

The Study of Physico-Chemical Characteristics of Drinking Water: A Case Study of Nimgaon Jali Village

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Abstract: Preservation and protection of water quality is very important for our environment and water is very much essential for life. But nowadays because of various pollutants water quality is decreasing. For present drinking water analysis we have selected the village Nimgaon Jali because we observed that many peoples of that village did not use water purifiers so we collected samples of purified as well as Non-purified water. Various Physico-chemical characteristics of drinking water are studied during this analysis and the result obtained during the study was compared with WHO and BIS Standards. And then it was found that there is no larger variation between purified and non-purified water samples excepting few samples. The present study suggests that there is no specific need to use of water purifiers to obtain potable water if they maintain their drinking water source contamination free.

Keywords- Water, Drinking water quality analysis, pH, comparative study, Purified water and Non -Purified water.

INTRODUCTION

Water is special importance to human life. Humans cannot survive with water, but since the after industrial revolution increasing large number of pollution on the earth. Water pollution is increasing rapidly after industrialization, mainly due to increasing population, as well as water pollution is also caused by urbanization and large amount use of fertilizers and pesticides in agricultural sectors [4,8,10,11]. For all these reasons drinking water is scarce and poor water supply and not good quality water available for drinking proposes. Therefore, the study of the characteristics of drinking water also became an importance factors. Water has immense importance in shaping and regulating the climate. In the last few decades, there has been a tremendous increase in the demand of freshwater due to rapid growth of population [7]. Water is one of the most important of all natural resources known on earth. It is important to all living organisms, ecological systems, human health, food production and economic development [1]. The only source of water is rainfall [12,13]. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems [5,11,14]. Due to these contaminants quality of drinking water becomes poor. Sometimes such poor quality water causes many diseases in the humans, so that quality of water must be tested for both the chemical as well as for the microbial contaminants [6]. Human is main source for water pollution and other pollution [8,14,16,18]. There are many sources for drinking water in which water mainly falls on the ground in the form of rain and water supply is available through well, river, tank, dam etc [26]. It is not wrong to say that there is no life without water because various plants and animals are in dire need of water so water is the elixir of human life [23,24,25]. Water is being polluted due to various human activities including water from chemical fertilizers and pesticides from farms and water for domestic use and industrial [9,20,21,22].

The major water quality parameters considered for the examination in this study are pH, Hardness, Calcium, Magnesium, TS, TDS, TSS, DO, BOD, E. Coli.

STUDY AREA

Study area of present water quality analysis is the village Nimgaon Jali Tal.Sangamner Dist. Ahmednagar. It is located at 19°.56'54"N, 74°.38'24" E. Total area of this village is 2121.92 ha. Present population of Nimgaon Jali is 5845. Chinchpur village is located at East, Manchi village located at West, Lohare village located at North and Ashwi village is located at South of the village Nimgaon Jali. There are around 172 villages in Sangamner taluka and this village was selected for this study because water canal is also located near the village which is use for drinking purpose and it is observed that many household do not use water purifier machine and So it's necessary to study physico-chemical characteristics of drinking water of this village for people's health.

AIMS AND OBJECTIVES

The present study aims to determine drinking water quality and study of following objectives.

- 1) To study physic-chemical characteristic of drinking water i.e. Purified and Non -Purified.
- 2) To analyze the parameter of drinking water that is purified and non -purified such as : 1) pH 2) Taste 3) Odor
- 4)Hardness 5)Magnesium 6) Calcium 7) Total solids 8) Total Dissolved Solids 9) Dissolved Oxygen 10)BOD 11) E.Coli.

METHODOLOGY

The present study has depended on the primary and secondary data. The primary data having field work for drinking water collection and secondary data have used references book, articles and other information to refer. The following methods were used for the research work.

The present study was carried out for ten different areas of village.

➤ **Field work and filed Sampling:**

The field work was carried out for two days and total 40 houses visited for sample collection. Samples were collected randomly on 2nd, 3rd of September 2019. In the present study the sampling was done during morning hours. And all water samples were collected in the 1litre Plastic bottles. Total 40 samples were collected in which sample of purified water was 20 and sample of Non- Purified water was 20.

➤ **Water Quality Analysis:** From the time of sample collection and to the actual analysis, many physical and chemical reaction would change the quality of water sample therefore to minimize this change the sample where preserved soon after the collection. The study was carried for a period of two months (Sept-Oct 2019). The collected water samples were brought to the laboratory and relevant analysis was performed.

➤ **Parameters to be analyzed:** For the assessment of drinking water quality of purified and non -purified of the village Nimgoan Jali, taking in view the following drinking water parameters are analyzed : 1) pH 2) Taste 3) Odor 4)Hardness 5)Magnesium 6) Calcium 7) Total solids 8) Total Dissolved Solids 9) Dissolved Oxygen 10)BOD 11) E.Coli.

➤ **Description of Water Quality Test:**

Analysis of following parameters is necessary because this parameters were mainly affects the human health such as low or high pH results problem with lung or kidney functions, consumption of high TDS water may cause bone diseases, dental problem and may be some times infertility, use of hard water make skin dry etc.

The following table describes about the important drinking water quality parameters which are analyzed.

Table no 01: Important of Drinking Water Quality Parameters

Water Quality Test	Description	Instrument/Method
pH	The major acidity (hydronium ion, H+) in the water.	pH meter.
Taste	Taste of water ranging from agreeable to disagreeable.	By tasting.
Odor	Odor is recognizing as a quality factor affecting acceptability of drinking water.	Wide mouth glass stoppered bottle.
Hardness	Measurement of Calcium and Magnesium in water.	Titrimetric method (complex metric).
Magnesium	Measurement of Magnesium amount in water.	Titrimetric method.
Calcium	Measurement of Calcium amount in water.	Titrimetric method
Total Dissolved Solids	The measure of amount of particulate solid that are in water.	Gravimetric analysis.
Dissolved Oxygen	The amount of oxygen available in the water.	Titrimetric method (Isodiametric).
Biochemical Oxygen Demand	BOD is the amount of dissolved oxygen needed by aerobic biological organism.	Titrimetric method.
E.Coli	Number of microbes present in water	Fermentation (Laboratory method)

RESULT AND DISCUSSION

Eleven components of drinking water in Nimgoan Jali village were studied. The following are the result of the total components but there are two types of Purified water and non- Purified water.

Table no 02: Result of Purified (RO) Drinking Water

N	Test	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20
1	pH	5.8	6.7	6	5.9	7.6	7.1	7.1	6.2	6.9	6.8	6.4	7.9	6.9	6.1	6.9	6.3	6.4	6.8	6	7
2	Taste	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	Odor	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	Hardness (mg/lit)	20	20	20	22	16	18	12	18	20	24	12	10	10	8	16	12	12	16	20	18
5	Magnesium (mg/lit)	1.4	0.9	0.4	1.9	1.4	1.4	1.4	0.9	3.8	1.4	0.9	0.4	0.9	0.9	0.4	0.4	0.9	0.4	0.9	0.9
6	Calcium (mg/lit)	5.6	6.4	7.2	5.6	4.0	4.8	2.4	5.6	1.6	7.2	3.2	3.2	2.4	1.6	4.8	3.2	4.0	4.8	7.2	5.6
7	TDS (mg/lit)	50	100	50	50	100	50	100	100	100	50	50	50	100	50	50	100	100	50	100	100
8	Total Solids	50	100	150	200	100	100	100	150	100	300	100	100	150	100	200	400	100	100	100	100
9	DO (mg/lit)	0.018	0.010	0.021	0.008	0.001	0.001	0.001	0.000	0.003	0.001	0.008	0.001	0.001	0.0018	0.0008	0.0018	0.0005	0.0021	0.0016	0.0026
10	BOD (mg/lit)	0.005	0.002	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0008	0.0003	0.0005	0.0002	0.0005	0.0006	0.0007
11	E.Coli.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(* Agreeable, - Acceptable) [Source- Researcher (field work) and Analysis]

- The analysis of (RO) water gives results about parameters such as pH, taste, odor, hardness, and calcium, TDS, DO, BOD and E.Coli.
- The sample from X1 to X5, sample X1 have very low pH that is 5.8 and the limit of pH is must be within 6.5 to 8.5, therefore this sample is acidic. It may be the purifier machine problem and remaining all parameters such as Hardness, Calcium, Magnesium, TDS, TS, DO, BOD, E.Coli are within the limit.
- The sample from X6 to X10, pH maintains at neutral level and all remaining parameters are within the limit.
- The sample from X11 to X15, the sample X11 has low pH that is 6.4, it means it is acidic and all remaining parameters are within the limit.
- The sample from X16 to X20, sample X16 has 6.3 pH. Sample X17 have pH 6.4 and sample X19 have pH 6, it means they are also acidic and there is must regular maintenance of purifier machine to maintain pH at neutral level that is 6.5 to 8.5 as per WHO or BIS standards.

Table no 03: Result of Non Purified (Non RO) Drinking Water

N	Test	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	
1	pH	6.9	6.9	7.8	7.9	7.2	6.8	6.6	6.2	7.7	7.5	6.9	6.2	6.9	6.8	6.9	6.9	7.4	7.8	5.9	6.9	
2	Taste	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	Odor	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	Hardness (mg/lit)	40	44	50	56	53	40	92	104	130	138	88	98	108	104	76	70	84	92	88	82	
5	Magnesium (mg/lit)	3.8	1.4	4.3	3.4	25.8	43.3	3.4	6.3	4.9	8.7	2.9	4.9	2.4	5.3	3.4	3.4	1.9	2.4	1.9	1.4	
6	Calcium (mg/lit)	9.6	15.2	12.8	92.1	169.9	92.1	31.2	31.2	48.8	40.8	30.4	31.2	39.2	32.8	24.8	22.4	30.4	32.8	32.0	30.4	
7	TDS (mg/lit)	50	100	50	100	50	50	50	50	100	150	150	100	100	150	50	150	150	100	150	50	
8	Total Solids (mg/lit)	400	200	300	300	200	200	250	250	350	450	200	800	250	450	300	300	400	350	300	950	
9	DO (mg/lit)	0.032	0.024	0.018	0.021	0.013	0.026	0.018	0.024	0.029	0.010	0.018	0.021	0.016	0.024	0.024	0.010	0.016	0.021	0.026	0.024	
10	BOD (mg/lit)	0.008	0.008	0.002	0.008	0.005	0.005	0.005	0.006	0.003	0.005	0.005	0.005	0.006	0.006	0.011	0.002	0.006	0.005	0.005	0.006	
11	E.Coli	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

(* Agreeable, - Acceptable) [Source- Researcher (field work) and Analysis]

- The analysis of Non RO water gives results about parameters such as pH, taste, odor, hardness, calcium, TDS, DO, BOD, E.Coli.
- The sample from X1 to X5, sample X5 have amount of Calcium 169.9mg/lit because it is observed that source of water is bore well and water purification is necessary and all remaining parameters are within the limit.
- The sample from X6 to 10, sample X8 have low pH that is 6.2, it means it is acidic and sample X9 have hardness 130 mg/lit and sample X10 have hardness 138 mg/lit because the source of water is bore well, therefore water purification is also necessary to them and all remaining parameters are within the limit.
- The sample from X11 to X15, sample X12 has low pH that is 6.2 and all remaining parameters within the limit.
- The sample from X16 to X20, sample X19 have Ph 5.9 that is acidic and sample X20 have TS is 950 mg/lit therefore water purification is necessary to sample X20. all remaining parameters of all samples are within the limit.

SUGGESTION

1. Sample X1, X3, X4, X8, X11, X14, X16, X17, X19 of purified water have low pH that is they are acidic, therefore sample maintain at neutral level is necessary by regular maintenance of purifier.
2. Sample X8, X12 and X19 of non-purified water have low pH that is they are acidic and pH must be neutral at 7. this can be achieve with the help of Soda Ash and Sodium Hydroxide (1mg/lit.) which raise the pH of water to near neutral when injected into a water system.

3. Sample X9 and X10 have high Hardness which can reduce by Lime Soda (0.781ppm per 1000 litre) into source of water.
4. Sample X4, X5 & X6 have high amount of Calcium content which can be reduce with the help of water purifier.
5. It must be necessary to maintain and preserve all drinking water sources.

CONCLUSION

The result obtained during study was compared with WHO and BIS Standards. The major variation of pH is found in all samples of purified water. The non-purified water sample X9 and X10 have high Hardness so they need to use water softeners to reduce hardness of water. The large variation between purified and non-purified water is not found. Therefore the present analysis shows there is no need to use water purifiers (RO machines) if they maintain their drinking water resources free from contamination. The village of Nimgaon Jali Village is dependent on the entire agricultural sectors, hence the water is polluted due to the using of chemical fertilizer and pesticides in the village. For this farmers need to use organic farming, failure to do so would endanger human health and natural health.

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