



# Analysis Of Physicochemical And Nutrient Parameters Of Drinking Water Sources In Shegaon Taluka Of District Buldhana

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## Abstract

Clean drinking water is crucial for survival and preventing waterborne diseases, since last few decades, it has been observed that water resources are limited and must be conserved, leading to the necessity for improving quality control. Many of the communicable diseases having the greatest impact on mankind are waterborne, and a permanent reduction in morbidity and mortality can most effectively be achieved by providing safe drinking water. In present study physico-chemical analysis of 15 drinking water samples was carried out to develop a data base on the quality of water being consumed in different areas of Shegaon taluka. The drinking water samples were taken from the main water sources from where maximum people using them for drinking purpose. Physicochemical analysis of water is categorized as Mineral Analysis consisting of physical parameters including analysis covering COD, BOD, DO, etc., Nutrient Analysis consisting of different forms of nitrogen, phosphorous. Measurement of Temperature, pH, Conductivity, Total Dissolved Solids (TDS), Salinity, Turbidity and Dissolved Oxygen was done. standard methods were applied to determine the quantities of other components. Most of the water samples were within WHO/ ISI standards. The results of the present research work showed that drinking water collected from different areas of Shegaon taluka was found to be suitable for human health. It is recommended to boil water, proper chlorination, use efficient system for garbage collection and its disposal, proper sewage waste treatment, recycling of waste into useful products such as fertilizers, education to people through awareness program about the causes +and consequences of water pollution.

**Keywords:** Physicochemical Parameters, Nutrient analysis, Drinking water.

## Introduction

Traditional methods employing selective, differential and non- selective media were used to isolate and identify different species of bacteria from rural drinking water reservoirs of Mount Darwin district of Zimbabwe (Zvidzai C.,et al., 2007). Quality of water is an important criterion for evaluating the suitability of water for drinking and irrigation. Water quality of dug well, tube well and municipal supply of Vadekkekara Panchayath in Ernakulam District of Kerala state was studied with an objective to assess the water quality status in the study area and its potability. The water quality parameters considered were: colour, odour, turbidity, temperature, pH, electrical conductivity, total dissolved solids, acidity, alkalinity, total hardness, chloride, free CO<sub>2</sub>, dissolved oxygen, biological oxygen demand, chemical oxygen demand, calcium, magnesium, iron, sodium, potassium (Sleema B. and Ramesh Babu M.G. 2009). The piece of investigation was carried out to study the ground water as well as surface water quality, nutrient status and physico-chemical characteristic of Bargarh district of Orissa, India. Work has been conducted by monitoring two types of ground water i.e. dug well water and bore well water as well as ponds. Attempts were made to study and analyze the physico- chemical characteristics of the water (Mahananda M.R.,et al., 2010). Study of the Physico- chemical Parameters of Tamadolge Water Tank in Kolhapur District, Maharashtra has been done. Monthly Changes in Physical and Chemical Parameters Such as Water Temperature, Transparency, Turbidity, Total Dissolved Solids, pH, Dissolved

Oxygen, Free Carbon dioxide, and Total Hardness, Chlorides, Alkalinity, Phosphate and Nitrates were analyzed (Manjare S.A., et al., 2010). Physico-chemical analysis such as temperature, pH, dissolved Oxygen, TDS, Chloride, Total Alkalinity, Calcium and Magnesium hardness, Sulphate, Phosphate, Nitrate and fluoride of borewells, wells and lacks drinking water has been carried out from fifteen sampling stations of Gandhinagar territory area during June 2011 and Nov 2011 in order to assess water quality index<sup>8</sup>. Physico-chemical analysis such as temperature, salinity, alkalinity, total hardness, phosphate, sulphate, nitrate, pH, electrical conductivity, T.D.S., turbidity, dissolved oxygen, fluoride, chloride of bore-well water was carried out from twenty five sampling stations of Morbi-Malia territory during May-2010 (before monsoon) and October-2010 (after monsoon) in order to assess water quality index (Bheshdadia B.M., et al., 2012).

Over the last few decades the concentrations of sulphate and nitrate ions in water have greatly increased in areas that are intensively farmed due to the widespread use of fertilizers such as ammonium sulphate and ammonium nitrate. The quality of water is of vital concern for mankind since it is directly linked with human welfare. The major sources of water pollution are domestic waste from urban and rural areas, and industrial wastes which are discharged into natural water bodies.

## Material and Method

**Collection of water samples:** A successful sampling program involves the selection of sampling points in line with objective of the study. For the purpose of water quality estimation, the selection of sampling sites requires, field survey of such sources, such as waste discharges, natural and man-made pollutants, chemical treatments, underground water resources, agro wastes, seasonal variations, surface runoff, geographic weathering, etc. The samples were analyzed as soon as it was possible. A total of 15 water samples were collected. The sources and locations of samples are given in Table-1.

**Table 1. water source and its location**

Sample	Location	Source
S1	Shegaon	Municipal corporation
S2	Kalkhed	Well
S3	Sagoda	Bore well
S4	Manasgaon	Well
S5	Paturda	Bore well
S6	Chincholi	Municipal corporation
S7	Savarna	Well
S8	Kanarkhed	Bore well
S9	Bhongaon	Municipal corporation
S10	Nagzari	Well
S11	Gaulkhed	Bore well
S12	Adasna	Municipal corporation
S13	Jawla	Well
S14	Dongargaon	Bore well
S15	Kalamba	Well

Physicochemical analysis of water includes analysis of COD, BOD, DO, Permanganate value etc., Nutrient Analysis consisting of nitrogen, phosphorous and Heavy Metal Analysis.

**Temperature:** The temperature of drinking water has an influence on its taste.

**pH:** The pH of natural water usually lies in the range of 4.4 to 8.5.

**Conductivity:** Conductivity measurement gives rapid and practical estimate of the variations in the dissolved mineral contents of water supply.

**Turbidity:** Turbidity is measured by an instrument called Turbidometer.

**Colour:** Colour is determined by visual comparison of the sample with known concentration of colored solution. Colour is expressed in terms of Hazan standard unit.

**Solids:** All solids are measured gravimetrically except settleable solids by volume and Total dissolved solids by specific conductance.

**Acidity:** Water containing mineral acidity (due to  $H_2SO_4$ ,  $HCl$  and  $HNO_3$ ) are unacceptable. Further, acid water pose problem of corrosion and interfere in water softening. Acidity can be calculated by neutralizing samples to pH 4.3.

**Alkalinity:** Alkalinity of sample can be estimated by titrating with standard sulphuric acid.

**Chloride:** Chloride is determined by titration with standard silver nitrate.

**Fluorides:** The colorimetric method (SPADNS) is the most satisfactory and applicable to variety of samples. Under acid condition fluorides (HF) react with zirconium SPADNS solution and the colour of reagent gets bleached due to formation of  $ZrF_6$ . Since bleaching is a function of fluoride ions, it is directly proportional to the concentration of fluoride.

**Sulphate:** Sulphate ions usually occur in natural waters. Many sulfate compounds are readily soluble in water. Sulphate ions are precipitated as  $BaSO_4$  in acidic media ( $HCl$ ) with Barium Chloride. The absorption of light by this precipitated suspension is measured by spectrophotometer at 420 nm.

**Hardness:** In alkaline condition, EDTA reacts with Ca and Mg to form a soluble chelated complex. Ca and Mg ions develop wine red colour with eriochrome black T under alkaline condition. When EDTA is added as a titrant, Ca and Mg divalent ions get complexed resulting in a sharp change from wine red to blue which indicates end point of the titration. The pH of this titration has to be maintained at 10. At a higher pH i.e. about 12  $Mg^{++}$  ion precipitates and only  $Ca^{++}$  ion remains in solution. At this pH Murexide indicator forms a pink colour with  $Ca^{++}$ . When EDTA is added  $Ca^{++}$  gets complexed resulting in a change from pink to purple which indicates end point of the reaction.

**Dissolved oxygen:** Dissolved oxygen (DO) is also important in precipitation and dissolution of inorganic substances in water. It is necessary to know DO levels to assess quality of raw water and to keep a check on stream pollution. In liquid waste dissolved oxygen is the factor that determines whether the biological changes are brought out by aerobic or anaerobic organisms.

**Biochemical Oxygen Demand:** The test is mainly a bio-assay procedure, involving measurement of  $O_2$  consumed by bacteria while stabilizing organic matter under aerobic conditions.

**Chemical oxygen Demand:** Chemical Oxygen Demand (COD) test determine the oxygen required for chemical oxidation of organic matter with the help of strong chemical oxidant. The organic matter gets oxidized completely by  $K_2Cr_2O_7$  in the presence of  $H_2SO_4$  to produce  $CO_2$  and  $H_2O$ . The excess  $K_2Cr_2O_7$  remaining after the reaction is titrated with  $Fe(NH_4)_2(SO_4)_2$ . The dichromate consumed gives the  $O_2$  required for oxidation of the organic matter.

**Nitrogen (Total):** In the presence of sulphuric acid mercuric sulfate catalyst organically bound nitrogen gets converted into ammonium sulfate. Potassium sulfate is added to raise the boiling point of sulfuric acid from  $345^\circ C$  to  $370^\circ C$ . The digest is diluted, made alkaline with  $NaOH$  and distilled. The liberated ammonia is absorbed in boric acid. The absorbed ammonia is determined by titration.

**Phosphate - Total and other forms:** In acidic condition, orthophosphate reacts with ammonium molybdate to form molybdophosphoric acid. It is further reduced to molybdenum blue by adding reducing agent such as stannous chloride. The intensity of the blue colored complex is measured which is directly proportional to the concentration of phosphate present in the sample.

## Results and Discussion

**Table 2. Physicochemical parameters analysis of water samples**

Sample	Temp.	P <sup>H</sup>	Conductivity	Turbidity	Colour	TDS	Acidity	Alkalinity
S1	27.1	6.5	1.12	3	1	1050	10	300
S2	25.4	7.2	2.20	0	0.2	190	30	525
S3	26.0	8.0	1.65	1	0.1	200	90	500
S4	27.12	6.9	0.73	6	1	610	40	275
S5	28.12	7.5	0.49	2	0.3	580	70	420
S6	25.20	6.5	0.30	0	0	210	30	630
S7	27.13	6.0	2.28	3	1	650	40	500
S8	26.14	7.5	1.10	6	0.3	220	90	270
S9	27.15	7.8	1.26	0	0.2	190	10	320
S10	28.0	8.2	2.14	1	1	120	20	175
S11	25.23	9.1	1.28	3	0.2	1020	60	229
S12	27.20	8.2	0.26	5	0	1300	30	220
S13	26.20	6.2	2.25	3	0.3	1300	40	320
S14	25.00	5.2	1.27	4	0.2	580	70	300
S15	27.20	7.2	2.28	1	0	190	90	200

**Table 3. Mineral analysis of Water Samples**

Sample	Chloride	Fluoride	Sulphate	Hardness	DO	BOD	COD	Nitrogen	Phosphate
S1	9.2	1.0	40	95	6.5	5	15	1.2	3.8
S2	13.4	0.3	34	101	7.0	3	10	1.4	2.4
S3	18.4	0.4	18	130	6.8	1	14	2	2.1
S4	9.50	0.4	50	120	6.5	2	20	4	0.2
S5	69	0.6	70	160	7.0	7	12	1	0.8
S6	23.2	0.9	40	270	6.5	5	10	1	3.4
S7	89.10	1.2	20	220	6.8	3	15	1.4	0.8
S8	18.0	2.1	34	120	6.5	2	20	6	1.5
S9	12.89	1.5	18	97	7.0	6	14	3	1.9
S10	72.10	0.3	24	240	6.8	4	12	8	0.2
S11	26.12	0.2	40	300	7.0	5	15	2	1.2
S12	18.12	0.7	35	240	6.8	6	10	1.4	2.4
S13	20.20	0.1	28	130	7.0	7	15	2	2.1
S14	13.21	0.4	59	95	6.5	5	10	8	1.3
S15	9.5	0.3	48	105	7.0	3	14	6	2.5

**Result of physicochemical analysis is given in Table-2, Mineral Analysis is given in Table-3.**

### Discussion

Total 15 samples were analyzed for physicochemical and Mineral analysis and in physicochemical analysis temperature range was 25.4°C to 28.12°C P<sup>H</sup> 6.0 to 9.1 Conductivity was 0.26 to 2.28 m.S/Cm., Colour 0 to 0.3 units, TDS was in between 120 to 1300 ppm. Similar results were observed by (Manjare S.A., et al., 2010, and Anwar Khalid, et al., 2011) . Acidity of water samples was found to be 10 to 90 ppm and Total alkalinity was analyzed in between 175 to 630 ppm. Also observed by (Neerja Kalra, et al., 2012). The mineral content of the water was Chloride ions was 9.2 to 89.10 ppm, Fluoride was in between 0.1 to 2.1 ppm. Sulphate was analyzed as 18 to 50 ppm. Similar findings were obtained by (Shams Ali Baig, et al., 2012). Hardness of the water samples was 95 to 300 ppm. Dissolved oxygen found to be 6.5 to 7.0 mg/lit. BOD was 1 to 7 mg/lit. COD was 10 to 20 mg/lit. also analysed by (Martin E. Ohanu, et al., 2012) . Total Nitrogen was 1 to 8 mg/lit Phosphate was found to be 0.2 to 3.8 mg/lit similar findings were observed by (Chittaranjan Hazarika. 2013, and Tahir M.A. and Rasheed H.2013). at the end it was found that most of the water samples were within WHO / ISI standards.

## Conclusion

Physico-chemical analysis of 15 drinking water samples was carried out to develop a data base on the quality of water being consumed in different areas of Shegaon taluka. The drinking water samples were taken from the main water sources where maximum peoples were using them for drinking purpose. Measurement of Temperature, pH, Conductivity, Total Dissolved Solids (TDS), Salinity, Turbidity and Dissolved Oxygen was done. Different methods were applied to determine the quantities of other components. Most of the water samples were within WHO / ISI standards. The results of the present research work showed that drinking water collected from different areas of Shegaon taluka was found to be suitable for human health. It is recommended to boil water, proper chlorination, use efficient system for garbage collection and its disposal, sewage waste treatment, recycling of waste into useful products such fertilizers, education of people through awareness program about the causes and consequences of water pollution.

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