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ijirset@gmail.com



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# Study of Assessment and Impact of the Quality of Water

**Rushikesh Subhash Shinde, Vaibhav Pramod Patil, Vikrant Vijaykumar Jirage,**

**Nikhil Ramesh Sawant, Prof. Ashish Halke**

Department of Civil Engineering, Dr. D. Y. Patil School of Engineering and Technology, Charoli-Pune, India

**ABSTRACT**-The present study the quality of drinking water supplied to the (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City, through tap, which includes tests for temperature, pH value, total solids, total suspended solids, hardness, acidity, alkalinity, chloride, chlorine, jar test, BOD and DO. Pune is one of the most important city in the state of Maharashtra which has near to Mumbai. A water quality standard is a rule or law comprised of the uses to be made of a water body or segment and the water quality criteria necessary to protect that uses. The average temperature, concentration of pH, turbidity, TDS (Total Dissolved Solids), TSS (Total Suspended Solids), DO (Dissolved Oxygen), BOD (Biochemical Oxygen Demand), total hardness, alkalinity and chloride are found to be 27.38 °C, 7.37, 2.438 NTU, 156.8 mg/l, 2.653 mg/l, 42.156 mg/l, 3.6 mg/l, 8.65 mg/l, 102.3mg/l and 21.2 mg/l respectively. The results obtained from the water quality criteria parameter are within the drinking water standard. (IS: 10500).

**KEYWORDS:** water quality, IS: 10500, pH, hardness, total solids, total suspended solids, residual chlorine, alkalinity, turbidity, BOD, dissolved oxygen, chloride.

## I. INTRODUCTION

### 1.1 Groundwater

Water quality criteria of various groundwater has been studied from different sources e.g. Tube well, Dug well, Bore well etc. by a number of Researchers, It has been reported that well water in the study area was not suitable for drinking due to high contamination of Total and Fecal coliforms and moderate contamination by nitrate and manganese. It has been reported that the level of Electrical Conductivity, Total Solids, Colour, Chloride, Chemical Oxygen Demand, Sodium, Copper and Lead in the groundwater of wells located adjacent to the disposal site were higher than the other areas. Nitrate pollution of groundwater in 14 cities of Northern China due to nitrogen fertilizer has been reported

### 1.3 Pesticide, its Occurrence and Environmental Pollution

Pesticides are very complex in their structure and are well known for their stable and non-degradable nature in the environment. Utility of pesticides in India and the other parts of the world was found in agriculture, grain storage, soil conditioning, public health and building materials. Their application in agriculture in different modes viz. spray, wet powder, dust, smoke, leads to their accumulation in all parts of the environment i.e. atmosphere, lithosphere and hydrosphere

### 1.4 Problem Statement

The pesticide contamination is becoming a great problem in water bodies especially in the underground water. It is reported by several agencies that the underground water of those areas, which are developed in agriculture, contains pesticides.

### 1.5 Scope of project

Keeping the above in view, the study area has rightly been selected. The study area experiences a seasonal climate and broadly divided into three seasons as Winter (November to February), Summer (March to June) and Rainy (July to October).. The analytical data of various physico-chemical parameters indicates that some parameters like pH, Hardness, Calcium, Magnesium, Electrical Conductivity, DO, Chloride, Total Alkalinity, Iron are found to be excess than the prescribed limit in some groundwater samples of the study areas.

### 1.6 Objective

The primary objective of this study is to assess the environmental impact of on water quality and its modelling. The specific objectives are mentioned below.

1. Determination of surface and ground water quality of a area
2. Determination of harmful contaminants present in water
3. Assessment of environmental and health impact.
4. Designing of a graphical model of water quality

## II. LITERATURE REVIEW

**Madzin et al. (2016)** assessed the concentration of heavy metals in the soil of the area near iron ore mines, viz., active Kuala Lipis Mine and abandoned Bukit Ibam Mine in Pahang, Malaysia. The water bodies were also evaluated for various physicochemical parameters for determining the WQI. Soil and water samples were collected from four different sites. The physicochemical parameters used for assessing WQI were DO, pH, BOD, COD, TSS, and ammoniacal nitrogen.

**Singh (2016)** computed the Canadian Council of Ministers of the Environment-Water Quality Index (CCME-WQI) to assess the overall water quality scenario in the limestone mining area of Meghalaya. The CCME WQI value ranges between 0 to 100 indicating poor to excellent water quality and has been widely used by the researchers for quality assessment.

**Essalhi et al. (2016)** suggested that the violation of environmental regulations causes harmful effects on the surrounding environment of the mining area. They studied the mining areas near the Little Atlas mountain ranges in Morocco. They showed four key adverse impacts, viz., the effect on the natural beauty, safety, human health and the rate of recovery.

**Bora and Goswami (2016)** conducted a study to analyse the seasonal variations in the water quality of the river Kolong through WQI. The WQI values indicated very poor and unacceptable water quality of almost all samples from along the river Kolong. The water quality was found to be worst during the wet season with a mean WQI of 122.47, whereas, the dry season had a mean WQI value of 85.73. The sampling locations that were found to be most polluted are Hatimura site and Nagaon Townsite.

**Gaonkar et al. (2016)** suggested that the open cast mining imposes significant effects on the environment including degradation of the quality of water sources, mainly due to deliberate violation of environmental regulations, widespread usage of unscientific methods, and flawed mining and dumping practices.

**Al Obaidy et al. (2016)** studied and assessed the WQI based on Weighted Arithmetic Index to evaluate the water quality of the Tigris River for drinking. Water quality deterioration in surface water was the effect of human activities because of the rapid industrialisation. Tigris River is of vital significance in the assessment of surface water quality as industrial, agricultural and municipal wastes and surface runoffs were getting mixed with river stream and the nearby water bodies thereby degrading the water quality.

**Aikins et al. (2015)** worked on physicochemical quality of ground and surface waters from Bibiani, Ghana determined whether physical, chemical and trace metal contamination of water sources as a result of mining or geochemical and biochemical processes within the environment.

**Hoseinzadeh et al. (2014)** analysed the water quality of the river Aydughmush using National Sanitation Foundation Water Quality Index (NSF-WQI), Forestry Water Quality Index (FWQI), and River Pollution Index (RPI), by evaluating various parameters, viz., DO, temperature difference, BOD, faecal coliform bacteria, turbidity, TDS, pH, phosphate in addition to 22 other parameters. They monitored parameters of eight different locations for 12 months.

### III. METHODOLOGY

The details of experimental site, experimental set up, procedures adopted and material used for experimentation are described below.

#### 3.1 Experimental Site

Pollution is commonly regarded as the result of the industrial revolution. Environmental quality of the area deteriorates mainly as a result of the increasing industrial activity. In order to find out the current status of the pollution in the area, due to the increasing trend in the industrial activities, it is very much essential to identify the various sources of pollution. Water is essential for the survival of any form of life. On an average a human being consume about 2 liter of water everyday during his whole life period. The exploding population, increasing industrialization and urbanization causes water pollution. The water pollution by agricultural, municipal and industrial sources has become a major concern for the welfare of mankind. The following is the list of few industries which are the main sources of pollution generating unit in the area:

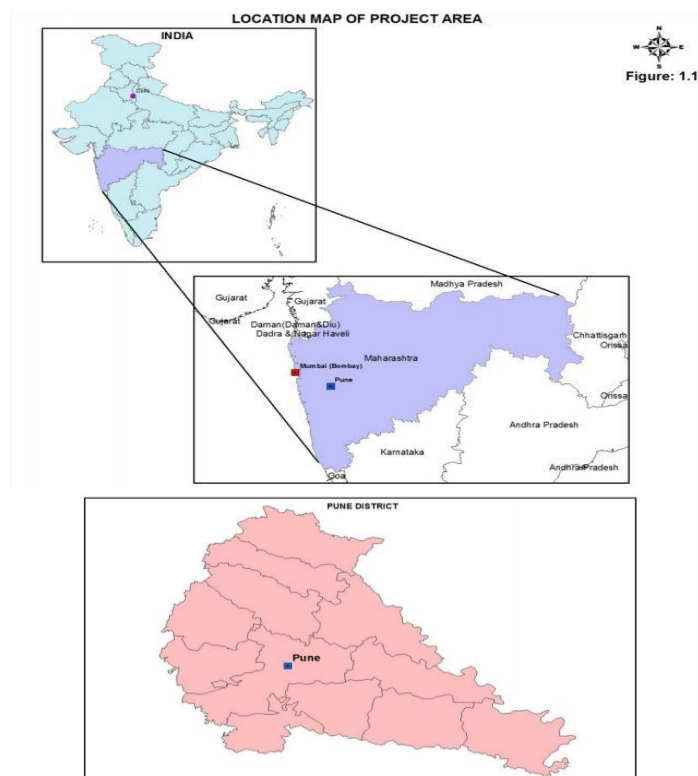


Figure 3.1– Location map of project area

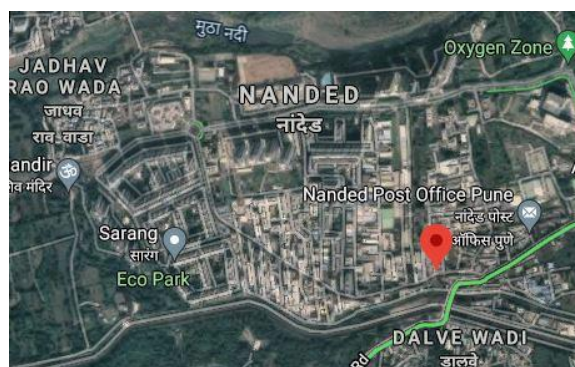


Figure 3.2 Remote Sensing Image: Satellite View of Nanded City



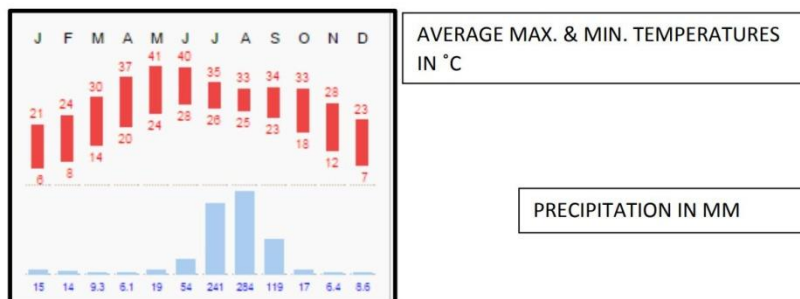


Figure 3.3 Climate Chart of Pune

- (a) Nanded Multispeciality Hospital
- (b) Madhuvanti Society
- (c) Oracle College
- (d) Sarang Society
- (e) Anlmc Church

The climate is with hot and dry having high humidity (85 %) during Summer season. Normally, there is heavy rainfall during the South West monsoon and that of light rainfall during the pre-monsoon seasons. The South West monsoon usually onsets during second week of June and retreats by mid-September.

### 3.1.1 EXPERIMENTAL METHODS

#### 3.1.1.1 WATER SAMPLING PROCEDURE AND ANALYSIS

The water samples were analyzed for various parameters in the laboratory of Environmental Engg

Various physical and chemical parameters like Temperature, pH, Turbidity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Hardness, Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Residual Chlorine, Chloride, Alkalinity have been monitored for the tap water of different locations

#### 3.1.1.1 . SAMPLING POINTS

In institute campus samples collected from the sampling point as marked in fig.3.1 and are as follows:

- (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City

### 3.2. WATER QUALITY PARAMETERS

1. Temperature of the tap water from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
2. pH value of the tap water from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
3. Total solids of the tap water from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
4. Total suspended solids in the tap water (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
5. Dissolved oxygen in the water samples (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
6. Biochemical oxygen demand of the tap water (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
7. Turbidity of the water samples from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
8. Alkalinity of the water samples from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City
9. Total hardness of the water samples (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City

10. Presence of residual chlorine in the water samples from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City

The results of the analyzed parameters of tap water of the different locations of Nanded City are compared with the related standards for drinking water prescribed by IS:10500 and USPHS. The drinking water standard is given in the table no.3.

**Table No. 3.1. DRINKING WATER STANDARDS (IS: 10500)**

Sl.No.	Parameters	Permissible value	Standard
1.	Color	Unobjectionable	IS:10500
2.	Taste	Agreeable	IS:10500
3.	pH	6.5-7.5	IS:10500
4.	Turbidity(Max NTU)	5	IS:10500
5.	TDS	500	IS:10500
6.	TSS	5	USPHS
7.	BOD	Nil to 5	USPHS
8.	DO	4.0 to 6.0	USPHS
9.	Total hardness	300	IS:10500
10.	Chloride	250	IS:10500
11.	Alkalinity	120	USPHS
12.	Residual chlorine	0.2	IS:10500

(Except pH and turbidity other parameters are in mg/l)

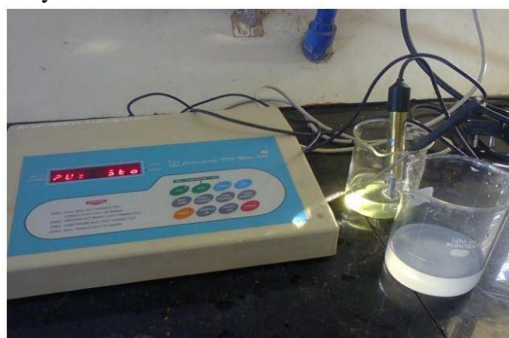
### 3.3. MATERIALS AND METHODS

#### 3.3.1. METHODOLOGY FOR THE MEASUREMENT OF TEMPERATURE PROCEDURE

a. Temperature was measured with the thermometer immersed directly in the water body, after a period of time sufficient to permit constant reading. b. Make measurement of the temperature of a water body at a particular depth with the thermometer immersed directly in the water body. After sufficient time has elapsed to allow the thermometer to come to the exact temperature of the water, take a reading.

#### 3.3.2. METHODOLOGY FOR MEASUREMENT OF pH VALUE (ELECTROMERIC METHODS)

pH value is the logarithm of reciprocal of hydrogen ion activity in moles per liter. In water solution, variations in pH value from 7 are mainly due to hydrolysis of salts of strong bases and weak acids or vice versa. Dissolved gases such as carbon dioxide, hydrogen sulphide and ammonia also affect pH value of water. The overall pH value range of natural water is generally between 6 and 8. In case of alkaline thermal spring waters pH value may be more than 9 while for acidic thermal spring waters the pH may be 4 or even less than 4.



**Fig 3.4 Conductivity meter**

##### 3.3.2.1. PRINCIPLE

The pH value is determined by measurement of the electromotive force of a cell consisting of an indicator electrode (an electrode responsive to hydrogen ions such as a glass electrode) immersed in the test solution and a reference electrode

(usually mercury/calomel electrode), Contact between the test solution and the reference electrode is usually achieved by means of a liquid junction, which forms part of the reference electrode.

### 3.3.2.2. APPARATUS

1. **pH meter** - With glass and reference electrode (saturated calomel), preferably with temperature compensation.
2. **Thermometer** - With least Count Of 0.5°C.

### 3.3.2.3. SAMPLE HANDLING AND PRESERVATION

1. Samples should be analyzed as soon as possible, preferably in the field at the time of sampling.
2. High purity waters and waters not at equilibrium with the atmosphere (ground waters or lake waters collected at depth) are subject to changes when exposed to the atmosphere, Therefore the sample containers should be filled completely and kept sealed prior to analysis.

### 3.3.2.4. PROCEDURE

After required warm-tip period, standardize the instrument with a buffer solution of pH near that of the sample and check electrode against at least one additional buffer of different pH value. Measure the temperature of the water and if temperature compensation is available in the instruments adjust it accordingly. Rinse and gently wipe the electrodes with solution.

## IV. RESULT AND DISCUSSION

### 4.1. TEMPERATURE

It is found that the temperature of the water supplied to the (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City are within the permissible limit as per IS:10500. As the result in figure 4.1 shows the temperature of the tap water collected from (a) Nanded Multispeciality Hospital (b) Madhuvanti Society (c) Oracle College (d) Sarang Society (e) Anlmc Church at Nanded City during winter.

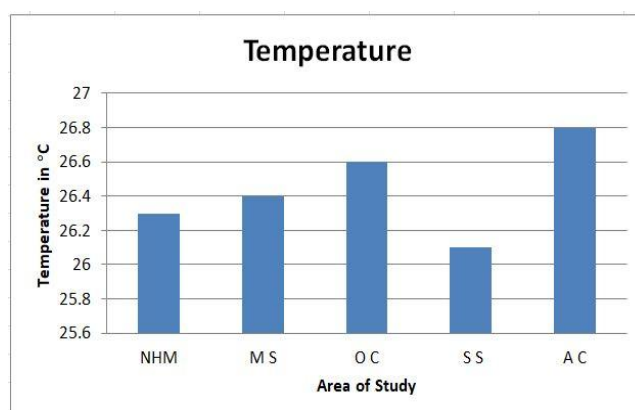


Fig.4.1. Average Temperature of tap water from different areas during winter.

### 4.2. PH VALUE

The pH is a measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. It has no direct adverse effect on health, however, a low value, below 4.0 will produce sour taste and higher value above 8.5 shows alkaline taste. A pH range of 6.5 – 8.5 is normally acceptable as per guidelines suggested by ISI. In the present study, the fluctuation of pH in the samples is from 7.32 to 7.53.

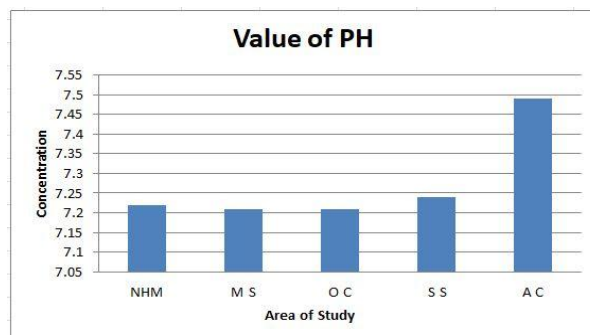


Fig.4.2. Average pH of the water samples from different areas.

#### 4.3. TURBIDITY

Measurement of Turbidity reflects the transparency in water. It is caused by the substances present in water in suspension. In natural water, it is caused by clay, silt, organic matter and other microscopic organisms. It ranged from 2.31 to 2.56 NTU. However the prescribed limit of Turbidity for drinking water is 5 NTU (IS: 10500). Turbidity was found within the permissible limit in all the water samples.

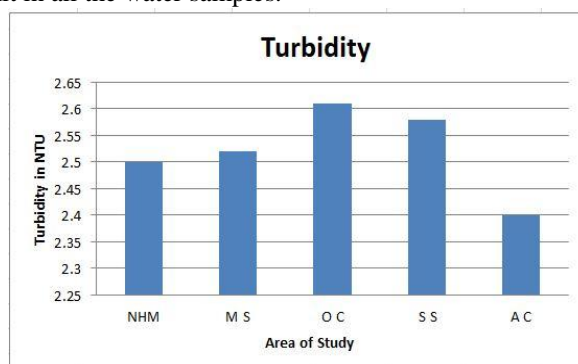


Fig.4.3. Average Turbidity of the water samples from different areas.

#### 4.4. TOTAL SOLIDS AND TOTAL SUSPENDED SOLIDS

Total Dissolved Solids may be considered as salinity indicator for classification of groundwater. The TDS in groundwater is due to the presence of Calcium, Magnesium, Sodium, Potassium, Bicarbonate, Chloride and Sulphate ions. In the study area TDS varied from 145 to 175 mg/l. As prescribed limit of TDS for drinking water is 500 mg/l, all the water samples have TDS concentration well below the prescribed limit. Total Suspended Solids in the study area varied from 2.419 to 2.863 mg/l.

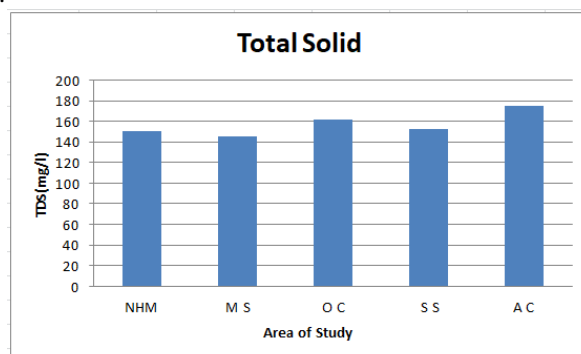


Fig.4.4.(a) Average Total solids in the water samples from different area



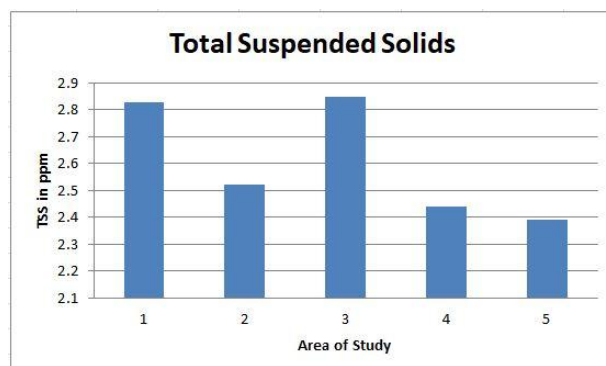


Fig.4.4.(b) Average Total suspended solids of the samples from the different area.

#### 4.5. TOTAL HARDNESS

Hardness of water is objectionable from the view point of water use for laundry and domestic purposes since it consumes a large quantity of soap. Based on present investigation, hardness varied from 40.2 to 45.2mg/l. However the permissible limit of Hardness for drinking water is 300 mg/l (IS 10500). According to Hardness classification (Durfor and Backer, 1964), the no of water samples of the study area can be classified as given in table 4.1. It is found that the water supplied to the hostels, canteens and institute building is soft.

Table 4.1. Classification of the water according to hardness

TDS Range	Description
0-60	Soft
61-120	Moderatelyhard
121-180	Hard
>180	Veryhard

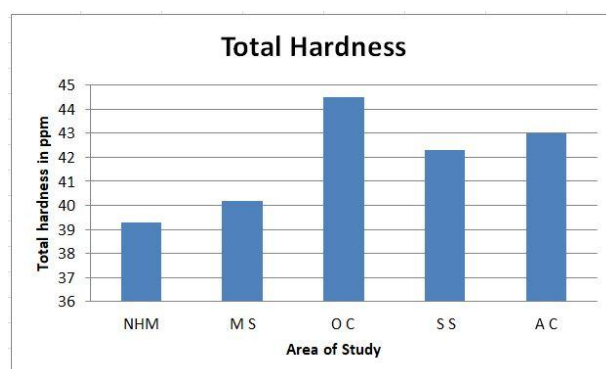


Fig.4.5Average hardness of the water samples from different areas.

#### 4.6. BIOCHEMICAL OXYGEN DEMAND (BOD)

BOD gives a quantitative index of the degradable organic substances in water and is used as a measure of waste strength. The low BOD value in all samples showed good sanitary condition of the water. It is found that all the water supplied to the institute is within the permissible limit.(ie;3 to 4 mg/l) .

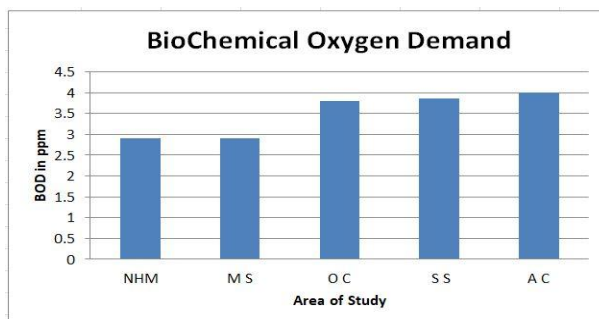


Fig.4.6. Average BOD of the water samples from different areas.

#### 4.7. DISSOLVED OXYGEN (DO)

Dissolved oxygen content in water reflects the physical and biological processes prevailing in water and is influenced by aquatic vegetation. Low oxygen content in water is usually associated with organic pollution. DO is ranged from 8.61 to 8.96 mg/l in the study area, where as the prescribed limit for DO is 5.0 mg/l.

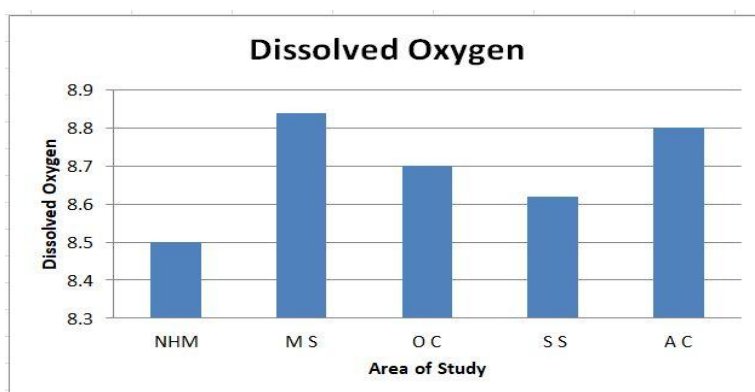


Fig.4.7. Average DO of the samples from different areas.

#### 4.8. ALKALINITY

In the present study Phenolphthalein Alkalinity was absent in all samples and Methyl Orange Alkalinity was ranged from 98 mg/l to 106.3 mg/l, this indicates the absence of Hydroxyl and Carbonate and presence of Bicarbonate. However the prescribed limit for Total Alkalinity is 120 mg/l.

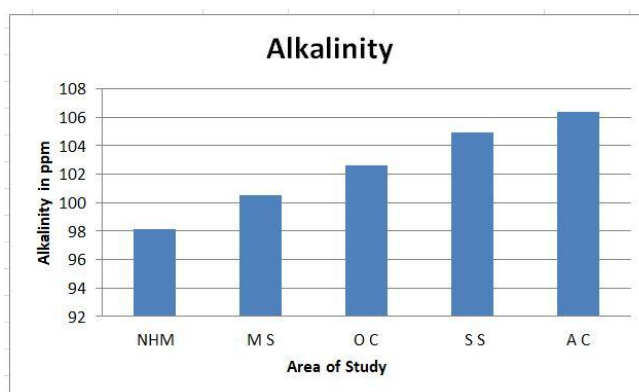
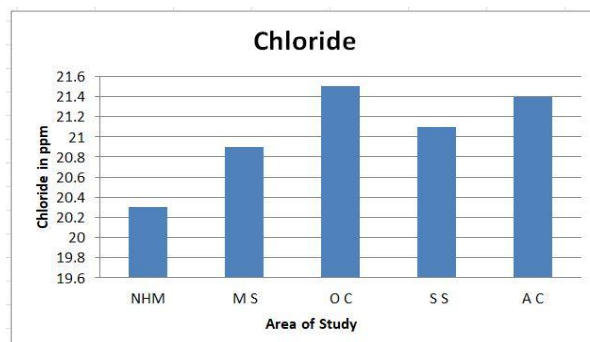


Fig.4.8. Average Alkalinity of the water samples from different areas.

#### 4.9. CHLORIDE

In the study area there is no significant change in chloride concentration and it ranged from 21.0 to 21.4 mg/l. Chloride which have been associated with pollution as an index are found below the permissible value set at 250 mg/l in most of the study area. Chloride in excess (> 250 mg/l) imparts a salty taste to water and people who are not accustomed to high Chlorides can be subjected to laxative effects.



**Fig.4.9. Average chloride present in the samples from different areas.**

## V. CONCLUSION

The average ranges of physical, chemical and biological characteristics of water quality are as per the ground water quality. The pH ranges from 7.32 to 7.53. The Turbidity, TDS and TSS ranged from 2.31 to 2.56 NTU, 145 to 175 mg/l and 2.419 to 2.863 mg/l respectively. The value of Turbidity was found to be within the permissible limit in all the. Hardness, ranged from 40.08 to 45.2 mg/l and it is found that the water supplied to the campus area is soft. The DO and BOD were in the range of 8.68 to 8.96 mg/l and 3 to 4 mg/l. The Chloride and Alkalinity were in the range of 21 to 21.4 mg/l and 98 to 106.3 mg/l respectively. The parameters studied resemble the drinking water quality.

## FUTURE SCOPE

Keeping the above problem in mind, the following objectives have been planned.

1. To collect water samples from mining areas or polluted area
2. To analyze the water samples for evaluating the physical and chemical parameters.
3. To identify the most polluting component in the samples and also to identify its source.
4. To estimate the extent of quality of all the samples using water quality index.

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