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## The crucial role of physiochemical parameters in evaluating the potability of water: A review

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**Abstract:** Water is what makes our planet so unique and virtually everything on our planet relies on it. Having clean and safe water is vital to our individual health, our collective agricultural needs and the needs of our environment. Urbanisation, agricultural runoff and many anthropogenic activities affect the water quality. Physicochemical parameters is very necessary and principal to test the water at regular interval of time before it is used for domestic, agricultural, drinking and industrial purpose. Water need to be tested with many physicochemical parameters like temperature, pH, alkalinity, turbidity, TDS, Electrical conductivity, CO<sub>2</sub>, Dissolve Oxygen, BOD, Nitrate etc. Evaluating the potability of water is essential to ensure it is safe for human consumption. Physicochemical parameters play a crucial role in this evaluation, as they provide important information about the waters quality and safety. These parameters include physical properties, chemical constituents and contaminants, each affecting the waters suitability for drinking.

**Key words:** Potable water, Physico-chemical parameter, Contaminants.

**Introduction:** WHO defines safe drinking water as water that does not represent any significant risk to health over a lifetime of consumption. Water is indispensable to ecosystem, providing habitats regulating temperature supporting photosynthesis, maintaining water quality. Its availability and quality are essential for the survival and flourishing of both terrestrial and aquatic life forms. Access to clean drinking water is essential to maintaining good health. It prevents water borne diseases such as diarrhea typhoid. Water resources found on earth are under tremendous pressure and they should manage properly for the survival of human being and aquatic organism (Ali *et al.*, 2019) proper hydration is also crucial for bodily function including digestion, temperature regulation etc. Protecting water sources from pollution and overuse is essential for maintaining biodiversity and environmental health, clean drinking water is a global priority that requires concerted efforts in water management, infrastructure development and public health initiatives. Water quality assessment was developed to give an indication of how suitable the water is for human consumption and other purposes (Tapase B, 2021). Water quality is so core to WHO's heart that ensuring availability and sustainable water management and sanitation for all is goal six on its 2030 agenda for sustainable development (Akaho *et al.*, 2022)

Consistent monitoring and analysis of water are crucial to assess its quality or level of pollution. Poor quality of water is considered as one of the manifestations of poverty in developing countries (Aminu *et. al.*,2017).

**Physico-chemical Assessment :**

To analyse the physico-chemical parameters of water, we will need to follow standardized methods to ensure accuracy and reliability.

Data should be recorded and tabulated for analysis

Data processing for statistical analysis.

Results have to be compared with standard water quality guidelines (eg.WHO) to assess compliance and potential health risk.

Physicochemical parameters of water will be analyzed by using standard methods given by APHA (American Public Health Association).

**Methods used to study the physico-chemical parameters:**

Sr.No	Physico-chemical Variables	Methods used
1	Temperature	Thermometer
2	pH	pH meter
3	Electrical conductivity	Water analysis kit/Conductivity meter
4	Total dissolved solids	TDS meter
5	Total hardness	Titrimetric method(Complexometric)
6	Turbidity	Turbidity meter
7	DO	Titrimetric method
8	BOD	Titrimetric method
9	Nitrate	Spectrophotometer

## **Review of literature:**

Numerous technical research papers on water quality assessment for fresh and marine water bodies have been presented for study at the research level. Some papers are presented below.

Shyam Sunder and Khatri A.K. in 2015 have studied the water quality of Ottu reservoir in Sirsa district, Haryana during the period of April 2012 to June 2013 by using some Physico-Chemical parameters. Various physico-chemical parameters such as Water temperature, pH, Turbidity, Electrical conductivity, Total alkalinity, Total hardness, DO, BOD, COD, Nitrate, Sulphate etc. From the observations it is clear that the water is less polluted but TDS and BOD value of water of ottu reservoir was high so not suitable for drinking purpose but suitable for agricultural, industrial cooling and domestic uses.

Manjare *et.al.*, in 2010 has studied the analysis of water quality of Tamdalge tank in Kolhapur district in Maharashtra by using some physicochemical parameters. Water samples from tank were collected from four different stations in the morning hours. And were analyzed for a period of one year from January 2009 to December 2009. From the study it was shown that all the parameters were within permissible limits. The results indicate that the tank is non-polluted and can be used for domestic, irrigation and pisciculture.

Verma *et al.* in 2012, have studied the water quality of Chandola lake located in Ahmadabad city by investigating different physical and chemical parameters. To evaluate the water quality of this lake, study was carried out for the period of one year, March 2009 to February 2010. Sampling was done during morning hours. This lake is surrounded by large number of small scale industries and slums so waste from surrounding area directly released into the lake. Result obtained during study was compared with WHO and BSI standards and was found that maximum number of parameters in Chandola lake were above desirable limit in all the seasons. The lake water is highly polluted and not suitable for drinking.

Shrivastava *et al.* in 2009, studied the physico-chemical characteristics of water of lakes (Jalmahal lake and Ramgarh lake) around Jaipur city, India. Water sample were collected and analyzed for a period of 12 months, February 2005 to January 2006. Physico-chemical variations in lakes have been correlated to changes in levels of zinc and endosulfan as common pollutants. From the results it was concluded that Jalmahal lake is most polluted having high alkalinity, free CO<sub>2</sub>, hardness, and pH but low level of DO. Endosulfan and zinc contents are also high in Jalmahal lake making it unsuitable for drinking, for biota, fish and others. Ramgarh lake is least polluted lake suitable for survival of fishes.

Akaho *et al.* in 2022 have studied the physicochemical analysis of potable water in Baham community, western region of Cameroon by collecting water samples were from four boreholes, well and stream. Collected samples were analyzed based on some physicochemical parameters. From the result, it was concluded that the quality of water in Bahm is not fit for consumption according to WHO standards. It is acidic, lack essential minerals, not properly disinfected and disturbingly high lead concentration.

## **Physico-chemical parameters:**

Physico-chemical parameters of water are crucial for assessing water quality because they provide essential information about the chemical and physical characteristics of water. These parameters help determine the suitability of water for various uses such as drinking agriculture industry and ecosystem health. Here are some physicochemical parameters and their importance:

**Temperature:** The increase in temperature directly correlated with duration of bright sunlight. It affects the seasonal and diurnal variation (Nigam et al., 2013). Temperature influences chemical reaction, processes and solubility of gases (eg. CO<sub>2</sub>, O<sub>2</sub>). It is significant factor detecting the water quality.

**pH :** It affects the solubility and toxicity of chemicals and heavy metals in water. Most aquatic life thrive within a pH range of 6.5 to 8.5. The pH of water affected by the reaction of Carbon di Oxide as well as organic and inorganic solutes occurred in water. Any alteration in water pH are accompanied by the alter in other physicochemical properties (Kulshrestha *et al.*, 1992).

**Electrical conductivity:** High conductivity indicate the presence of pollutants such as sodium chloride and other ions. EC is a ability to conduct electrical current .It is directly related to concentration of dissolve ions such as salts minerals and metals in the water. EC used to monitor the health of aquatic ecosystem as it can affect the survival of reproduction of aquatic organisms. Water with very high conductivity may not be suitable for drinking due to harmful dissolve substances. It is crucial parameter for assessing water quality. The underground drinking water quality can be checked effectively by controlling conductivity of water (Navneet kumar and Sinha, 2010).

**Total dissolve solids:** It is a key parameter in assessing water quality. it provide crucial information about the concentration of dissolve substances in water which affects human health, environment and industrial processes WHO recommended a TDS limit of 500 mg/l for drinking water. EC is a surrogate measure of TDS (Thirumalini and Joseph, 2009). High TDS affect the taste of water and indicate presence of harmful contaminants.

**Total hardness:** The main cause of hardness of water is primarily due to the presence of various salts of calcium and magnesium and it is needed to classify water as hard or soft. Hardness is directly proportional to temperature (Verma *et al.*, 2012).

**Turbidity:** Turbidity indicates the presence of suspended particulates in water. High turbidity can harbor pathogens and reduce the effectiveness of disinfection process. it is a important indicator of water quality. Monitoring and managing turbidity level is essential to ensure safe drinking water, maintain healthy aquatic ecosystem. Higher turbidity affect the light penetration in water indirectly (Varma *et al.*, 2012)

**Dissolved Oxygen(DO):** Dissolved Oxygen is a vital component Of water quality,crucial for the survival of aquatic organisms and overall health of aquatic ecosystem.The higher concentration of DO provide better water quality(Nagam *et al.*,2013).DO is indirectly propotional to BOD.

**Biological Oxygen Demand (BOD):** It is important parameter for assessing the organic pollutin level in waterbodies. Monitoring and managing BOD levels are essential to prevent oxygen depletion, protect aquatic life. Higher temperature enhance microbial activity increase BOD. BOD itself maynot be directly regulate in drinking water but it is closely monitored as an indicator of overall water quality. BOD is nothing but the required amount of oxygen to decompose organic matter present in water (Agarwal and kumbhar,2016).

**Nitrate:** Nitrate pollution in water is a significant environmental and public health concern due to its widespread sources and adverse effect on aquatic ecosystem and drinking water quality.High nitrate concentration can result in excess algal bloom in water body.it is not beneficial for potability of water(Agarwal and kumbhar,2016).

**Conclusion:** This study has demonstrated that monitoring and maintaining optimal physico-chemical parameters in drinking water sources are critical for ensuring safe and sustainable water quality. our findings underscores the significance of regular assessment of parameters such as pH, turbidity, DO and nitrate level in safeguarding public health and environmental integrity. it is imperative to enhance monitoring capabilities, strengthen regulatory frameworks and promote community management to uphold water quality standards.by taking proactive measures and fostering collaborative efforts we can secure access to safe drinking water ,protect ecosystem and promote public health resilience in the face of emerging challenges.

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