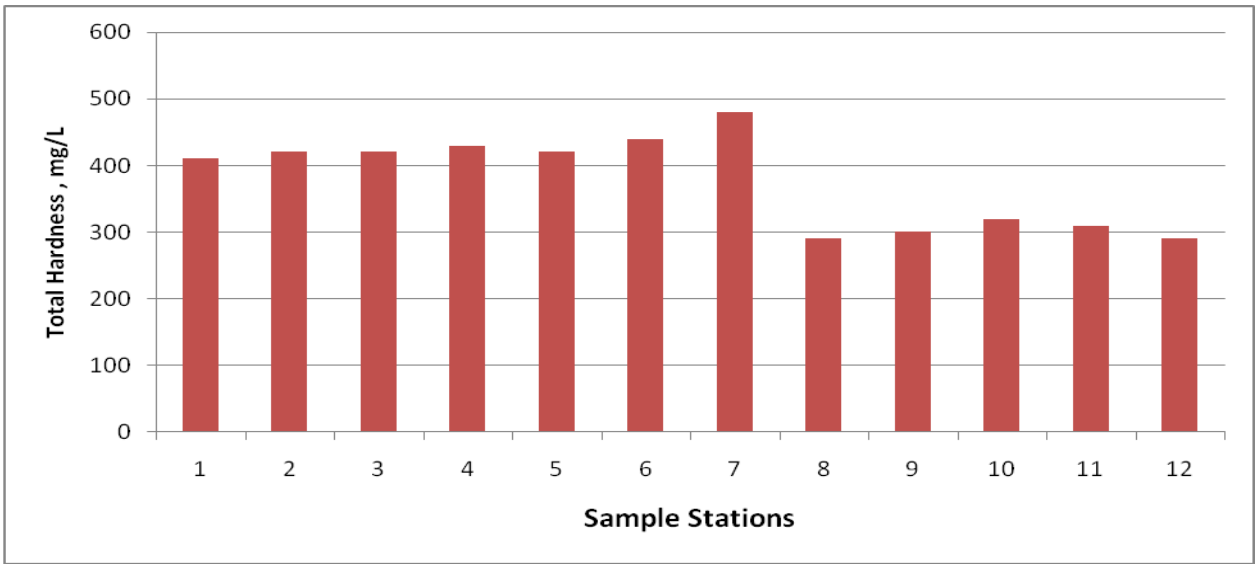

Figure 3: Variation of Total Hardness

Research Open Journal of Water
Vol. 1, No. 2, July 2013, PP: 25 - 34
Available online at http://www.scitecpub.com/Journals.php

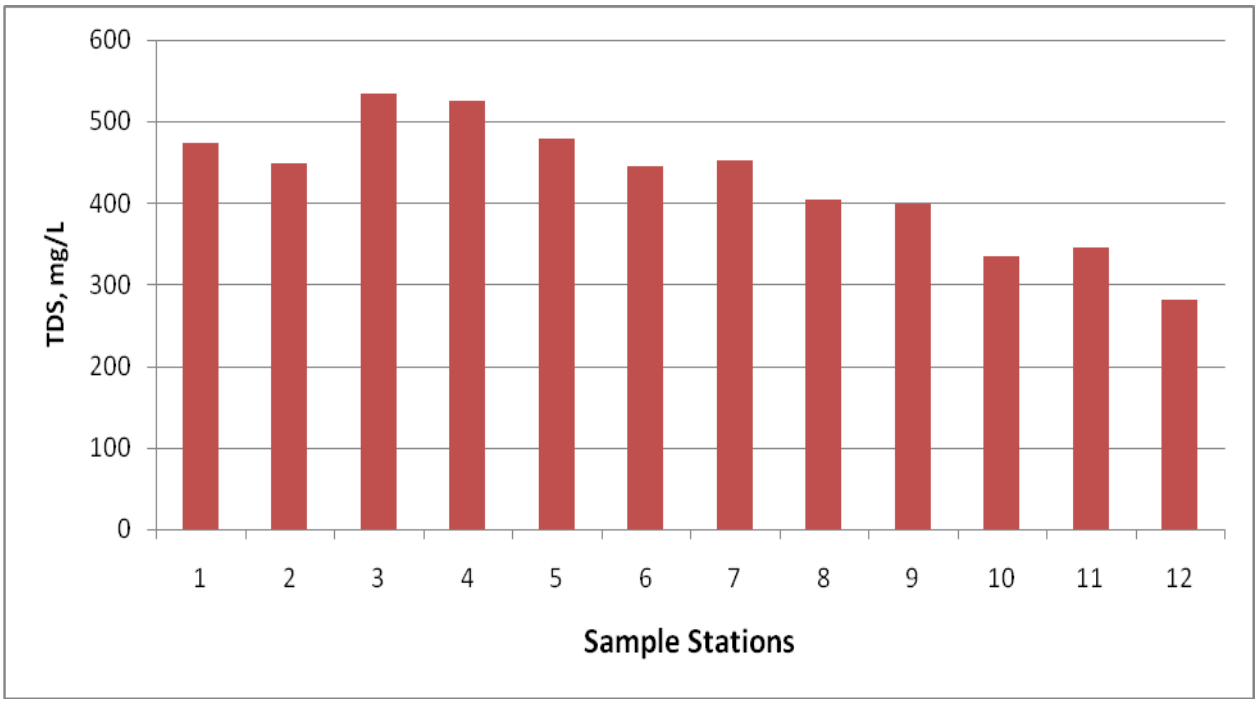

Figure 4: Variation of TDS

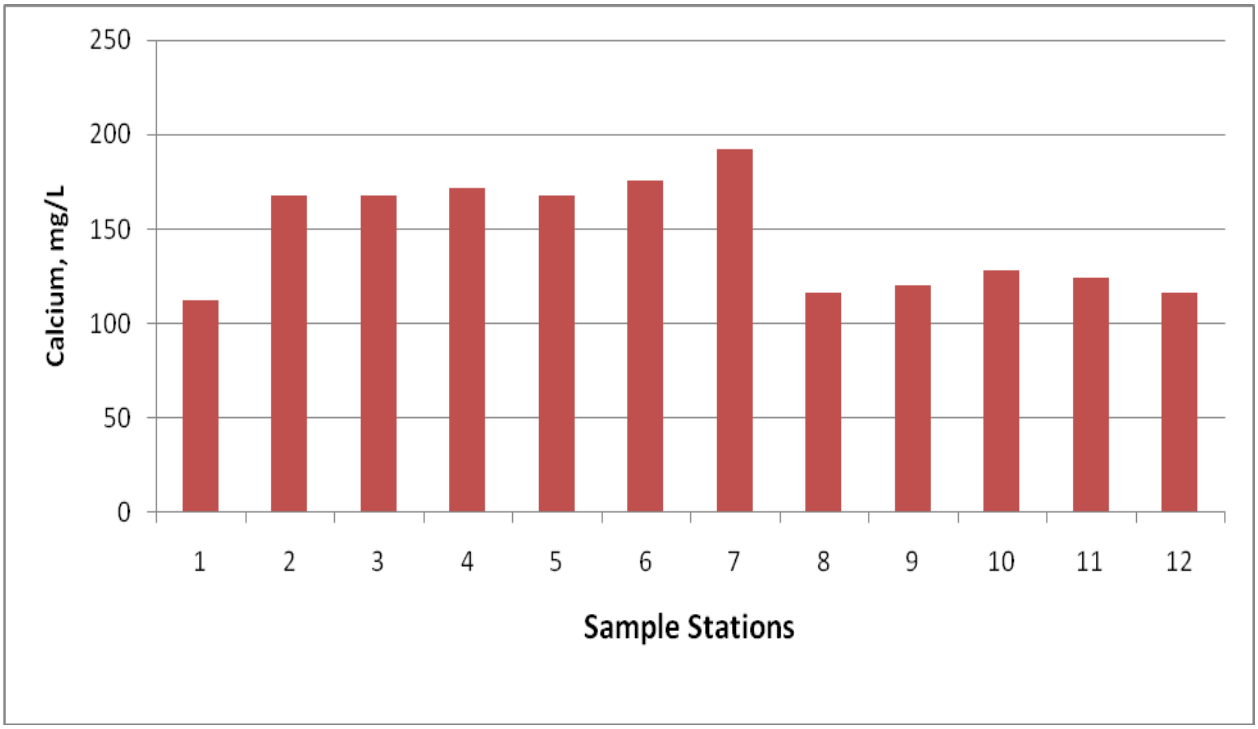

Figure5: Variation of calcium hardness

Research Open Journal of Water
Vol. 1, No. 2, July 2013, PP: 25 - 34
Available online at http://www.scitecpub.com/Journals.php

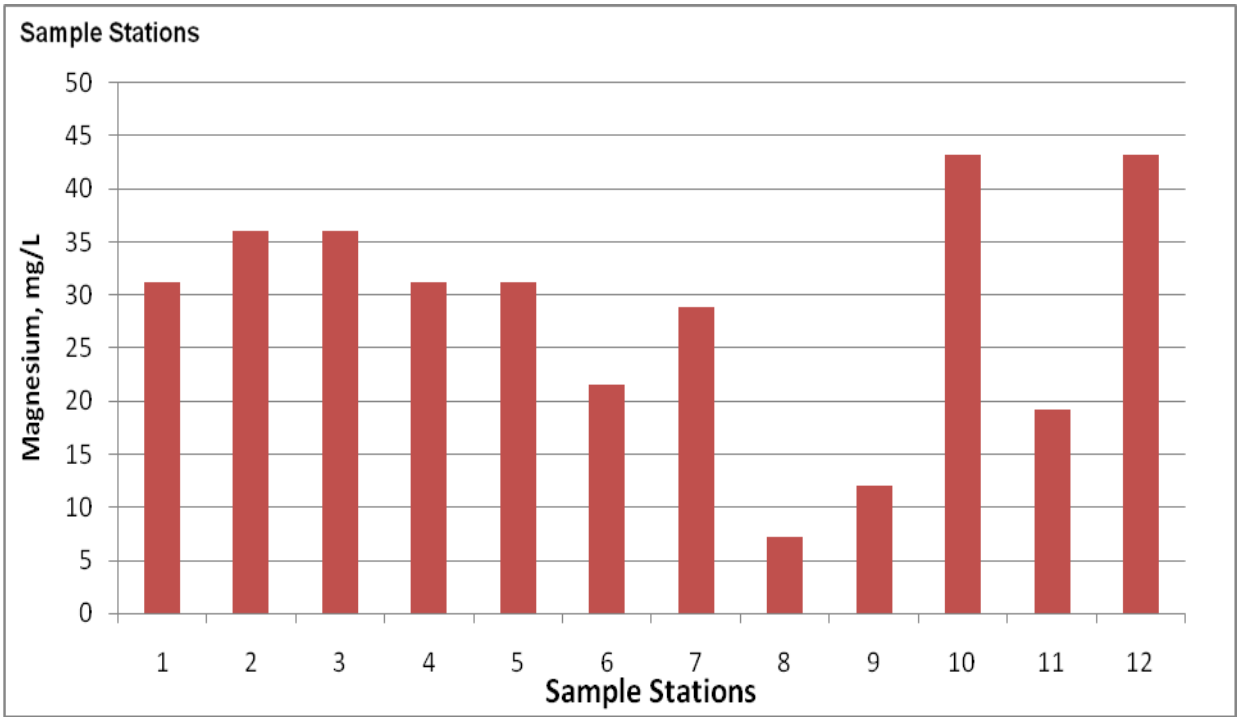

Figure 6: Variation of magnesium hardness

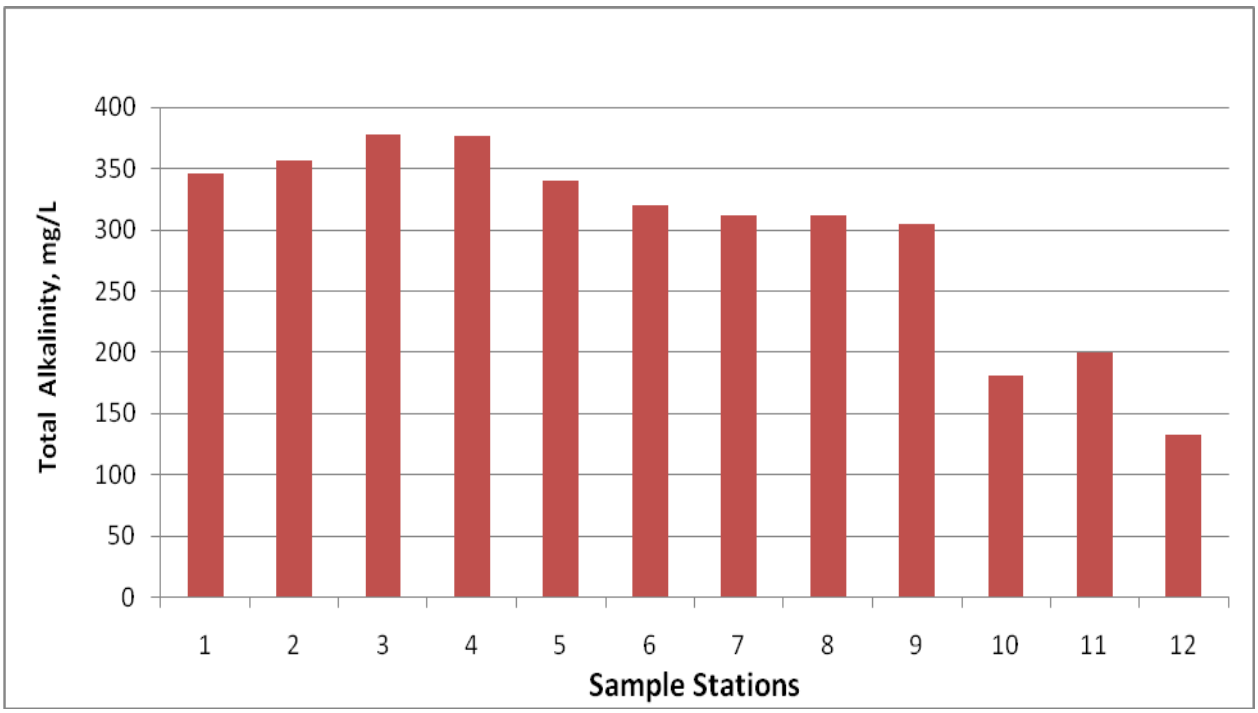

Figure 7: Variation of total alkalinity

Research Open Journal of Water
Vol. 1, No. 2, July 2013, PP: 25 - 34
Available online at http://www.scitecpub.com/Journals.php

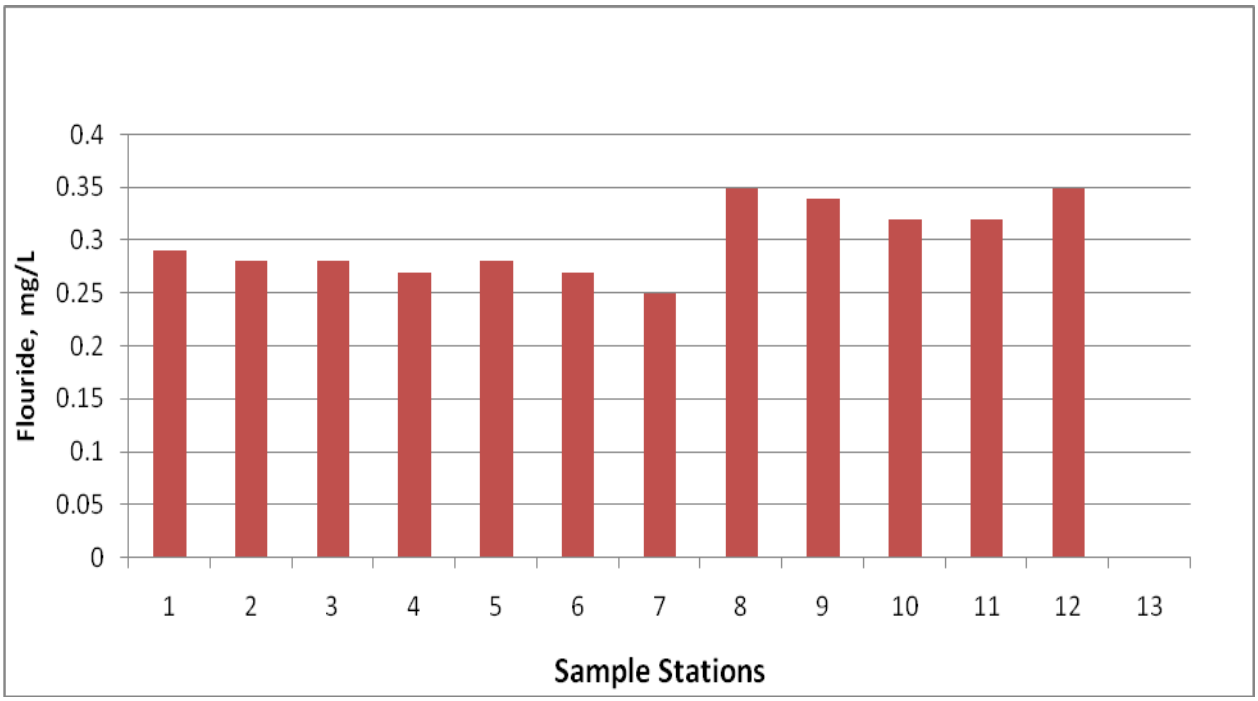

Figure 8: Variation of fluorides

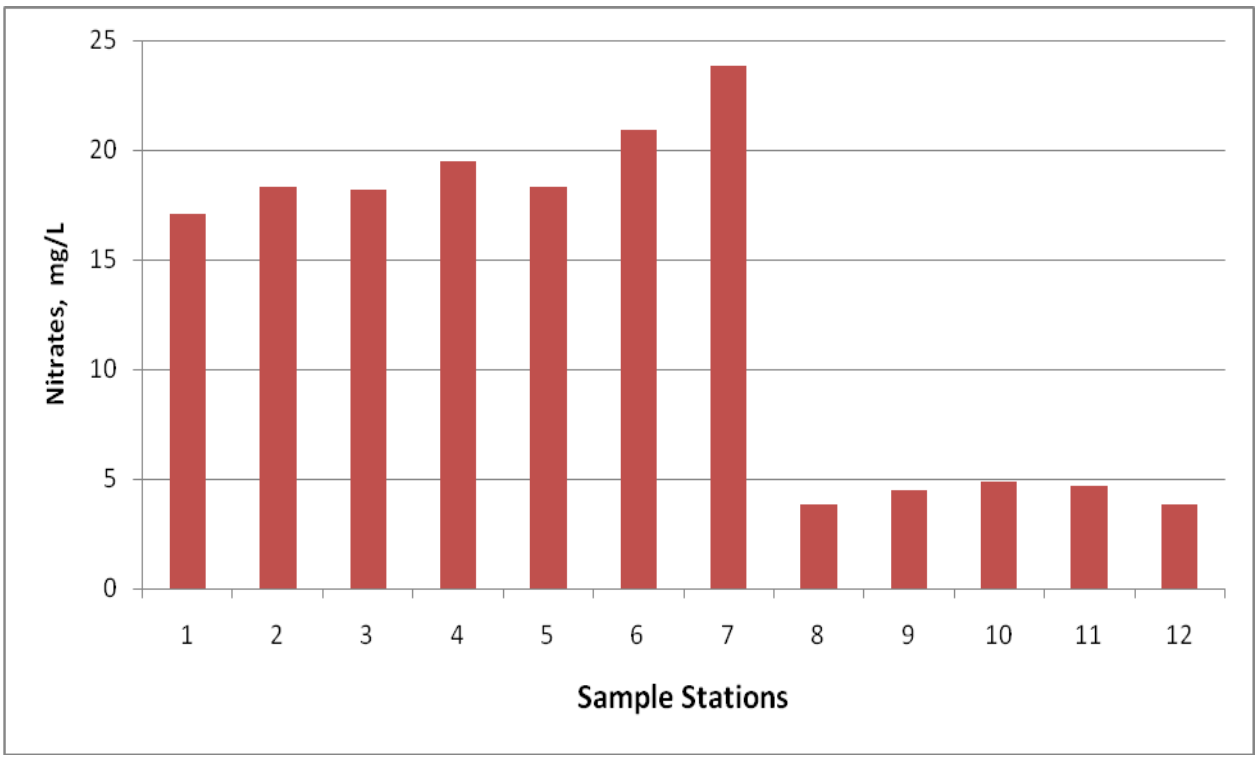

Figure 9: Variation of nitrates

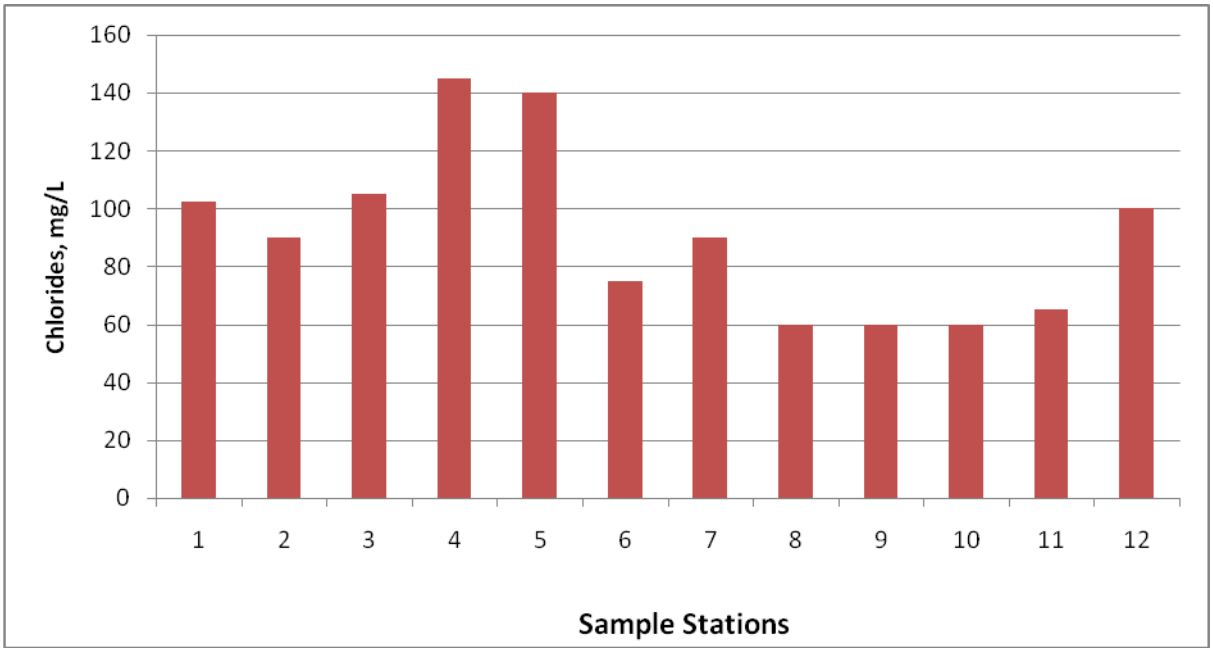

Figure 10: Variation of chlorides

4.2 Discussions

From fig. 2 to fig. 10, it can be observed that the pH value varied from 6.86 to 7.84. total hardness varied from 290 to 489 mg/L, total alkalinity value varied from 132 to 378 mg/L, fluoride value varied from 0.25 to 0.35 mg/L, TDS varied from 281.35 to 534.43 mg/L, chloride varied from 59.98 to 145 mg/L, nitrate value varied from 3.8 to 13.8 mg/L, calcium value varied from 112 192 mg/L, magnesium hardness varied from 7.2 to 43.2 mg/L. All the parameters are within the permissible limits as per BIS 10500-1991.

Total dissolved solids varied from 281.35 to 534.43 i.e stations 3 and 4 exceeding the desirable limit of 500 mg/L. Beyond this palatability decreases and may cause gastro intestinal irritation. However its within the permissible limit of 2000 mg/L.

Fluoride occurs most commonly as fluorite or fluorspar. The fluoride minerals are merely insoluble in water. Permissible limit of fluorides in drinking water is 1mg/L to 1.5mg/L (IS10500-1991). Fluoride ions have dual significance in water supplies when concentration of fluorides is greater than 1.2mg/l it causes dental fluorosis, skeletal fluorosis, stiffness of joints and concentration level less than 0.2mg/l may results in formation of fevers cavities in the teeth of children and dental caries. Fluoride may kept as low as possible.

Nitrates are mainly derived from plants or sewage. The significant sources of nitrates are chemical fertilizers from cultivated lands, drainage from live stock feed as well as domestic and industrial sources. Natural water in their unpolluted state contains only minute amount nitrates. Nitrates may enter the ground from sewage discharge on land or from sewage lagoons. Nitrates in concentration greater than 45mg/l (IS10500-1991), is considered as undesirable in domestic water supply because of potential toxic effects on young infants although adults and other children may not affected. Mathemoglobinimea is a disease caused by the nitrates. High nitrate concentration indicates the pollution of surface water and presence of harmful micro-organisms. Regular monitoring of nitrate in ground water is essential in order to prevent the potential danger of human exposure to pollutants.

5. Conclusions

Based on the work carried out the following conclusion were drawn Total 12 samples were selected from prelocated sampling stations of Kodipalya, Kengeri for the analysis of various physico-chemical characteristics. The quality of ground water is well within the limits as per Bureau of Indian Standards for drinking water. Higher concentration of Total hardness is mainly due higher concentration of calcium and magnesium in the basin. Higher concentration of Total dissolved solids is may be due to higher concentration sodium, magnesium and chloride etc in groundwater. Groundwater of the study area is suitable for drinking and also for irrigation. If fluoride is greater than 1mg/l it may be decays of teeth i.e., called fluorosis disease takes place in human being. So care should be taken for future life if value exceeds the permissible value.

References

[1] Garg S K, Water supply engineering, vol1, Khanna publications, 18th edition, 2008.

[2] Garg V K, Sharma B P, Rakesh K Hooda, Ground water contamination in an urban area, journal of IPHE, India, vol 2, 2003.

[3] ISI, Indian standards for drinking water, 10500-1991.

[4] (http://pubs.usgs.gov/gip/gw/quality.html)

[5] http://en.wikipedia.org/wiki/Water

[6] www.lentech.com/water