

Quality Assessment of Drinking Water Ghorpad Village Tehsil Kamptee, District Nagpur: Characterisation of Chemical Parameter

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Abstract

Paper present a study of drinking water quality in Ghorpad village, tehsil kamptee, district Nagpur which involved analysis of chemical parameter of drinking water samples from different bore well and water sources. The drinking water sources examined include well and bore well. Water quality studied PH, Total Hardness, Ca+2, Mg+2, Alkalinity, TDS and DO. The concentration of hardness in mg/lit by EDTA complexometry method and dissolve oxygen by the Winkler method with Azide modification. The bore well water quality suitable for drinking purpose and the study revealed that the parameter of water sources below permissible limit. As per IS:10500:2012 guidelines all parameter was examined. It was recommended that drinking water sources for domestic use should be protecting from pollution sources.

Keywords: - Drinking Water quality; PH; Hardness; Dissolve oxygen; Permissible limit.

INTRODUCTION

Ghorpad is a Village in Kamptee Taluka in Nagpur District of Maharashtra State, India. It belongs to Vidarbha region. It belongs to Nagpur Division. Ghorpad is surrounded by Nagpur Taluka towards west,

Parseoni Taluka towards North, Mouda Taluka towards East, Ramtek Taluka towards North Ghorpad, Situated 6 Km away from Kamptee, District Nagpur. It is having population 1138. Ghorpad is having Latitude 21°18'80"N and longitude

MATERIALS AND METHODS:

The research was conducted in Ghorpad village. The sampling sites were selected in a scientific manner so as to come up with results, which reflect the entire spectrum of the water quality profile in Ghorpad village. Paper describes and explains the physical drinking water quality parameters of water sampled from bore well, shallow and deep wells used for domestic purposes (drinking) in Ghorpad village. The results are based on samples collected from 05 bore well water sites, 02 shallow wells and 03 deep wells in selected. The selection of sampling areas was based on the upstream and downstream water level. Figure 1 shows the sampling sites and type of source. The main purpose of studying drinking water quality was to assess its quality in terms of chemical characteristics. The parameters analysed include: pH, chloride, sulphate, total alkalinity, total hardness and dissolved oxygen.

Drinking water pH levels: The measurement of pH was done by using a portable pH meter onsite. The meter was calibrated with standard buffer solutions of pH 4 and 7, making adjustments for temperature and asymmetry potential required by the instrument. The electrode

was removed from the buffer and rinsed with the sample and after adjustment, the pH was recorded. The electrode was rinsed with distilled water between successive measurements.

Total hardness of the drinking water:

Total hardness was obtained by titrating 50 ml sample solution with a 0.01 N of ethylenediaminetetraacetic acid (EDTA) solution by using Eriochrome black T indicator, until the colour changes from purple to pure blue. Approximate 50 ml of water sample was accurately transferred into a 250 ml conical flask, and then 2 ml of buffer solution were added, stirred and mixed with Eriochrome black T. Indicator was added and mixed well until dissolved. After that the mixture was titrated with 0.01 N, EDTA solution until the colour change from purple to pure blue.

Chloride concentration: Several analytical techniques may be used for chloride in water including titration (e.g., potentiometric titration with silver nitrate). Chloride was obtained by titrating a sample solution with a 0.0141 N silver nitrate solution by using potassium chromate indicator, until the colour changes from yellow to red blood. Approximate 100 ml of

water sample was accurately transferred into a 250 ml conical flask, and then 1.0 ml potassium chromate solution were added, stirred and mixed properly. After that the mixture was titrated with 0.0141 N silver nitrate solutions until the colour changes from yellow to red blood.

Alkalinity of the drinking water: Alkalinity was obtained by titrating 50 ml sample solution with 0.02 N standard sulphuric acid solution by using phenolphthalein indicator indicates neutralisation of OH and 1/2 CO₃ while to pH 4.5 or sharp change from yellow colour changes to orange. This was obtained total alkalinity due to complete neutralisation of OH, CO₃ and HCO₃.

Dissolve oxygen of the drinking water: Dissolve oxygen was obtained by titrating 203 ml sample solution with 0.025 N sodium thiosulphate solution by using starch indicator.

Sulphate Concentration: Sulphate was obtained by suitable volume of sample solution in 250 ml conical flask and dilute it 100 ml and then 5.0 ml condensing reagent were added stirred and mixed properly. After that mixture was stirred then adds BaCl₂ crystal. Measured the turbidity was developed after every 30 sec. on spectrophotometer at 420 nm. Recorded this value for sulphate determination.

RESULTS AND DISCUSSION:

Table 1: Represents the data analysis and the major parameters, arranged by drinking water sources.

Results for chemical parameters

Sr. No.	Source Identification	Types of Drinking water sources	PH	Total Hardness mg/lit	Chloride mg/lit	Sulphate mg/lit	Total Alkalinity mg/lit	Dissolve Oxygen mg/lit
1	BWu-01	Bore well	7.2	142	44	115	212	5.9

2	BWu-02	Borewell	7.1	157	73	134	226	6.7
3	BWu-03	Borewell	7.8	129	62	98	217	6.2
4	BWd-04	Borewell	7.3	98	67	126	238	5.5
5	BWd-05	Borewell	6.8	163	105	185	207	6.3
6	DW-01	Deep Well	8.1	192	105	141	216	7.2
7	DW-02	Deep Well	7.4	201	120	132	249	6.9
8	DW-03	Deep Well	7.6	195	112	137	267	7.1
9	SW-04	Shallow Well	6.9	171	97	104	272	5.1
10	SW-05	Shallow Well	7.3	147	81	99	261	5.3

pH

pH levels for drinking water from different selected water sources showed little variation, as shown in Figure 2. The variation in pH was due to chloride, carbon dioxide and or dissolved minerals that normally affect the pH. The acceptable range of pH for drinking water quality as per WHO and IS:10500:2012 standards is 6.5 - 8.5. The noticeable effects above the maximum contaminant level for pH is that,

low pH leads to bitter metallic taste and corrosion, high pH leads to slippery feel and soda taste. The statistical results for different water sources for pH were standard deviation 0.46, mean 7.54 and median 7.55. Highest pH was observed to be 8.1 showing low acidity of all the samples collected. Hence this shows that most of drinking water sources had the pH less than 7.5 indicating slightly acidic nature of the water. In present study the pH value

varies between 6.8 to 7.8, which are within the permissible limit of WHO.

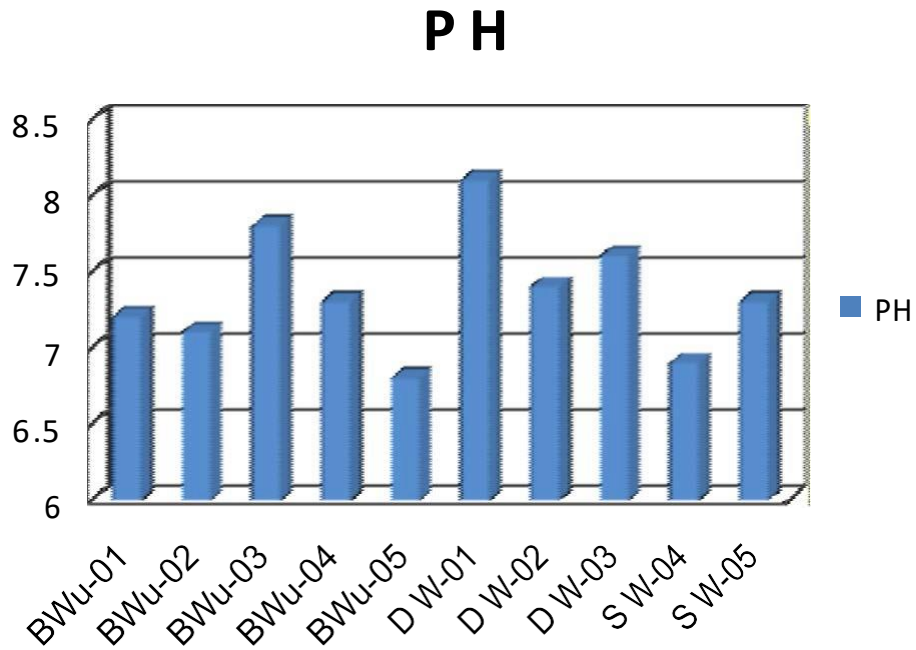


Figure 2

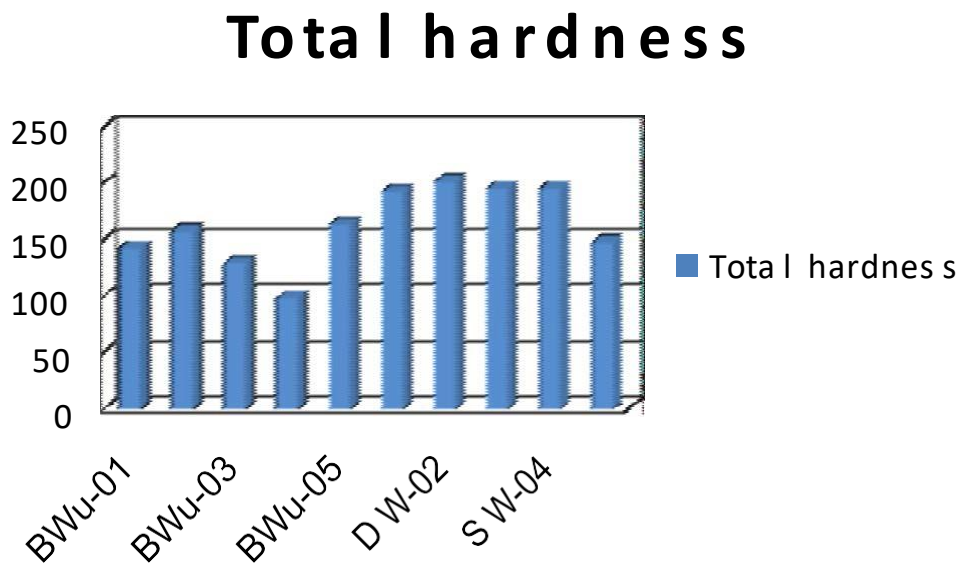


Figure 3

TOTAL HARDNESS

Total Hardness (TH) is the property of water which prevents the lather formation with soap and increases the boiling points of water. Hardness of water mainly depends upon the amount of calcium or magnesium salt or both. In present study, TH value varies from 98 to 201 mg/l, which are within the permissible limit of WHO, Which shows moderately hard in nature [150-250 concentration mg/litre]. See figure 3.

TOTAL ALKALINITY

Total Alkalinity (TA) of water is its capacity to neutralize acids and it is normally due to the presence of bicarbonates, carbonates and hydroxide compound of calcium, sodium and

potassium. In present study, the alkalinity value varies from 207 to 272 mg/l, which are within the permissible limit of WHO.

See figure 4.

CHLORIDE

Main sources of chloride in river water are from industrial effluents, agricultural run-off, pesticides, insecticides etc. if present. Chloride gas is highly toxic but Chloride ions are essential for life. The Chloride value varies from 44 to 120 mg/ litre, which are below the permissible limit of WHO. Low chloride ion concentration indicates less organic pollution in water. The lesser content of chlorine in water bodies in various samples is due to steady lake water and as it cannot pass different catchment area. [i.e. Human faces and sewage inflow].

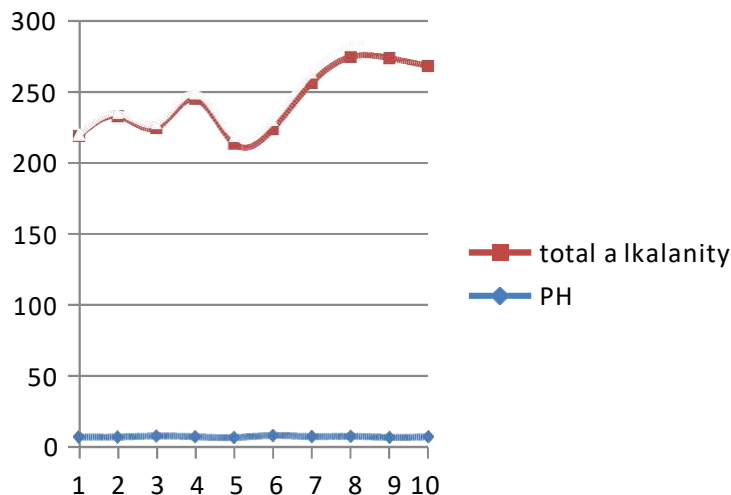


Figure 4

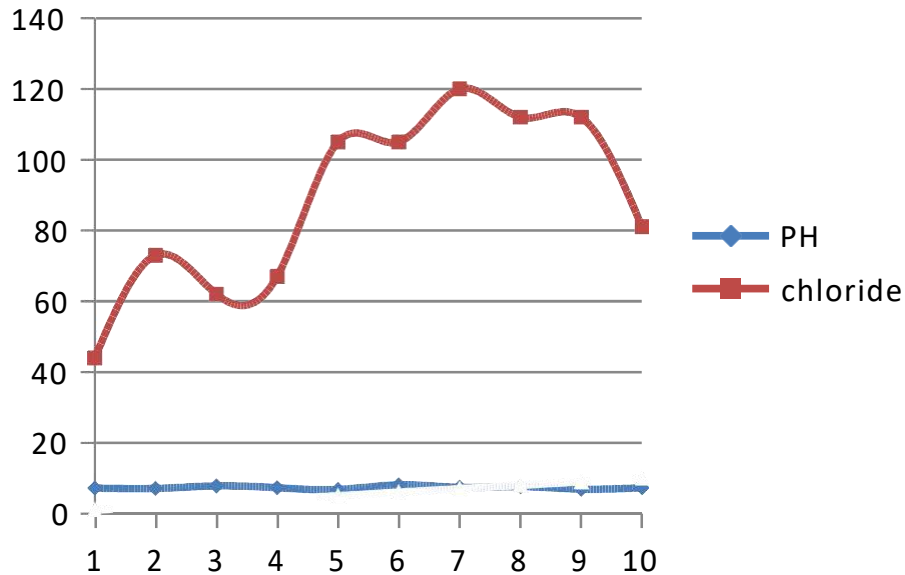


Figure 5

CONCLUSION

This study provides an informative primary data on water quality parameters and helps to understand the contamination of Ghorpad village river water and its possible influence on the ecological system.

This study would help the water quality monitoring and management in order to improve the quality of water with maintaining better sustainable management. The water quality can be improved by creating awareness in local public about the degrading status of river, by making farmers understand about proper use of fertilizers and pesticides in farms and also formulating

action plan to save the river from drastic pollution. In above study, most parameter is within the permissible limit given by WHO standards. In maximum locations, it must be noted that a water quality of Ghorpad Village River at Kamptee district Nagpur is good for domestic and drinking purpose.

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