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A Critical Review of the Physico-Chemical Analysis of Drinking Water

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Abstract

Compared to ground water, drinking water from a tube well is fresher and less contaminated. Water consumption has a significant impact on people's health and welfare. Drinking water quality has long been a serious health risk, particularly in developing nations where poor sanitation and the use of contaminated water are blamed for 80% of disease cases. The main health issue in the majority of developing nations is the lack of access to clean water for a sizable portion of the populace living in rural areas. This article focuses on the drinking water's physico-chemical analysis.

Keywords: Analysis, Disease, Drinking, Health, Physico-chemical, Water.

1. Introduction

India has a vast network of rivers and large alluvial basins that store groundwater, among other water resources. Rapid population growth has exacerbated the problem by raising demand for water supplies for industrial, agricultural, and human use. Water is necessary for life to exist; it is also necessary for weather management because everything in water radiates heat, contributing to temperature regulation. All life and insignificant strength end without water. In addition to potable water, each person needs safe, individual water for industrial and developing operations, agriculture, and hydroelectric power generation, the creation of electricity, tools, and wildlife, among other uses. Without water, all life cycles come to an end because it is essential for monitoring the climate. Man is primarily dependent on surface water. Earth primarily depends on rain to guard against droughts or floods that could cause devastation by reducing the amount of fresh water present in rainfall at random. A vital necessity for all living things and other organisms is potent, clean water. When a reserve is put to such varied uses, it is crucial that it be developed and used wisely.

2. Review of Literature:

According to Mohabansi, N.P. et al. (2011), the Wardha region's textile industry effluent underwent physico-chemical and microbiological analysis. India's Wardha is a significant and ancient city. Examining the textile industry effluents in the Wardha district is the goal of this work. This paper aims to evaluate the water quality of the textile mill effluents. The effluent collected from the textile industry in the Wardha region was subjected to physico-chemical parameter analysis, including colour, odour, temperature, density, sulphate, COD, BOD, and pathogens. Additionally, flame photometric analysis was used to analyze sodium and potassium elements. The WHO acceptable limit for BOD is exceeded. This high BOD level is a sign of dyeing unit contamination and improper drainage, which could have disastrous effects by reducing the amount of fresh water present in rainfall. Strong, clean water is an essential

requirement for all living things and other organisms. It is essential that a reserve be developed and used responsibly when it is put to such diverse uses. Based on the current investigation, we have concluded that the water samples under study had acceptable quality for the majority of physico-chemical parameters. [1]
Khound, N.J. et al. (2012) conducted physico-chemical investigations to assess the quality of surface water in the Jia Bharali river basin, North Brahmaputra Plain, India. The boundaries of the Jia Bharali river catchment area are latitudes 26º39'–28º00' N and longitudes 92º00'–93º25' E. One of the main tributaries of the Brahmaputra, the Jia Bharali, originates in northeastern India's Arunachal Pradesh and passes through the center of the Sonitpur district of Assam. This study provides a thorough evaluation of the region's surface water quality based on the examination of six data sets that span three years (2008–2010) and represent 35 point sources. The temporal and spatial relationships between the physico-chemical parameters are not constant. In both the wet and dry seasons, the anion composition follows the trend $HCO_3 > Cl > SO_4 >> PO_4 > NO_3$, while the major ion contents show the trend Ca > Na > Mg > K. [2]
In the Amravati district of Maharashtra, India, Triveni Lake water underwent physico-chemical analysis by Khan, R.M. et al. (2012). Triveni Lake in the Amravati district of Maharashtra was chosen for the physico-chemical analysis of water in the current investigation, which examines the quality of water in relation to physico-chemical parameters. The lake provides drinking and irrigation water to fifteen canal-irrigated villages. These days, home waste and agricultural runoff pollute lake water. A year was spent studying and analyzing the physico-chemical characteristics of the water in Triveni Lake, from December 2010 to November 2011. Numerous physico-chemical characteristics, including air and water temperatures, pH, humidity, conductivity, and the total hardness of $CaCO_3$, Ca^{2+}, and Mg^{2+}, were examined in order to comprehend the Triveni Lake water quality. [3]
Kalra, N. et al. (2012), Physico-chemical analysis of ground water collected from five blocks in southern Bojpur (Bihar): Udwantnagar, Tarari, Charpokhar, Piro, and Sahar. The study area is the district of Bhojpur in the state of Bihar. The town of Ara, which is a part of the Patna region, serves as the administrative hub for the state of Bihar, which consists of 38 districts in total—including Bhojpur. The boundaries of the Bhojpur district (plate 1) are 25º 00′ to 25º 30′ N and 84º 15′ to 84º 45′ E. The region is bordered to the east by the Ganga River, to the north by the Darmawati-Gangi River, and to the east by the Son River. Its area is dispersed over 3395 square kilometers in total geographic area. There are three subdivisions in the district: Jagdishpur, Piro, and Arasadar. Arasadar, Udwantnagar, Jagdishpur, Koliwan, Sahar, Barhara, Sandesh, Shahpur, Charpokhari, Piro, Tarari, Bihia, Agiawon, and Garhami are among the district's blocks. A physico-chemical analysis was done for the five blocks in southern Bhojpur as part of the current study. Numerous quality parameters are measured in the physico-chemical analysis, such as the concentration of nitrate in ground water, pH, turbidity, electrical conductivity, total dissolved solids (TDS), total hardness (TH), and the amount of calcium, magnesium, chloride, sulphate, iron, DO, COD, and BOD. Additionally, every parameter was contrasted with the water quality standards set by the ICMR. Additionally, the classification of water samples from five blocks was examined using TDS and TH in the current research paper. The study demonstrates that the only source of water available to people in the study area is ground water, and the findings of the chemical analyses of the ground water show significant variation. The majority of the water samples don't meet ICMR drinking water standards. It is found that only a small portion of the water quality in the inspected area is safe to drink without any prior treatment. It should be noted that a routine chemical analysis is necessary to ensure that the water quality in this area is not contaminated, in addition to considering the construction of new walls in the area to supply more water for the locals. [4]

In 2012, Boral, S.B., and Banmeru, P.K. investigated groundwater physico-chemical analysis. For the current study, groundwater samples were gathered from specific sampling locations near the late Ku. Durga K. Banmeru Science College in the Lonar district of Buldhana, Maharashtra. The water quality parameters advised by the WHO, ICMR, ISI, and other organizations were analyzed. Mg, dissolved oxygen, chloride, nitrate, phosphate, copper, and iron were all examined in this investigation. In this study, the level of chloride is also above the recommended threshold. [5]

In order to assess the quality of the water, Bheshdadia, B.M. et al. (2012) studied the physico-chemical analysis of bore well water taken from twenty-five sampling stations in Morbid-Malia territory between May 2010 (before monsoon) and October 2010 (after monsoon). The analysis included measurements of temperature, salinity, alkalinity, total hardness, phosphate, sulphate, nitrate, pH, electrical conductivity, T.D.S., turbidity, dissolved oxygen (DO), fluoride, and chloride. In the current study, the temperature ranged from 29.6°C to 32.6°C in May 2010 and from 29.1°C to 31.8°C in October 2010. In both seasons, the dissolved oxygen ranged outside of the acceptable range of 4.0 ppm for drinking water. In this study, the pH ranged from 7.10 to 8.90 in May 2010 and from 7.62 to 9.02 in October 2010, indicating that some sampling stations had pH values above the recommended range. Every sampling station's turbidity has revealed Nephelometric Turbidity Units (NTU) values that are below the recommended range. At certain sampling stations, TDS levels surpass the recommended threshold as well. Between May 2010 and October 2010, the range of phosphate was 13–41 mg/l and 10-39 mg/l, respectively. This exceeds the recommended amount. Total hardness was found to be higher than the tolerance limit in certain sampling stations between May 2010 and October 2010, with a range of 110 to 960 ppm in May and 85 to 920 ppm in October. [6]

According to Skinder BM et al. (2013), the Tawa River water quality assessment was conducted from January to May of 2006. The results of the study showed that the physico-chemical properties of the water in the river (stream) vary slightly over time and space. [7]

According to Shalini, Sharma PK, Naithani P, et al. (2018), the impact of industrial effluent on groundwater was assessed in Haridwar. Seven water samples were taken into consideration; two ground water samples were taken from Salempur, a village near the State Industrial Development Corporation of Uttarakhand Limited (SIDCUL) in Haridwar, and five samples were taken from SIDCUL. Factors including pH, total hardness, electrical conductivity, salinity, lead (Pb), chromium (Cr), arsenic (As), iron (Fe), aluminum (Al), manganese (Mn), and nickel (Ni) were among the parameters that were examined in the samples. [8]

3. Discussion:

The following topic may be discussed in light of the literature review on the physico-chemical analysis of drinking water: According to bacteriological standards, the water still has to be treated before being used for domestic purposes; as a result, there is always a risk that sample water used without sufficient disinfection will become contaminated with waterborne diseases. Based on physico-chemical parameters, surface water sources in the Jia-Bharali catchment and its environs are deemed suitable for use in industrial, agricultural, and residential settings. The spatiotemporal variability of the physico-chemical parameters from this study may be used as baseline data in the future to monitor and manage any changes caused by changing land use. While some of the physico-chemical parameters showed notable seasonal variation in the results, most of them were within the normal range and suggested that the lake water quality was better. Winter and summer are the best seasons to drink water, according to research. The study's conclusions indicate that the selected points are of low quality and require additional attention before consumption. As a result, it recommends the following treatment methods: Prior to employing an appropriate filter system to remove suspended solids and colloidal particles to achieve adequate aeration, add KMnO4 and leave the water in the atmosphere after pumping the water out of the bore well. Alum or another coagulant should be added to water to cause metallic salts to precipitate. For this, a hot soda-lime solution should be used. The study discovered that the levels of essential elements in water, such as total dissolved solids (TDS), salinity, phosphate, nitrate, pH, total hardness, and chloride, exceed the tolerance range. Because of this, drinking the local bore well water is dangerous. The outcomes should be contrasted with the Bureau of Indian Standards' limitations. Since the groundwater near the industrial area was found to be contaminated by industrial waste water, which degrades groundwater, it poses a major risk to the health of Salempur residents.

4. Conclusion:

Humans, animals, and plants all require water to survive. The consumption of drinking water is quickly becoming one of humanity's most serious problems. All life depends on water. The human body is composed of 70% water. Without water, humans cannot survive. The availability of high-quality water is critical for disease prevention and improving quality of life. Thus, it is crucial to comprehend the different physical characteristics—such as color, temperature, total hardness, pH, sulfate, chloride, DO, BOD, COD, and alkalinity—that are used to test the quality of water. Until 2025, approximately 45 countries are expected to be fighting water scarcity-related problems, accounting for approximately 2.7 billion people, or 34% of the world's estimated population. Ethiopia, India, Kenya, and Nigeria are the most likely countries to face a water shortage in the next 25 years. Few large nations, such as China, are currently suffering from severe water shortages.

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