Water Quality Assessment of Selected Tube Wells in Arjuni/Morgaon Town of Gondia District, Maharashtra

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Abstract

In this research work, the tube well water samples (S_1 to S_6) were collected from Arjuni/Morgaon town, district Gondia of Maharashtra state, India. This town has population around 10000. The six different ground water samples (tube wells) were collected during Oct. 2022 to Jan. 2023. The sample places are different and maintain diversity in locality. The physical and chemical properties of collected water samples such as temperature, pH, EC, total dissolved solid (TDS), total alkalinity (TA), total hardness (TH), dissolved oxygen (DO), Sulphate ion, Chloride ion and Nitrate ion were determined. The values obtained are compared with standards prescribed by WHO. In present study, five water samples were within the limit. However one water sample showed slightly high TH, Chloride, TA and low DO values indicating poor water quality. The present investigation provides information on the quality of tube well water from collected area in Arjuni/Morgaon town and it is useful to identify polluted site, causes. This study helps to determine quality of the water samples are safe to drinking propose.The details are given in the result & discussion.

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Introduction

Water is life. Large amount of water available on the earth is saline in the nature; only small quantity exists as fresh water. The resources of fresh water are surface water (lakes, ponds, rivers, etc.) and ground water (tube wells and wells). Fresh water may cause contamination due to increasing world's population, urbanization, industrialization. Human being depends on water for their survival. According to WHO 80% of diseases are arises due to contamination groundwater [1]. Water is also a raw material for photosynthesis and therefore is important for crop production. Obviously an optimum agricultural production depends on water and soil quality [2].

In Arjuni/Morgaon the ground water is considered as a first and main water source for drinking and other human routine uses. Ground water is ultimate, most suitable fresh water resource with nearly balanced concentration of the salts for consumption by humans. Prolonged discharge of industrial effluents, domestic sewage and solid waste dump causes the groundwater to become polluted and created health problems [3]. The more serious problem is due to microbial contamination by human feces. This contaminated drinking water leads to diarrheal diseases. Globally, almost 90% of child deaths from diarrheal diseases are directly linked to contaminated water, lack of sanitation, or inadequate hygiene [4].

Ground water chemistry, in turn, depends on a number of factors, such as general geology, degree of chemical weathering of the various rock types, quality of recharge water and inputs from sources other than water rock interaction. Such factors and their interactions result in a complex ground water quality [5-6]. Hence it is necessary to undergo for quality analysis of groundwater in order to assess its suitability for consumption. Arjuni/Morgaon town lies at Eastern region of Maharashtra state. It is one of the taluka place in Gondia district having population nearly thirty thousand and the water cannel of Itiadoh dam go through the town. Due to the acute summer, there is always a shortage of water in Arjuni/Morgaon town. The government

(Nagarpanchayat) has constructed the tube wells in various parts of the town. Large amount of water is used from these tube wells by people for their daily need. The present investigation was carried out by selecting six different sites from Arjuni/Morgaon town.

Material & Methods
i)   **Sampling sites:** Water samples were collected from six sampling points of different locality in Arjuni/Morgaon town during the period of four months (Oct. 2022 to Jan. 2023). The sampling points and places are given in table 1.

Table 1: Sampling sites & places

Sampling Sites	Place
S1	Tube well Bus Stand.
S2	Tube well near Rural Hospital.
S3	Tube well near Nagarpanchayat Bhavan.
S4	Tube well near Municipal lake.
S5	Tube well near Bharat Mata square.
S6	Tube well at Durga Square.

ii) **Collection of Water Samples:** Samples were collected from six different tube wells of different areas of Arjuni/Morgaon town Dist. Gondia Maharashtra. Before water sampling, all the double stoppered polythene containers of two liters capacity were cleaned and rinsed thoroughly with water samples to be analyzed. The chemical analysis was done using the standard methods [7].

iii) **Methodology:** The temperature was recorded at the sample site. The chemicals used were of A Grade and was used without further purification. The solutions were prepared in distilled water. The temperature, pH, conductivity and dissolved solids of the water samples were determined on the spot using a thermometer, pH meter, conduct meter and TDS meter. Total hardness was measured by EDTA titrimetric method using EBT indicator. Dissolved oxygen was determined by Wrinkle's method. The chloride ions present in the sample was determined by Mohr's method. The Sulphate concentration was determined by turbid metric method. Nitrate was estimated by calorimeter [8-9].

Table 2: Average values of Physico-chemical parameters with drinking water standards (Oct. 2022 to Jan. 2023) of Arjuni/Morgaon town.

S. No.	Parameters	Sampling Sites						Range of Results		WHO
		S_1	S_2	S_3	S_4	S_5	S_6	Min.	Max.	
1	T (^{0}C)	20.8	21.2	21.4	22.4	21.7	20.9	20.8	22.4	--
2	pH	7.3	7.3	7.1	7.9	7.4	7.7	7.1	7.9	6.5-8.5
3	EC	1312	1241	1385	1590	1378	1374	1241	1590	1400
4	TDS	449	414	523	913	528	507	414	913	1000
5	TA	203	197	221	293	224	205	197	293	120
6	TH	437	393	499	628	481	412	393	628	500
7	DO	4.4	4.6	4.2	2.3	4.8	4.0	2.3	4.8	-
8	Cl^-	177	123	152	278	159	167	123	278	250
9	SO_4^{--}	63	41	97	83	81	68	41	97	200
10	NO_3^-	17	24	37	36	50	31	17	50	45

(All parameters are in mg/l except pH, EC. EC is in m mhos/cm)

Result & Discussion
Total six water samples from tube wells are analyzed for physico-chemical parameters like T, pH, EC, TDS, TA, TH, DO, Cl^-, NO_3^-, SO_4^{--}. The pH is the measure of the intensity of acidity or alkalinity & gives the concentration of hydrogen ion in water. It has no direct adverse effect on health but a low value below 4.0 gives sour taste & higher value above 8.5 shows alkaline taste. In the present study, the pH value varies between 7.1 to 7.9 & were within the limit prescribed WHO [10].

Electrical conductivity (EC) values signify the amount of total dissolved salts. EC value varies from 1241 to 1590 which reveals that EC values for all tube wells were within the prescribe limit.

Total dissolved solids (TDS) indicate the general nature of water quality or salinity. In present investigation TDS value varies from 414 to 913 mg/l, it shows that sample S_4 have comparatively higher value than other samples but this value is within the prescribe limit given by WHO. This may be due to sewage along with the pond near the sampling point.

The alkalinity of water is measure of its capacity to neutralized acids. TA value varies from 197 to 293. The alkalinity values for tube wells for all samples were found to be greater than the value prescribed by WHO.

Hardness of water depends upon the amount of calcium or magnesium salt or both present. In present study TH value

varies from 393 to 628. In which S_4 sample value is more than the prescribe limit.

Dissolve oxygen (DO) is one of the important pollution parameter in water quality assessment, which indicates the degree of pollution in water bodies. In present investigation DO values varies from 2.3 to 4.8. The result indicates that the sample S_4 shows low DO value indicating heavy contamination by organic matter.

In present study Sulphates value varies from 41 to 97, Nitrates value varies from 17 to 50 & Chlorides value varies from 123 to 278. For S_4 sample value of Chloride and S_5 sample value of Nitrate is more than the prescribe limit.

Conclusion
In general ground water quality of Arjuni/Morgaon town is not harmful to human being. Since the ground water which were taken from the various places were analyzed and the analysis report that the water quality parameters lies within the maximum permissible limit prescribed by WHO. Except in tube well (S_4) sample which shows slightly high TH, Chloride, TA and low DO values indicating poor water quality due to pollution caused by sewage. Hence this report explains the ground water in Arjuni/Morgaon town is suitable for drinking purposes except S_4 sample. This sample not be used for drinking purpose without treating.

References

1. Smith AH, Lingas EO, Rahman M. "Contamination of drinking water by arsenic in Bangladesh" a public health emergency Bulletin of the World Health Organization, 78 (9) # World Health Organization, 2000, 1092-1103.

2. Ahmed M, Krishnamurthy R. Hydrobiological studies of Wohar Reservoir Aurangabad (Maharashtra state). *Indian J. Environ. Biol.* 1990; 11(3):335-343.

3. APHA. Standard methods for the examination of waste water. American public Health Association, Washington, 1998, D.C 874.

4. UNICEF Canada. Children dying daliy because of unsafe water supplies and poor sanitation and hygiene, UNICEF says, 2013.

5. Yadao Janeshwar, Pathak RK, Khan Eliyas. Analysis of Water Quality using Physico-chemical parameters, Satak Reservoir in Khargone District, Madhya Pradesh,India., Int.Res. J.Environment Sci. 2013; 2(1):9-11.

6. Mohamed Hanipha M, Zahir Hussain A. Study of Ground water quality at Dindigul Town, Tamilnadu, India, Int.Res. J.Environment Sci. 2013; 2(1):68-73.

7. American Public Health Association. Standard method for the examination of water and waste water. 17thEd., Washington, DC, 1989.

8. Kodarkar MS. Methodology for water analysis. Physic-chemical, Biological and Microbiological Indian Association of Aquatic Biologist Hyderabad. 1992; 2:50.

9. Yinn KK, Khin HW, Thidar K. Water Quality Assessment and Treatment of Tube Well Water from Selected Areas in Mandalay Region, Myanmar, International Journal of Scientific and Research Publications. 2019; 9(7):744.

10. WHO. Guidelines for Drinking water Quality 3rdEd, World Health Organisation, Geneva, 2004.