



(RESEARCH ARTICLE)



Analyzing of water quality at Ooty for drinking purpose

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Abstract

Analyzing of water quality at Ooty town and to provide clean and safe water. The water quality is analyzed and tabulated in this paper. So we are able to know the quality of water available in the sample taken. The water analyzed about the chemical, physical and biological characteristics of water. It is used to measure the appearance of sample water for the need of living. Water samples are collected from the open well (Latitude and longitude coordinates are 11.410000, 76.699997). The samples were tested for parameters like pH, turbidity, total hardness, fluoride, dissolved oxygen, ammonia nitrogen, chemical oxygen demand, acidity, and alkalinity. The values which are obtained from each parameter were compared with the Indian Standards: 10500 (Drinking water specifications). During the summer season the water demand is very high hence from the result the water was found to be safe for drinking.

Keywords: Sample Collection; Analyzing; Parameters; Quality; IS 10500:2012

1. Introduction

Ooty is a famous hill station located in Tamil Nadu. The hills surrounded with vegetation, hills and plateaus and it is one of the people attraction place. The temperature will be around 30° in summer and in winter it will be around 10°. Ooty is the place where it is full of tourism and agriculture. People from other countries visit Ooty to enjoy the beauty of nature. Water is one of the most important in day today's life. It is necessary for all to survive their life. In the past 10 years the use of water has been increased but in many places water availability is less. Ooty is already having water problem, while the year 2025 the population will get increased. The price of selling water will be increased rapidly. The water used in houses termed as domestic water. The water should be safe for drinking and other purposes.

Water quality is determined by its taste, odor and color. Polluted water can affect the water quality and human health. The inorganic chemicals pollute more than the organic chemicals but the inorganic are from heavy metals. Heavy metals consist of lead (Pb), magnesium (Mg), nickel (Ni), copper (Cu), and zinc (Zn) and causing health problems like cardiovascular diseases and cancer.

The procedures and equipment have been developed to approach the water contaminants. The present study aimed to evaluate the drinking water quality of open well water of ooty town. The testing of different parameters like pH, turbidity, total fluoride, dissolved oxygen, ammonia nitrogen, chemical hardness, oxygen demand, acidity, alkalinity and total suspended solids. These parameters can affect the water quality, if their values are in high than the permissible limits given by the World Health Organization (WHO). The review of these parameters gives the information of the water quality. It is easy to understand the information to the people and also to study the limits of these parameters. The water analysis of ooty town are not tested everywhere. This project shows the quality of water and for the comparison of result various other samples are taken and determined.

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2. Material and methods

2.1. Study area

The open well water is situated at the place of bandishola, ooty town. Latitude and longitude coordinates are: **11.410000, 76.699997**.

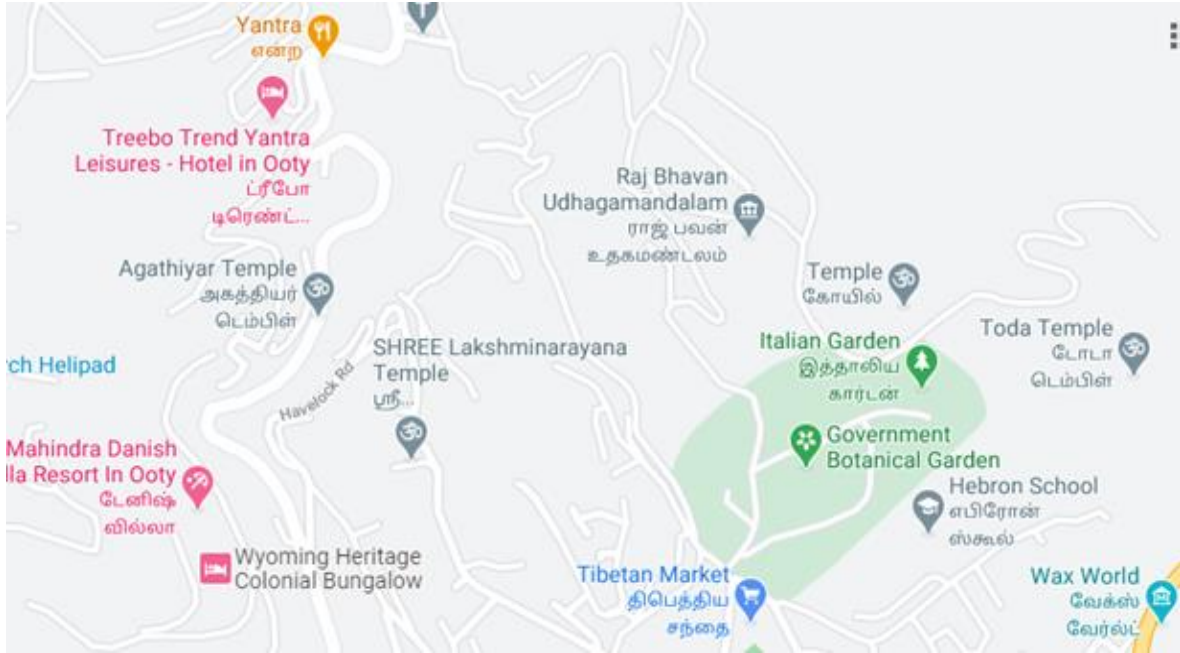


Figure 1 Study Area

2.2. Sample collection

The water samples were collected as from the standard is procedure from open well on the month of February 2020. The collected water samples were stored in a clean bottle for testing. The sample water was kept in the refrigerator analyzing and tabulated.

2.2.1. Water Sampling Procedure (ISO 5667 Part 5)

- Detach sand strainer or water filter from tap with appropriate tools.
- Check for the correct sample bottle and label.
- Turn on cold water tap at maximum flow and start timing.
- Let water flow for 2 to 5 minutes depending on how often the tap is used (If the internal plumbing system has not been used for a long period of time, flush the system thoroughly before sampling).
- After flushing, open cap of the sample bottle.
- Keep holding the sample bottle cap in one hand while sample is being collected to ensure it does not come into contact with anything to avoid contamination.
- Fill the sample bottle carefully to prevent overflow.
- Carefully put the cap back on the sample bottle.
- The following should be noted during sampling:
 - Never rinse the bottle; the sampling bottle shall be so held that the water does not come in contact with the hand before entering into the bottle.
 - Make sure that all samples are correctly labeled (sampling point, date and flushing time).
 - Reinstall tap sand strainer or water filter with tools.
 - Store water samples in ice-boxes with freezer packs and deliver to laboratory on the same day

2.2.2. leaning procedure for sampling bottles

- Rinse bottles and caps once with tap water.
- Fill bottles to just overflowing with diluted and put caps on bottles.
- Shake bottles slightly and let them stand for at least 2 hours.
- Remove caps and empty bottles.
- Rinse bottles and caps in flowing tap water until no foam is observed.
- Rinse bottles and caps once with deionised water.
- Fill up bottles with 1:1 nitric acid (HNO₃) and put caps on bottles.
- Shake bottles slightly and let them stand for at least 2 hours.
- Remove caps and empty bottles.
- Rinse bottles and caps 3 times with deionised water.
- Dry bottles and caps in oven at 50°C.



Figure 2 Sample 1



Figure 3 Sample 2

2.3. Quantity

As per IS code, 135litres are needed for daily use per person per day. Breakup of the IS assumptions

- Drinking – 5litres
- Cooking – 5litres
- Bathing & Toilet– 85litres
- Washing Clothes & Utensils – 30litres
- Cleaning House – 10litres

Volume of tank = Length x Breadth x Height

Length is taken as = 10 feet; breadth is taken 10 feet; height is taken as 6 feet

So, volume of tank = 10 x 10 x 6 = 600 cubic feet

Find out quantity of water in 1cuft in the following ways: -Density of water = 1000 kg/cum

1 cum = 1000litres (1000 kg)

1 cum = 35.3198cuft

The quantity of water in 1cuft = 1000/35.3198 = 28.31litres

Weight of water = 600 x 28.31 = 16989litres

It takes 15 hours to fill 16989liters, hence the water is filled for 1 hours is 1132.6litres

Therefore, the water is available for a day is 27182.4 liters

2.4. Parameters of testing

2.4.1. pH

pH is considered as an important parameter in almost every phase of environmental engineering practice such as of water supplies, water softening, disinfection and corrosion control. It is the measurement of the acidity and alkalinity of the water. If the pH is below 7 it is said to be acidic and if the pH is higher than 7 it is said to be alkaline. The normal drinking water pH range is between 6.5 and 8.5. pH is measured by using a pH meter.

2.4.2. Turbidity

Turbidity is an important indicator of the amount of suspended sediment in water which can have many negative effects on aquatic life. The diseases are caused by the organisms in water. The turbidity is measured by a turbidity meter.

2.4.3. Hardness

Hardness is a measure of water's ability to precipitate soap. It is caused by Ca and Mg ions. The calcium hardness precipitates lead to scaling in boilers which causes considerable economic loss. Magnesium hardness precipitates with sulphate ions, it has laxative effects. It is the process of controlling softening.

2.4.4. Fluoride

Fluoride is the process of decreasing the intensity of color is directly proportional to fluoride concentration. The presence of large amounts of fluoride is associated with dental and skeletal fluorosis.

2.4.5. Dissolved oxygen

Oxygen is a common dissolved gas in water. It is essential for the survival of aquatic life in water bodies. It can be dissolved in water by algae, in photosynthesis. Or by mechanical equipment and water enters directly to the atmosphere. Dissolved oxygen indicates the water's ability to purify from biochemical processes.

Table 1 Methods of Analysis

S.no	Parameters	Methods
1	PH	Electrometric
2	Turbidity	Electrometric
3	Hardness	Titration with EDTA
4	Fluoride	Laboratory Method
5	Dissolved oxygen	Iodometric (Titrimetric)
6	Chemical oxygen demand	Titration with Ferrous ammonium sulphate
7	Ammonia nitrogen	Titration with Sulphuric acid
8	Acidity	Titration with sodium hydroxide
9	Alkalinity	Titration with Sulphuric acid

2.4.6. Chemical oxygen demand

It is the measurement of the capacity of water to consume oxygen during the decomposition of organic matters and the oxidation of inorganic chemicals such as ammonia and nitrate. It also determines the oxygen required for the chemical oxidation of most organic matters with the help of a chemical oxidant.

2.4.7. Ammonia nitrogen

Ammonia ions react with Nessler's reagent to form a brown color substance and can be determined. Most of the natural water and waste water have interfering substances so that the steam distillation of ammonia becomes essential. The ammonia is present in the water through the fertile soil.

2.4.8. Acidity

Acidity is not as specific pollutants and it is measure of the effects of combination of substances and sources of water. It may be defined as the power of water to neutralize hydroxyl ions and is expressed in the terms of calcium carbonate .it is caused by the presence ofCO₂ and mineral acids.

2.4.9. Alkalinity

Alkalinity is the quantity capacity aqueous media to react with hydrogen ions. The natural or normal water normally due to presence of bicarbonate, carbonate and hydroxide components of calcium magnesium sodium potassium.

3. Results and discussion

Table 2 Parameters of water samples collected during month of February 2020

Sr.no	Parameters	Desired limit	Permissible limit	Sample 1	Sample 2
1	Ph	6.5	7.5	6.69	6.61
2	Turbidity(NTU)	0	5	2	2.5
3	Hardness (Mg/l)	200	600	205	225
4	Fluoride (Mg/l)	1	1.5	1	1
5	Dissolved oxygen (Mg/l)	0	5	2.36	3.5
6	COD (Mg/l)	0	20	4	8
7	Ammonia nitrogen (Mg/l)	0	0.5	0.1	0.25
8	Acidity (Mg/l)	0.5	500	20	0
9	Alkalinity (Mg/l)	200	600	210	275

After the calibration of ph meter the samples had the pH ranging from 6.69 and 6.61 which indicates presence of small amount of acidity compound in it. The values are plotted using a bar diagram for the comparison. According to IS standards, the limit of pH value for drinking water is specified as 6.5 to 7.5. The water samples lie between the limits so it can be used for drinking purpose and hence it is safe.

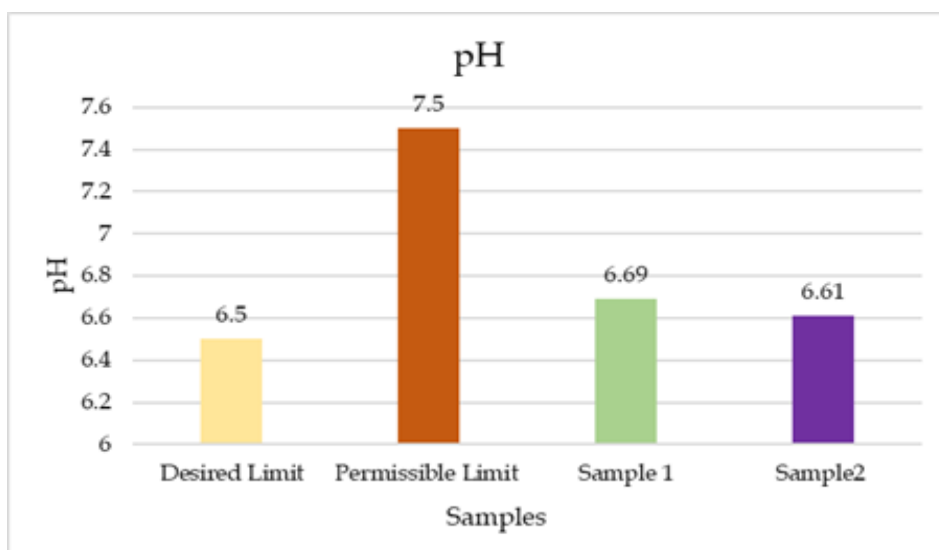


Figure 4 Variation of pH samples

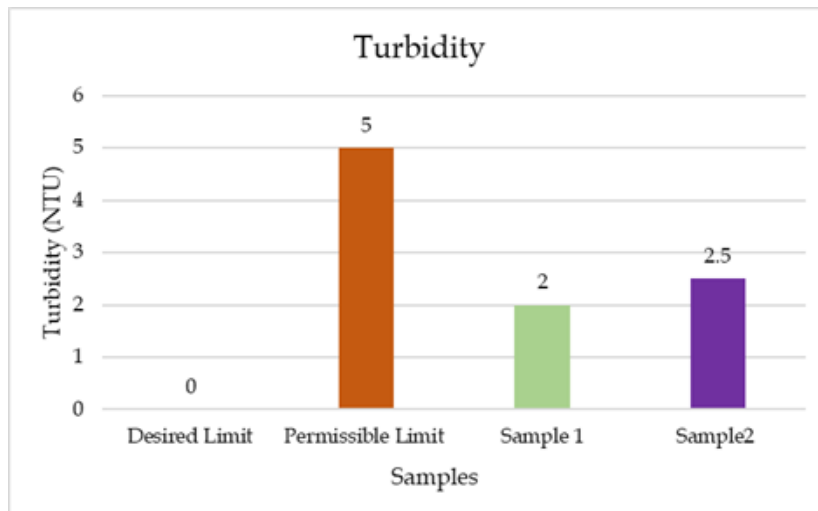


Figure 5 Variation of Turbidity samples

The turbidity of the given samples is 0.4NTU and 0.06NTU of water measure of light transmission and indicates the presence of suspended materials like clay and silt. If the turbidity excess of 5NTU is objectionable for aesthetic reason. The sample lies between the limits so it is acceptable for drinking purpose and hence it is safe.

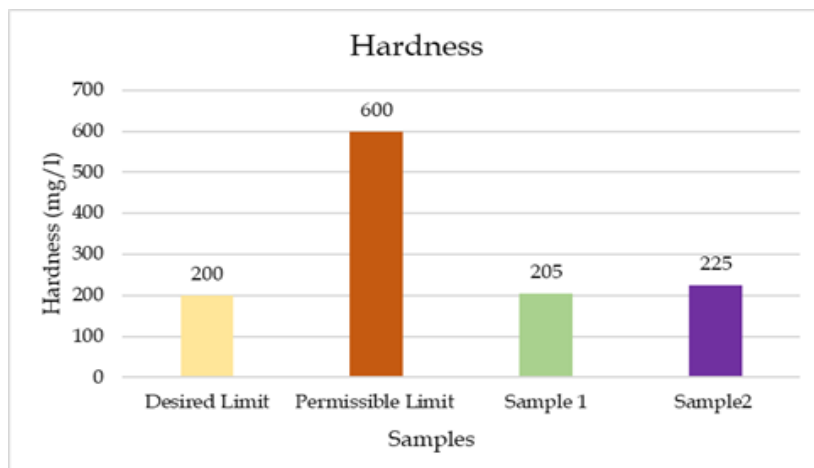


Figure 6 Variation of Hardness samples

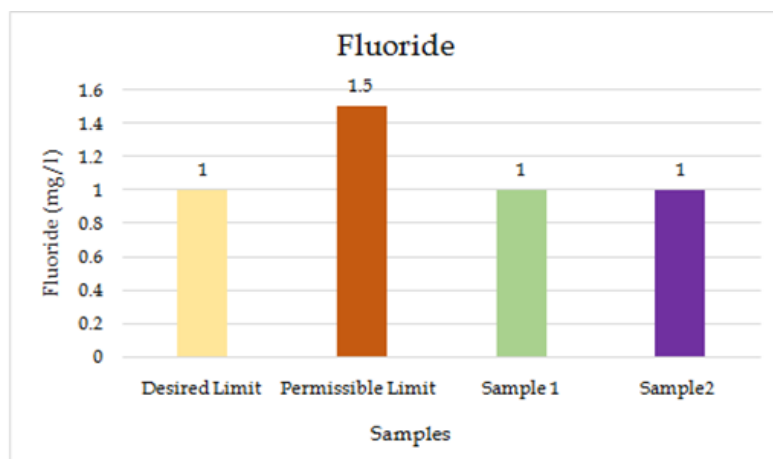


Figure 7 Variation of Fluoride samples

Hardness is the measure of calcium carbonate in the given samples. Open well water does not contain of soap and detergents and the sample tested values are 205mg/l and 225mg/l. The standard limit of total hardness for drinking water is 200mg/l-600mg/l hence the values lie between the acceptable limits so it is safe to use for drinking purpose.

The test is based on the fact that fluoride ion combines with zirconium ion to form a stable complex ion. As per IS 10500:2012 for fluoride in water the acceptable limit is 1 mg/l to 1.5mg/l and both the samples gets a value of 1mg/l. The samples lie in-between the range so it is accepted and safe for the purpose of drinking purpose.

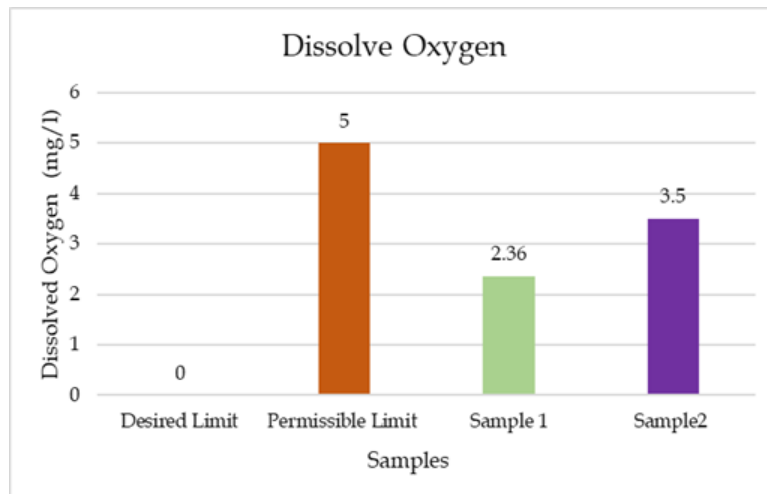


Figure 8 Variation of Dissolved Oxygen samples

It determines the water quality and organic waste content. Most of the organic waste concentration the presence of dissolved oxygen will be less. The standard limit of dissolved oxygen for drinking water should not be more than 5mg/l. The water samples collected from well shows lower dissolved oxygen than the permissible limit, hence it is safe to use for drinking purpose.

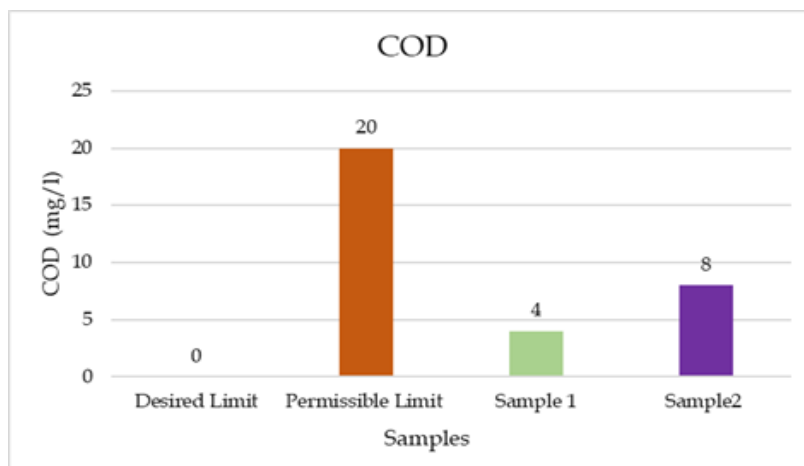


Figure 9 Variation of COD samples

The pollutants are measured in the given sample. As per Indian standards the permissible limit of COD is 20mg/l. The samples of chemical oxygen demand has a values of 4mg/l and 8mg/l, it is under permissible limit. Hence the well water can be adopted for drinking purpose.

Both the water samples contain less amount of ammonia nitrogen and its permissible limit is 0.5mg/l. None of the samples exceed permissible limit. Well water can be used for drinking purpose.

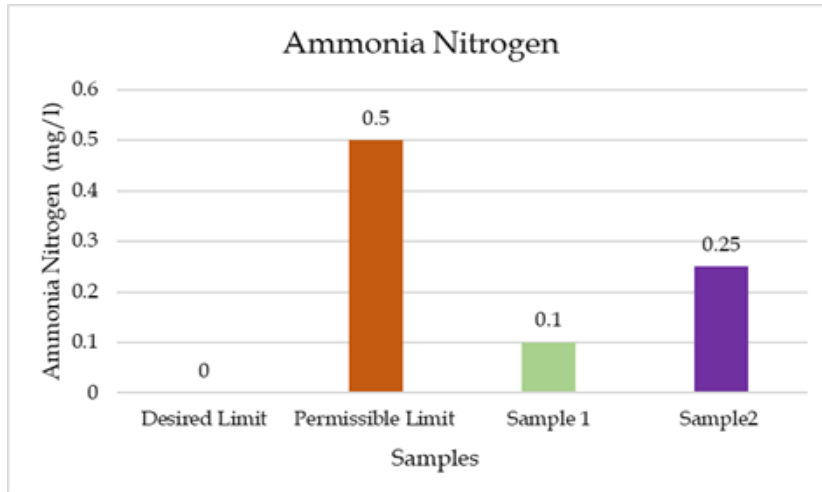


Figure 10 Variation of Ammonia Nitrogen samples

Alkalinity is a chemical measurement to know about samples bases. The acceptable limit for total alkalinity is 200mg/l-600mg/l. The samples values are 210mg/l and 225mg/l come under the limit. Well water has with its value for alkalinity it can used for drinking purpose.

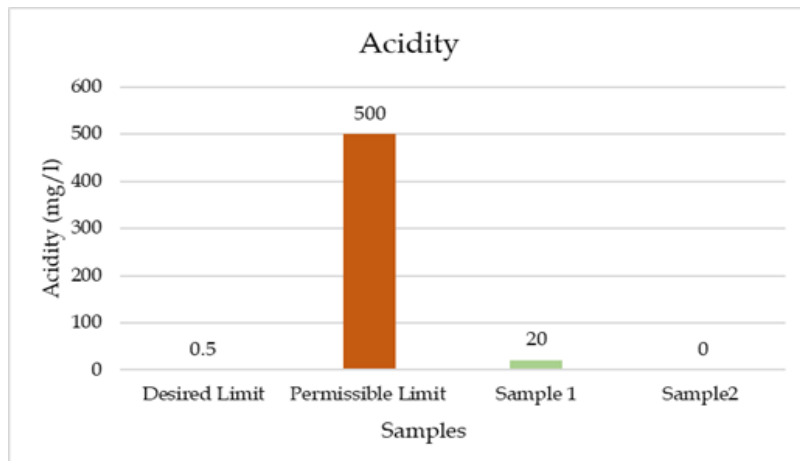


Figure 11 Variation of Acidity samples

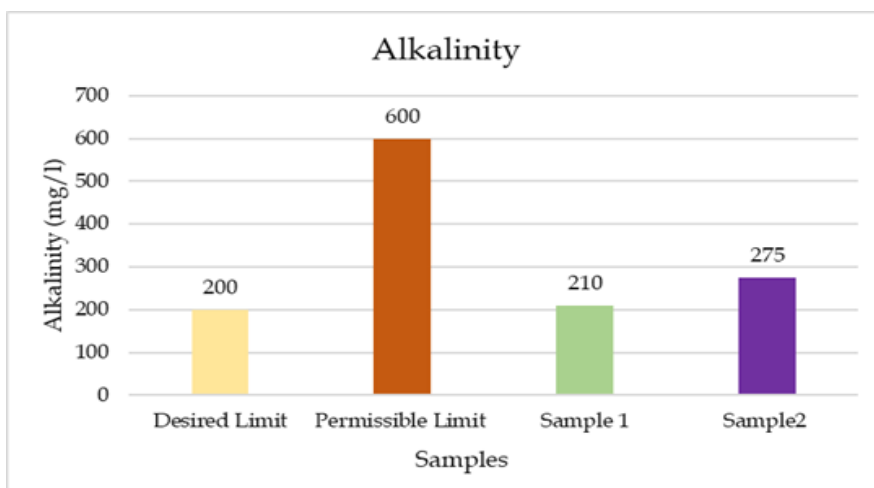


Figure 12 Variation of Alkalinity samples

4. Conclusion

The analysis of water quality parameters of open well water at ooty, nilgiris district shown the values of pH, turbidity, total hardness, fluoride, dissolved oxygen, ammonia nitrogen, chemical oxygen demand, acidity, and alkalinity are with the Indian Standard limits. From the result of present study we can concluded that the water is available for per day is 27182.4 liters and it can be supplied for a local area bandishola. Hence I can reduce the water scarcity in bandishola area, can also be used for drinking purpose without any treatment.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare no conflict of interest. Author 1(Gandhimathi.A) is a guide for project, Author 2 (Naresh.K) execute and take the results of the Project.

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