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The Bacteriological Analysis Of The Groundwater Sources At Doddaballapura, Karnataka State

Raghunandan Koppad ,
Assistant Professor, School of Civil Engineering,
REVA University, Rukmini Knowledge Park,
Bengaluru, Karnataka, India.

Amit S. Dharnaik ,
Assistant Professor, MIT School of Engineering,
MIT ADT University,
Pune, Maharashtra, India.

Apurva Deshpande ,
Assistant Professor, Department of Civil Engineering,
Pillai HOC College of Engineering and Technology,
Rasayani, Maharashtra, India.

Muhammed Zain
UG Student, School of Civil Engineering,
REVA University, Rukmini Knowledge Park,
Bengaluru, Karnataka, India.

Abstract

In recent times, The anthropogenic activities and improvement in modern lifestyle has increased the dependency on groundwater. In present work bacteriological studies in Doddaballapura, Karnataka state is carried out. Groundwater samples collected from 5 different bore well locations. Analytical techniques were adopted as described in the standard methods for the analysis of water and wastewater for physical, chemical and bacteriological analysis of the collected samples. The results obtained were compared with Bureau of Indian Standards applicable for wholesome water to identify the health hazards. The samples were analysed for various parameters like: pH, Conductivity, Dissolved Solids, Total Solids, Nitrates, Sulphate, Sodium, Potassium, Chloride Calcium, Magnesium, Fluoride, Total Iron, Bicarbonate, Carbonate, Total Hardness, and Bacteriological test. The analysis of water samples reveals that in the study area, most of the water quality parameters like Total Hardness, Chloride content, exceeds the permissible limits. On the basis of both chemical and bacteriological analysis, the water samples are found to be fit for drinking purpose

Keywords: *Bacteriological analysis, Groundwater, Health Hazards, Pollution, Water quality*.

Introduction

Water is the precious natural resources that Comprises over 70% of the surface of the earth. Water is elixir of life that cannot be ignored as it is of importance for the survival of life on earth. Increasing demand for water has stressed upon the utilization of ground water as reliable source due to extinction or contamination of surface water body and the dependency for water on the said source has increased over a time with population increase. Water quality test is an important test that needs to be carried out so as to satisfy the water quality requirement for good health of consumers.[11]

A recent study reported more than 40,000 people in Doddaballapura were found to be using private bore wells as as primary source for drinking of water. Limited Studies has been carried out for microbiological quality of untreated ground water. The purpose of the present study was to assess the bacteriological quality of groundwater supplies which has not been treated in Doddaballapura, Karnataka State.

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Study Area

Doddaballapur is situated in Bengaluru Rural district in Karnataka, India. Doddaballapur is 40 km from Bengaluru towards North on Hindupur-Bengaluru- State Highway. Doddaballapura, has a population of 93,105 which covers an area of 15.5 sq. km, Longitude - 13° 17′ 31.2″ N, Latitude - 77° 32′ 34.8″ E and Elevation of 880 m (2890 ft). Consisting of 31 wards, it has 18064 households. Of these, 17.5% (3169) are slum households and 82.5% (14895) are non-slum. At present there are 13 slums, 11 declared and 2 undeclared / identified. The total slum population is approximately 13919, 22% of the total population. The largest surface water body present in town is the 'Nagara kere', one of the key tanks of the cascading tank system of River Amravati, a tributary of River Cauvery, originates at Nandi Hills and flows for a distance of 190 kms. There is 100 per cent dependency on groundwater, with the municipal and private players supplying water from bore wells drawing from depths of 500 to 800 ft below ground and declining.

Ground water reaches people through taps (2135 public taps, 8295 domestic connections and 296 commercial connections), bore wells (private and 10 hand pumps), wells (Own and Public), Tanker and Bottled/Can water (Private suppliers). 14.5% (261) respondents harvest rain water (traditional and systematic water harvesting system), of which only 16% use it for potable purpose. Tanker is the main source of wholesome water which is estimated to be nearly 50% and 47% estimation is satisfied by municipal water, with 30% accessing water from more than one source. The main source of untreated water is municipal water (37% private tap and 50% public tap). But there exists a stark difference among the slum and non-slum community. More than half of the slum community (57%) gets potable water from public taps (municipal supply). More than half of the non-slum community (55%) buys water for potable purpose from tankers. Only 14% of the slum communities have access to domestic connections, whilst for the non-slum communities it is 44%.

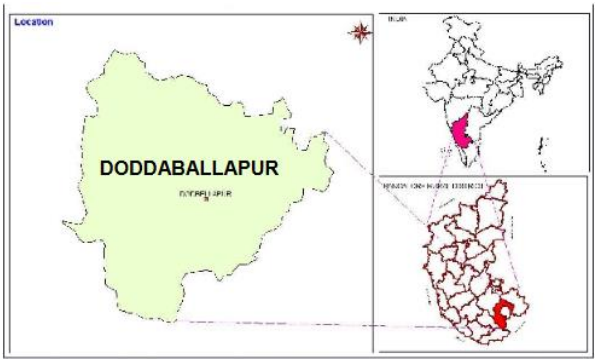

Figure 1: Location Map of Doddaballapur Taluk, Bangalore Rural District

Materials and Methodology

Around 5 houses are randomly selected in Doddabalapura, and the detailed survey regarding the availability of water and sources of supply, diseases associated with health was collected for the water quality analysis plastic cans of 2 litres capacity was used to collect the samples and for bacteriological study sterilized bottles of 500ml capacity was used after the primary study. The samples are labeled, kept in Ice box and transported to laboratory for analysis. All samples are analyzed for physcio-chemical characteristics and bacteriological tests (Total Bacterial Count, Fecal Coli form and E-coli) as standard methods of analysis. The water samples collected from Doddaballapura Town were analyzed for the following parameters such as Physico chemical analysis like pH, Conductivity (Micro-mhos/cm), Dissolved Solids (mg/L), Total Alkalinity (mg/L of $CaCO_3$), Chloride(mg/L), Sulphate(mg/L), Nitrates(mg/L), Sodium(mg/L), Total Iron(mg/L), Calcium(mg/L), Magnesium(mg/L), Total Hardness(mg/L), Fluoride(mg/L), Bicarbonate(mg/L), Carbonate(mg/L), Potassium(mg/L) and also Bacteriological analysis such as E-coli, Total coliforms and Fecal coliform. The location details of groundwater sampling stations are described in Table. 1 and Methodology adopted in this study is shown in Figure 2.

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Table 1: Details of sampling stations

Station No.	Station Names
S1	T Cross
S2	D Cross
S3	M.V.Jalappa Road
S4	
S5	

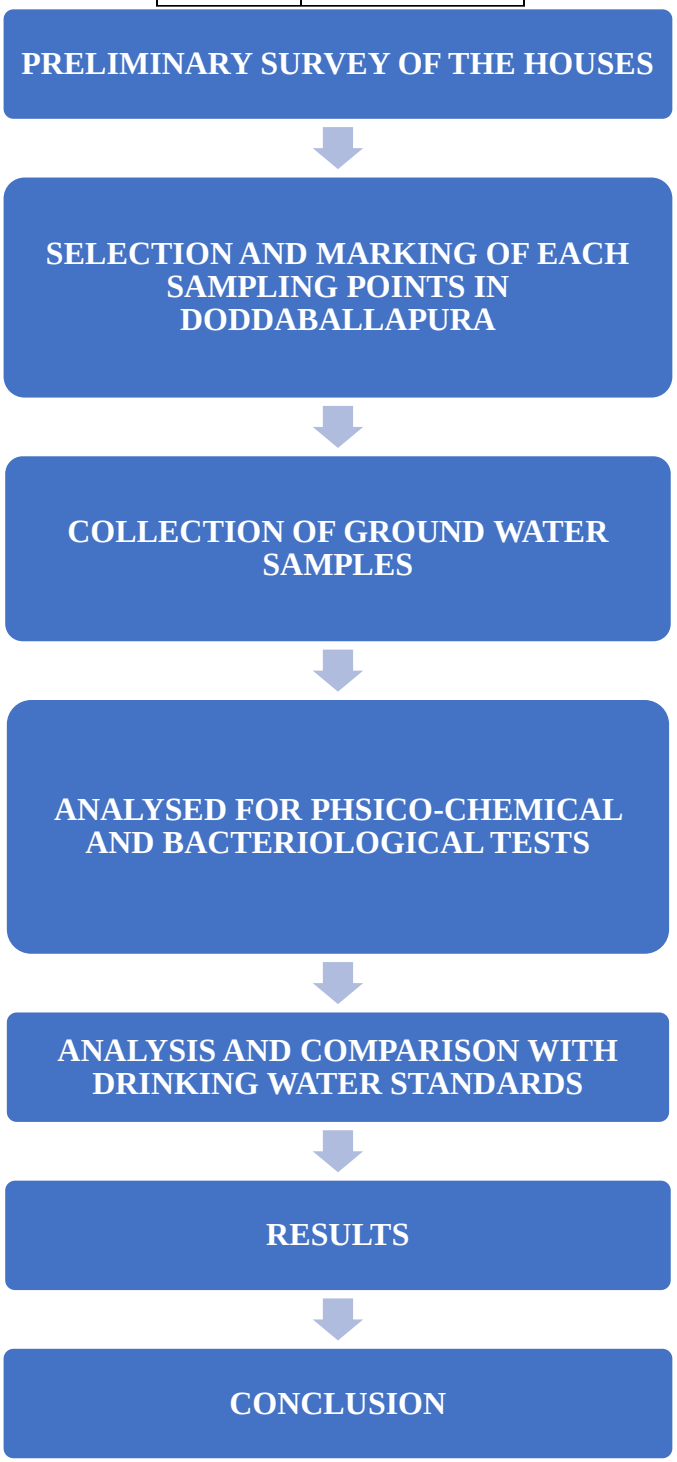

Figure 2: Flowchart of Methodology adopted in the study

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Results

Table 2: Water Quality Parameters of the Samples collected at the Study Area

Parameters	**S1**	**S2**	**S3**	**S4**	**S5**
pH	7.20	7.36	7.41	7.25	7.38
Conductivity (µ-mhos/cm	1350	1800	2567	2545	2675
Dissolved Solids (mg/L)	631	1339	1118	1235	559
Total Alakainity (mg/L)	180	272	272	284	200
Chloride(mg/L)	164	188	296	366	84
Sulphate(mg/L)	22	88.4	54	89.6	77.4
Nitrates(mg/L)	25	26	28	24	25
Sodium(mg/L)	26	36	31	36	32
Total Iron(mg/L)	0.03	0.2	0.15	0.11	0.2
Calcium(mg/L)	296	109	320	248	130
Magnesium(mg/L)	84	300	96	112	30
Total Hardness(mg/L)	380	409	416	360	160
Flouride(mg/L)	0.5	0.6	0.6	0.7	.8
Potassium(mg/L)	01	03	04	04	02
Total Coliform	2	2	Absent	1600	2
E-Coli	Absent	Absent	Absent	Present	Absent
Fecal Coliform	Absent	Absent	Absent	Present	Absent

Discussions

PH: The pH of water samples at all station is found in the range of 7.23 to 7.41 it can be observed that the pH is in the permissible limit of 6.5 to 8.5 in all samples hence safe for use.

Total Hardness: The total Hardness of the water samples at all the station is found to be in the range of 160 to 416 mg/L and it is observed that the total hardness is in the permissible limit of 300mg/L at station S5 the stations S1, S2, S3 and S4 which is more than the permissible limit.

Total Alkalinity: Total Alkalinity of water samples at all stations is found to be in the range of 180 to 284 mg/L and it can be observed that the Alkalinity is in the permissible limit which is not described by BIS.

Total Dissolved Solids: The Total Dissolved Solids of the water samples at all station in the range of 559 to 1339 mg/L and it is observed that it is within the permissible limit.

Chloride: The chloride content is about 84 to 366 mg/L and it is observed that the chloride is within the permissible limit of 250mg/L in all stations except in station S3 and S4.

Total Iron: The Total Iron of the water samples at all the station is in the range of 0.03 to 0.2 mg/L and it can be observed that the total iron is in the permissible limit of 0.3mg/L at all stations.

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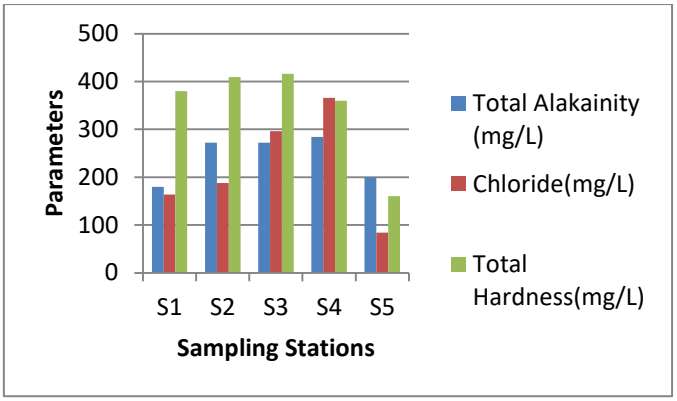
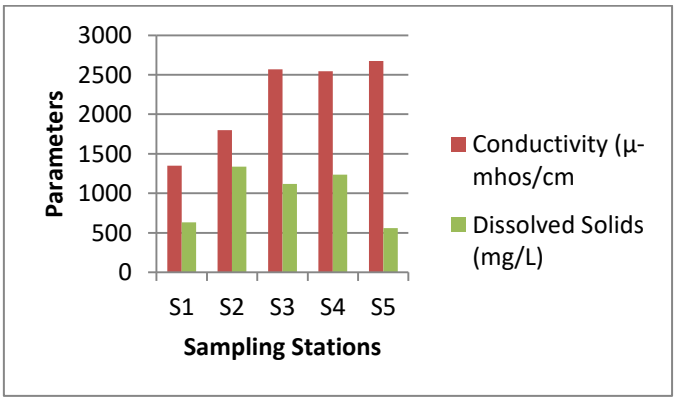
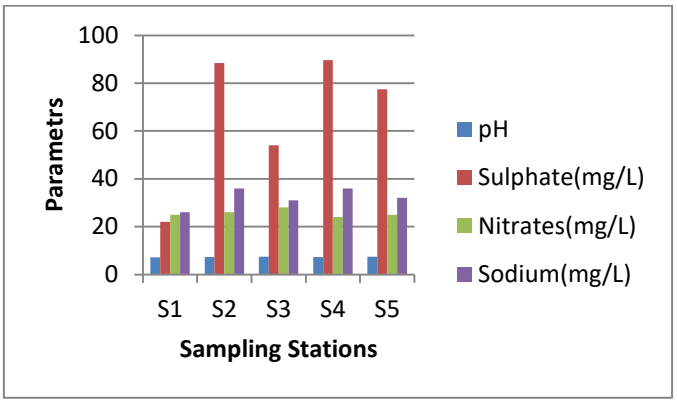


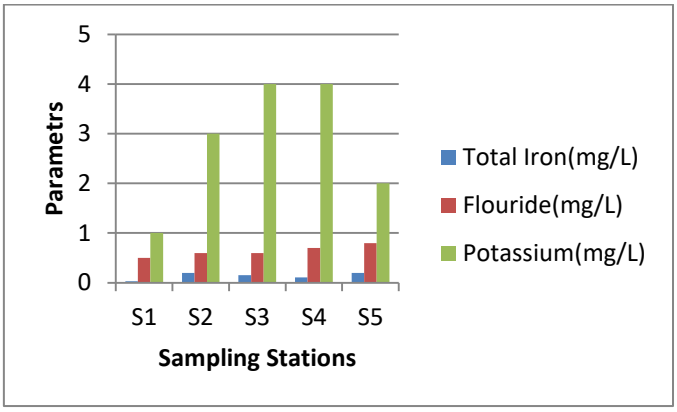
Graph 1: Results of Total Alkalinity, Chloride and Total Hardness



Graph 2: Results of Conductivity and Dissolved Solids



Graph 3: Results of pH, Sulphate, Nitrates and Sodium



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Graph 4: Results of Total Iron, Fluoride and Potassium

Nitrate: The range of the water sample at all station is found to be 24 to 28mg/ L and it is in the permissible limit of 45mg/L.
Fluoride: The fluoride is in the range of 0.5 to 0.8mg/L and is within the permissible limit of 0.6 to 1.2 in all stations except at station S1.
Potassium: Potassium of the collected groundwater samples is in the range of 3 to 7 mg/L.
Electrical Conductivity: The Electrical Conductivity is found to be in the range of 1350 to 1675 Micro Siemens and is within the permissible limit not described by ISI.
Total Coli form: The total coli form of water sample is in the range of 0 to 1600. The sample with coli form near to 0 is fit for drinking
E-Coli and Fecal- Coli: The E- coli and Fecal- coli from water in all samples is absent except in the sample of S4.

Conclusion

From the water quality analysis of collected water samples from Doddaballapur , it was found that the obtained results in most of the sampling stations, the following parameters like Total Hardness, Chloride content, E-Coli and Fecal-Coli were exceeding the allowable limit prescribed by BIS. The groundwater quality analysis of the water sample collected from all the bore well reveals that the groundwater is free from bacterial contamination and water found to be fit for drinking purpose. As ground water table is at greater depth (more than 800 feet) the quality of water is not affected by sanitary condition existing in the town.

Suggestions

Based on the results the following suggestions are made:
1. The provision of sewage system to collect waste water and waste water treatment plants to treat waste water will prevent the groundwater contamination
2. Monitoring water during all seasons of year is required to get concrete conclusion

References

[1] Haq, T.M.U.; Fahmida, P.; et al. (2007) Bacteriological analysis of groundwater of Karachi, Pakistan Journal of Scientific and Industrial Research; ISSN 0030-9885; Vol. 50, No. 4, pp. 273-277
[2] Irshad ul Hassan Lone et. Al (2012) Evaluating the effect of landfill leachate on groundwater quality in relation to physicochemical and bacteriological characteristics, Journal of Chemical and Pharmaceutical Research, ISSN : 0975-7384, Vol. 4, No.12, pp. 5202-5214.
[3] K Usharani, K Umarani, P.M Ayyasamy, K Shanthi, P Lakshmanaperumalsamy (2010) Physico-Chemical and Bacteriological Characteristics of Noyyal River and Ground Water Quality of Perur, India Journal of Applied Sciences and Environmental Management ISSN 1119-8362 Vol. 14, No. 2, pp. 29-35.
[4] Mengnjo Jude Wirmvem et. Al (2013) Sources of bacteriological contamination of shallow groundwater and health effects in Ndop plain, Northwest Cameroon Journal of Environmental Science and Water Resources ISSN 2277 0704, Vol. 2 No. 4, pp. 127-132
[5] Nanjundi Prabhu, M.Inayathulla (2019) Groundwater Quality Analysis of Hard Rock Terrain in Bengaluru North Taluk, Karnataka, India, International Journal of Innovative Technology and Exploring Engineering ISSN: 2278-3075,Vol. 8 No. 12, pp.1467-1472
[6] Naseem Us Saba, Rashid Umar & Arina Khan (2015): Evaluation of chemical and microbial quality of groundwater of Moradabad City, India, Arabian Journal of Geosciences, Vol. 8, pp. 3655–3672.
[7] Olobaniyi, S.B ; OGALA, J.E ; NFOR, N.B (2007) Hydrogeochemical and bacteriological investigation of groundwater in Agbor area, southern Nigeria, Journal of Mining and Geology Vol. 43, No.1, pp. 79 – 89

ISSN: 2233-7857 IJFGCN

[8] R. B. Binoj Kumar and Anet Panakkal (2012): Assessment of Groundwater Pollution Based on Bacteriological Study in Thrissur City, Kerala, India. Nature Environment and Pollution Technology, ISSN: 0972-6268 Vol. 11 No. 1. pp. 157-158.
[9] S.D. Jadhav, M.S. Jadhav, R.W. Jawale (2013) Physico -Chemical and Bacteriological analysis of Indrayani River Water at Alandi, Pune District (Maharashtra) India, International Journal of Scientific & Engineering Research, ISSN 2229-5518 Vol 4, No. 11, pp. 1940-1949
[10] Vinita Rawat et. al (2012): The bacteriological quality of drinking water in Haldwani Block of Nainital District, Uttarakhand, India. Journal of Water and Health. Vol. 10 No. 3. pp. 465-470.
[11] Ajaybhaskar Reddy, Y Ramalinga Reddy, "Grade Card Method of Ground Water Health Evaluation of Mustoor Sub-Watershed Chikballapur Taluk Karnataka", International Journal of Innovative Technology and Exploring Engineering (IJITEE), Issue-1, Vol-9, November 2019, ISSN: 2278-3075.

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