International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 09 Issue 12 ǁ 2021 ǁ PP. 01-04

Quality Assessment of Drinking Water Samples from Open Wells of Edanji Using Physico-Chemical Parameters

Sujith. S. B[#]., Ambady. S. S[#]., Aswathy. S. J[#]., Megha. S[#]., Jijo Johnson*
Department of Chemistry
Santhom Malankara Arts and Science College, Edanji
Manchavilakom P.O., Thiruvananthapuram – 695 503, Kerala, India
(# These authors contributed equally)
**Corresponding Author; E-mail: jijo.n.johnson@gmail.com*

Abstract
This study deals with the Physico-chemical analysis of drinking water samples collected from various open wells in Edanji, Thiruvananthapuram, Kerala. We have analyzed the physical (Odor, taste, colour, temperature, turbidity, and electrical conductance) and chemical (amount of total alkalinity, total hardness, Calcium, Magnesium, Chloride, Fluoride) parameters of the water samples. The water samples are found as odorless, colors, and tasteless. The temperature of the samples is in the range of 29.00-30.00 and is useful for drinking purposes. The turbidity measurement of the water samples was carried out. The analysis of the samples implies that the samples are slightly acidic. The electrical conductance values are within the acceptable limit. Alkalinity determination, hardness calculation, and determination of Ca^{2+}, Mg^{2+}, Cl^- *and* F^- *ions were also carried out. Overall, the analyzed water samples are found safe for drinking purposes.*

Keywords: *Physico-Chemical analysis; Turbidity; pH; Alkalinity; Hardness*

Date of Submission: 20-11-2021 Date of acceptance: 05-12-2021

I. INTRODUCTION

Water is an indispensable component for the persistence of entire living organisms, and it is also vital for agriculture, drinking, industries, etc. In India majority of the population depends on groundwater as the only source of drinking water [1]. During the past few decades, it has been noticed that the quality of groundwater gets polluted significantly due to human activities. According to the WHO, more than 75% of all diseases in developing countries arise from polluted drinking water [2]. Due to the lack of proper sanitization and accessibility of clean and safe drinking water, around 6-8 million people die each year due to water-related diseases and disasters [3].

Nowadays, groundwater protection has become a major environmental concern in developing nations [4]. A healthy water ecosystem is dependent on Physico-chemical and biological characteristics [5]. The quality parameters of groundwater also depend on the geographical features of the studied area, human activities, environmental factors, etc. [6]. The quality of water is usually described according to its physical, chemical, and biological characteristics. Hence it becomes necessary to find out the suitability of water for drinking [7].

By considering the above facts, we describe the quality assessment of drinking water samples collected from open wells of Edanji near Manchavilakom in Thiruvananthapuram District, Kerala, India using some Physico-chemical parameters.

II. MATERIALS AND METHODS

Drinking water samples were collected from ten different Open. The samples were collected after washing and rinsing of plastic containers of two-liter capacity. The temperature of the samples was measured directly using a thermometer, which was placed in the water sample taken in a 100 mL beaker. The digital pH meter was allowed to warm up for 5 minutes, then placed in the water sample taken in a 100 ml beaker, and the pH was read directly. Turbidity was determined spectrophotometrically at 450 nm with the help of a Nepheloturbidimetric meter. The electrical conductivity was measured using a digital Electrical Conductivity meter. The unit is presented ppm at 25 ^{0}C. EDTA titration was performed to measure the hardness of the water. Volumetric titration was utilized to determine the total alkalinity of the drinking water samples. The chloride content was assessed by argentometric titration. Fluoride concentration in the water samples was determined spectrophotometrically by the SPADNS method.

III. RESULTS AND DISCUSSION

The physical and chemical water quality constraints will give vital statistics about the quality of water. In this study, the water quality parameters were evaluated as per the instructions of the edition of 'standard methods for the examinations of water and waste water' published jointly by the American public health association and American water works association and federation in 2005. The quality standards followed as per the chart of IS 0500: 2012 published by the Bureau of Indian standards about water quality. The different water quality parameters evaluated were utilized to fix the quality of water for drinking purposes.

In the present investigation, ten water samples were collected from the open wells in Edanji near Santhom Malankara Arts and Science College, Edanji, Manchavilakom, Thiruvananthapuram District.

1.1. Physical parameters

The different physical parameters calculated for the water samples are presented in Table 1.

Table 1. Physical parameters of water samples collected from open wells

Sample ID	Odor	Taste	Colour	Temperature (oC)	Turbidity (NTU)	pH	Electrical conductance (ppm)
1	--	--	--	30.00	0.20	4.92	42.50
2	--	--	--	29.00	0.40	4.66	69.44
3	--	--	--	29.00	0.20	4.78	51.79
4	--	--	--	29.40	0.20	5.50	58.78
5	--	--	--	30.00	--	5.18	46.03
6	Agreeable	--	--	29.70	0.20	5.24	55.64
7	--	--	--	29.60	0.10	5.12	48.72
8	--	--	--	29.80	0.20	5.09	59.34
9	Agreeable	--	--	30.00	--	5.20	162.82
10	--	--	--	29.50	0.10	5.21	115.32

Odor: The presence of odor in water samples is an indication of pollution/contamination. Among the ten well water samples collected in the present study, except samples 6 and 9, all others are odorless, and the odor of samples 6 and 9 is agreeable.

Taste: All the water samples collected are found as tasteless.

Colour: According to the guidelines of WHO, the colour of a water sample should not exceed 15 TCU. In the study, the water samples collected from open wells are found as colourless.

Temperature: Temperature is an important physical parameter that influences chemical, biochemical characteristics. The temperature of the water samples collected from the open walls of Edanji ranges between 29.00-30.00, and the found values are in the acceptable range.

Turbidity: The measurement of turbidity of water is related to its optical property/transparency. Turbidity is influenced by the components present in the water sample. According to WHO guidelines, a water sample with turbidity less than 5 NTU is more favorable to drinking. Here the turbidity values are under INTU and range between 0.00 to 0.40 NTU. The low turbidity value indicates the absence of iron contamination and the lack of suspended organic contaminants [6, 8].

pH: The measurement provides vital information about the strength as acidity, and alkalinity of a sample. In the present study, all the water samples exhibit low values (4.6-5.5). Low water may be corrosive; it may cause metal leading from fittings and pipes and adversely affect human health.

Electrical Conductivity: Electrical conductivity measurements will provide an idea about the capability of water to conduct electric current and also is used as a tool to assess the purity of water. This parameter hinges on the nature of constituent present in water. Here, the electrical conductivity value is within the desirable limit and ranges between 42.5 to 162.82 *ppm.*

1.2. Chemical parameters

Different chemical parameters calculated for the water samples are provided below. It is also summarized in Table 2.

Total alkalinity: The total alkalinity in water is due to carbonates, bicarbonates, and salts of weak acids. The maximum tolerable limit of alkalinity of a water sample is 120 ppm. In this investigation, the total alkalinity of the water samples is in the range of 1-3 *ppm*, which is highly desirable for drinking water. The analysis reveals that the alkalinity is due to the presence of ions, and the alkalinity is expected to, and ions are absent.

Table 2. Chemical parameters of water samples collected from open wells

Sample ID	Alkalinity (ppm)			Total hardness (ppm)	Ca^{2+} (ppm)	Mg^{2+} (ppm)	Cl^- (ppm)	F^- (ppm)
	OH^-	CO_3^{2-}	HCO_3^-					
1	--	--	2.00	39.60	6.00	6.00	8.52	0.0013
2	--	--	3.00	15.70	3.00	2.00	16.33	0.0016
3	--	--	1.00	19.10	6.00	1.00	13.49	0.0012
4	--	--	1.00	30.50	4.00	5.00	14.91	0.0015
5	--	--	1.00	16.60	5.00	1.00	14.20	0.0014
6	--	--	1.00	33.90	7.00	4.00	19.17	0.0017
7	--	--	1.00	61.00	8.00	10.00	13.49	0.0015
8	--	--	2.00	43.00	9.00	5.00	17.75	0.0015
9	--	--	1.00	136.00	28.00	16.00	31.24	0.0016
10	--	--	2.00	91.50	12.00	15.00	15.62	0.0016

Total hardness: The hardness of water is a variable that depends on the quantity mixture of cations and anions. Mainly, calcium and magnesium salts of carbonates, sulphates, and chlorides are responsible for the total hardness. According to WHO, the permissible limit of total hardness for drinking purposes is 200 *ppm*. Hardness beyond 300 ppm may lead to serious health issues and affect heart and kidney functions [8]. In this study, the total hardness of water samples is very low (15.70-136.00 *ppm*) and is safe for drinking purposes. Among the 10 samples, seven samples are soft, two are moderately hard, and one is hard.

Calcium: According to WHO, the maximum favorable limit in drinking water is 75 *ppm*. Here, the Calcium level is within the limit (3.0-28.0 *ppm*).

Magnesium: The amount of Magnesium will influence the quality of drinking water. The allowed limit of drinking water is 30 *ppm*. In this study, the amount of *Magnesium* ranges from 1-16 *ppm* and is within the permitted limit.

Chloride: In general, the presence of excess amount Chloride ions in the drinking water will cause a salty taste. Chloride ions in water bodies are animal waste, industrial wastes, sediments from igneous rocks and pit latrines, etc. The permissible limit of Chloride ions in drinking water is 200 *ppm*. In the present investigation, the amount of Chloride ions in the water samples ranges from 8.52-17.75 *ppm* and are under for tolerance limit.

Fluoride: Fluoride ion is present in almost all water bodies. The presence of Fluoride ions up to 1 *ppm* is considered beneficial, which improves dental health. If the amount surpasses above 1.5 *ppm*, it is dangerous to health. Excessive fluoride in drinking water may lead to 'dental fluorosis' and other adverse health effects [6]. In this investigation, we found that Fluoride ion is present in trace amounts (0.0012-0.0017 *ppm*) and is beneficial for health in all water samples.

IV. CONCLUSION

In this study, we analyzed the quality of drinking water samples collected from various open wells in Edanji, Thiruvananthapuram, Kerala via the evaluation of different physical (Odour, taste, colour, temperature, turbidity, and electrical conductance) and chemical (amount of total alkalinity, total hardness, Calcium, Magnesium, Chloride, Fluoride) parameters. The water samples are found as odorless (except 6 and 9), colors, and tasteless. The temperature of the samples is in the range of 29.00-30.00 and is useful for drinking purposes. The turbidity measurement of the water samples indicates that *iron* and other suspended organic contaminants are absent. The analysis of the samples says that the samples are slightly acidic. The electrical conductance values are within the acceptable limit, which further suggests the absence of charged particles. Alkalinity determination says that the alkalinity of water samplers is mainly due to the presence of ions. Hardness calculation indicates, most of the water samples are soft. Among 10 samples, 7 are soft, 2 are moderately hard, and are sample is very hard. Ca^{2+}, Mg^{2+}, Cl^- and F^- ions are also within the tolerable limit and are beneficial for health. Overall, the analyzed water samples are safe for drinking purposes.

ACKNOWLEDGMENT

The authors express their sincere thanks to the Manager and Principal, Santhom Malankara Arts and Science College, Edanji, Manchavilakom P.O., Thiruvananthapuram – 695 503 for providing necessary facilities and their constant encouragement to carry out this work.

REFERNCES

[1] Patil V. T., Patil P. R. (2010) "Physicochemical Analysis of Selected Groundwater Samples of Amalner Town in Jalgaon District, Maharashtra, India", E-Journal of Chemistry/ Vol.7/ No. 1/ pp. 111-116.

[2] Reda A. H. (2016) "Physico-Chemical Analysis of Drinking Water Quality of Arbaminch", Town. J Environ Anal Toxicol/ vol. 6/ pp. 356/ doi:10.4172/2161-0525.1000356.

[3] Rahmanian N., Ali S. H. B., Homayoonfara M., Ali N. J., Rahman M., Sadet Y., Nizami A. S. (2015) "Analysis pf Physicochemical Parameters to Evaluate drinking water quality in the state of Revak, Malaysia", Journal of Chemistry, Article ID 716125.

[4] Bundela P. S., Sharma A., Akhilesh Kumar Pandey, Priyanka Pandey, Abhishek Kumar Awasthi, (2012) "Physicochemical Analysis of Ground Water Near Municipal Solid Waste Dumping Sites in Jabalpur", International Journal of Plant, Animal and Environmental Sciences, vol. 2/ No. 1/pp. 217-222.

[5] Kanase G. D., Shaikh A. S., Jagadale N. P. (2016) "Physico-chemical analysis of drinking water samples of different places in Kadegaon Tabsil, Maharashtra (India)", Pelagia Research Library Advances in Applied Research, vol. 7/ No. 6/pp. 41-44.

[6] Joseph J., Sajeesh A. K., Nagashri K., Gladis E. H. E., Sharmila T. M., Dhanaraj C. J. (2021) "Determination of ammonia content in various drinking water sources in Malappuram District, Kerala and its removal by adsorption using agricultural waste materials", Materials Today: Proceedings, vol. 45/ No. 2/pp. 811-819.

[7] Pawari M. J.,.Gavande S.M (2015) "Assessment of Water Quality Parameters: A Review", International Journal of Science and Research (IJSR), vol. 4/ No. 7/ pp. 1427-1431.

[8] Pradeep V., Deepika C., Urvi G., Hitesh S. (2012) "Water Quality Analysis of an Organically Polluted Lake by Investigating Different Physical and Chemical Parameters", International Journal of Research in Chemistry and Environment, vol. 2/ No. 1/ pp. 105-111.