

Water Quality For Drinking Water Potability

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Abstract- The paper is about to dealwith the chemical parameters present in water collected across the different places and making identification of chemical parameter which mostly affects the water quality. The chemical parameters such as PH, hardness, total dissolved solids, chloramines, sulphates, conductivity, organic carbon, turbidity, were taken into accommodations and put into use to determine overall quality of drinking water once after the water is gone through different processes. The chemical parameters were found within the WORLD HEALTH ORG. standards. Result showcased that most of the water samples collected across the different places is safe and can be used for human consumption.

Results showcased that the PH value was analysed that falls in between (6.5-8 PPM), hardness (176.4-215.6) mg/l and so on which can be further determined for chemical parameters plotted in below graph.

Keywords- Drinking Water, WHO Standards, Chemical Parameters, Data Visualization, Rough Set Theory, Reducts.

I. INTRODUCTION

Safe or pure drinking water is one of the essential components for human body and one of the most important affecting parameters on life of living organisms. In 21st century keeping health fit and fine has become one of the prior choices in one's daily routine as water plays an important role in regulation of a body temperature and performs different activities in human body. If you fail to consume water or maintain the proper level of water in body, he/she must come across different health issues and can affect in damaging to bodyorgans. Taking proper amount of pure water can help to reduce damage on internal organs of body.Developing advanced technology for water cleaning system has gained a popularity in urban areas. In 21st century as one is much more concerned towards his health which can directly affects the economic growth of country and thus help to reduce health effects.

In recent years consumption and dependency on water has drastically increased due to increase in human Population which further lead to increase in industrialisation and increasedthe human activities near the water bodies.Increased pollution near water bodies thus decreased

availability of water and adding of large amount of waste in water bodies thus affecting water quality and leading to addition of harmful substances which even cannot be purified completely even after going through different process and thuscreating adverse effects.So, it's necessary that daily there should be collection of water sample and using advanced technology to identify the harmful chemicals and reduce their effect on water quality.

II. LITERATURE REVIEW

1. **Drinking water quality assessment and its effects on residents' health in Wondo genet campus, Ethiopia [9].**

YirdawMeride, Bamlaku Ayenew [2016] – The author focused on analysis of water Yirdaw sample. Also took a glance at a water problem at Wondo genet campus, Ethiopia. The study was mainly focused on understanding the campus drinking water sampling site were consistent with WHO. In this study Bacterial contamination is also a big factor. The research found that drinking water is safe and has no health impacts.

2. **Analysis of Water Quality Using Chemical ParametersHosahalli Tank in Shimoga District, Karnataka, India [1].**

BasavarajaSimpi, KNS Murthy, K.N. Chandrashekar, Anil N Patel, E.T. Puttiah, S.M. Hiremath [2011] - The author Study involves the Analysis of water described by its Physical, Water Quality in Terms of chemical parameters of Hosahalli System Tank. Author mostly focused on parameters analyzed. The conclusion indicate that the water is non-polluted and used for manufacture works.

3. **A bibliometric analysis[2].**

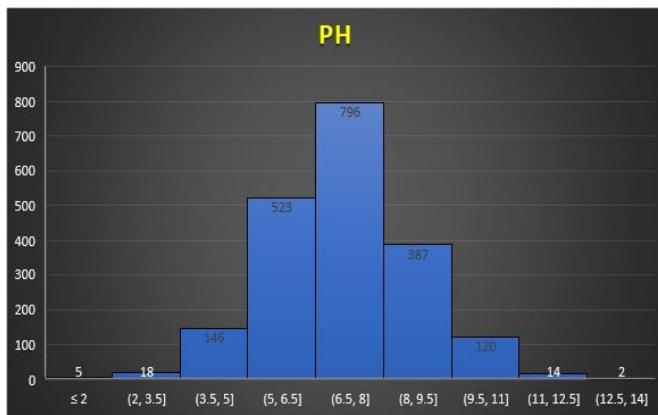
Ming-Huang Wanga, Jinfeng Lia, Yuh-Shan Ho [2011] - This research study was done to find global scientific output in the ISI subject category of " Water Resources " for past 16 years. The authors focused on the articles in the category of water resources journal listed in SCI expanded significant point on worldwide research performance from 1993 to 2008 were revealed.

4. Water quality analysis of surface water: a Web approach [3].

Poonam Prasad, Meenal Chaurasia, R. A. Sohony, Indrani Gupta & R. Kumar [2012] - The authors tried to find out chemical, physical and biological characteristics of water with respect to its suitability describe its quality and concentration of pesticides or fertilizers degrades the water quality and affects marine life. The conclusions are shown in graph of yearly, monthly and seasonal bases which will further help in the proper understanding of the pollution level of the river at a particular station point.

III. ANALYSIS OF WATER COLLECTED ACROSS THE DIFFERENT PLACES

1. PH--

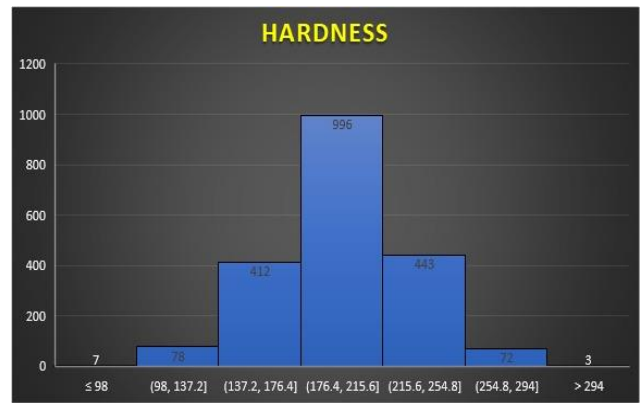


The PH value of the sample ranged from (2 ppm to 12.5 ppm) that is much more acidic to basic nature

The water samples were collected from different location tested in the study were found to be in the range of PH value determined by who that is inbetween (6.5 to 8.5 ppm).

- according to this graph, the maximum water sample collected ranged the PH from (6.5-8 ppm) from different sites which concludes it is a pure water and meet who standards.
- the water sample having the PH range between (2-5 ppm) is treated to be acidic in nature and PH above 8.5 is treated to be basic in nature which is not a pure water source and can affect health of human beings and destroy habitat.

2. HARDNESS--



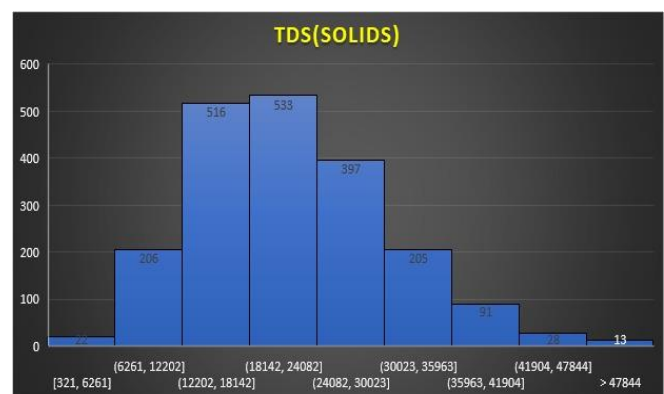
Hardness plays a vital role in quality of water for human consumption and different form of human activities uses.

Present of calcium, magnesium leads to formation of hard water.

- hardness recorded from samples of water was figured to be ranging between (98PPM-294PPM) which can be further distinguished as follows--
- According to collected Water samples hardness less than (60 PPM) is treated as soft which is a safe for drinking and also the range between (60ppm to 120ppm) can be treated as moderately hard can be consumed.

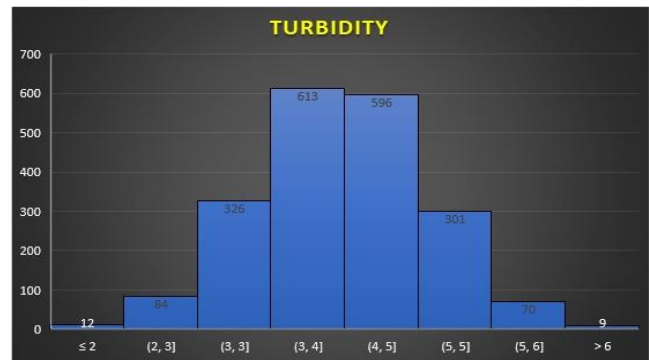
Hardness having range between (120PPM to 180 or more than 180PPM cannot be treated as safe drinking water.

3. TOTAL DISSOLVED SOLIDS-



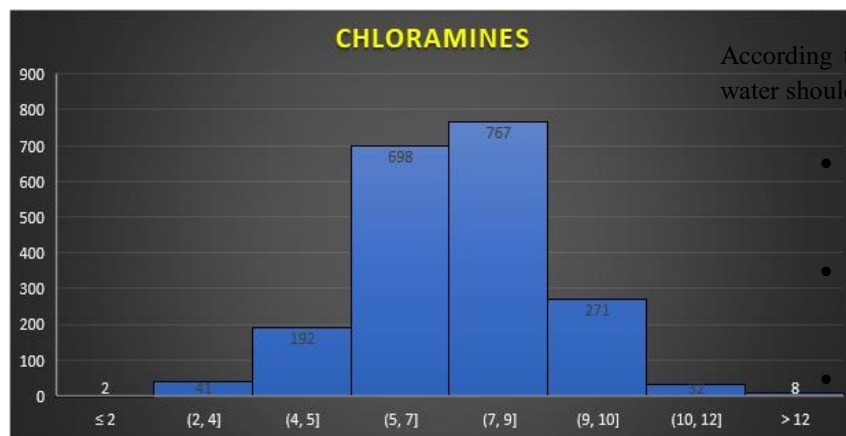
Water dissolves large number of minerals, salts also potassium, calcium, sodium etc. They give bitter taste and different colour to water. Thus, helping in determining water quality. Limit for TDS is (500 ppm to 1000 ppm) which prescribed for drinking purpose

- In the study TDS value showed a considerable variability ranging from (321ppm to 47844 ppm) was collected.
- According to given graph if (all the numbers are in PPM)
 - If value of TDS is greater than 35000 then it is “Brine Water”
 - If value of TDS is between 15000 and 35000 it is “Very Highly Saline Water”
 - If value of TDS is between 1500 and 7000 it is “Moderately Saline water”
 - If value of TDS is between 500 and 1500 it is “Moderately Saline water”
 - If value of TDS is less than 500, it is “Pure Water”



Turbidity depends on the quantity of solid matter present in the suspended state. It is used to indicate the quality of waste discharge with respect to colloidal matter. The mean turbidity value obtained for region was found less than 5 NTU (3 NTU corresponds to 1 PPM).

4. **CHLORAMINES--**



According to WHO STANDARDS the turbidity of drinking water shouldn't be more than 5 NTU

Chloramines: it occurs naturally in all types of waters. High level of chlorides is the indicator of pollution. Chlorides are harmful in irrigation water and harmful to aquatic life.

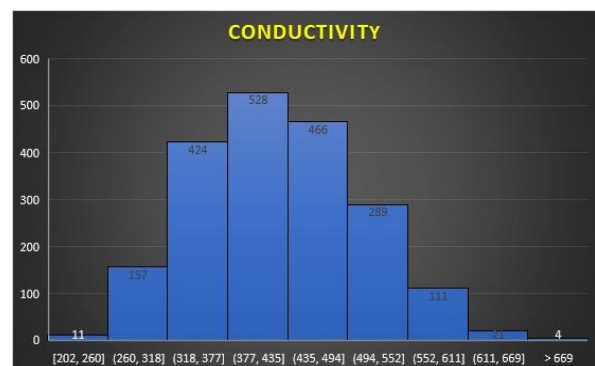
- In the study turbidity value showed a considerable variability ranging from (2 to 6 NTU) which showcased the following results
- Range less than (1 NTU) is not turbid and can be treated as safe drinking water and follow **who standards**.
- Range between (2 to 5 NTU) can be treated as slightly turbid and can be further purified and use for different activities.
- Range more than 5 NTU is treated as highly turbid which can be treated as unsafe and do not match to WHO STAN.

- (The chloride content showed very minute changes in sampling points between different sites)
- If chloramines is greater than 7, quality of water is good.
- If chloramines has range between 4 to 7, quality of water is tolerable and can be further purified.
- If chloramine has range between 1 to 4, it can be treated as average and if it is less 1 it is unsafe.

Increase in ions concentration enhances the electrical conductivity of water. Generally, the number of dissolved solids in water determines the electrical conductivity. Electrical conductivity (EC) measures the ionic process of a solution that enables it to transmit current.

5. **TURBIDITY--**

6. **CONDUCTIVITY-**

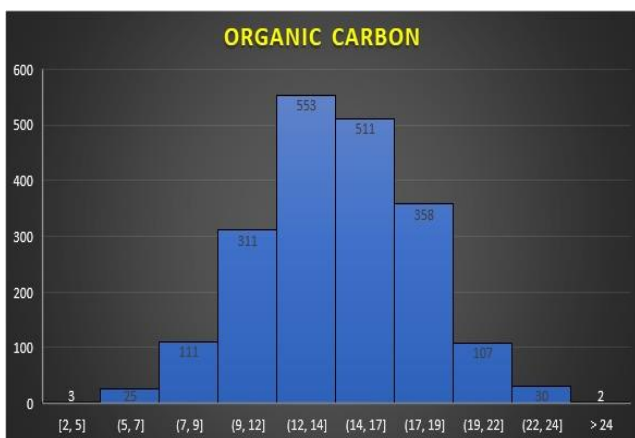


According to WHO standards, EC value should not exceed 400 $\mu\text{s}/\text{cm}$

- Study for electric conductivity showed a considerable variability ranging from (202 $\mu\text{s}/\text{cm}$ to 699 $\mu\text{s}/\text{cm}$)
- According to respected graph electrical conductivity having range between 202 to 377 $\mu\text{s}/\text{cm}$ was collected from most of the sites indicating a good water sample which meets WHO standards.
- EC having Less than 250 $\mu\text{s}/\text{cm}$ has very low conductivity (no generally problem)
- EC having range between 250 to 400 $\mu\text{s}/\text{cm}$ has medium conductivity (water can be purified)
- EC having range more than 750 $\mu\text{s}/\text{cm}$ has very high conductivity (unsafe for human consumption)

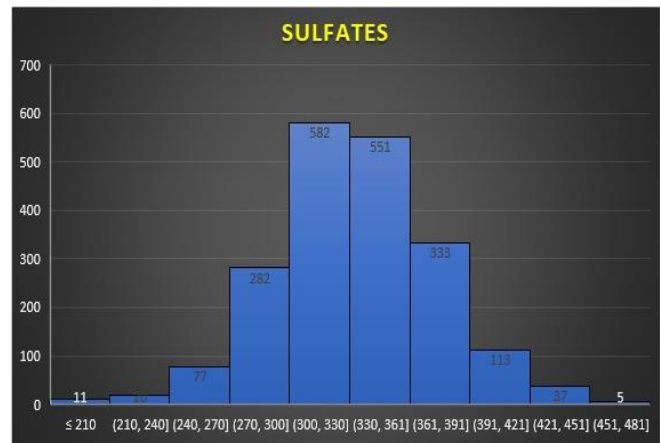
Total Organic Carbon (TOC) is source waters comes from decaying natural organic matter and synthetic sources. According to WHO standards range between (0.1PPM to 10 PPM) as TOC in treated / drinking water, and range between (10ppm to 20ppm) it should be determined as purified water and above 20PPM cannot be treated as safe.

7. ORGANIC CARBON-



- In the given study for TOC value showed a considerable variability ranging from (2 PPM to 24 mg/L/PPM).
- Water sample containing TOC that is range in-between (10 to 20 mg/L) was collected most of the times concluding that it is purified water and follow WHO standards and is safe for human consumption.
- TOC having range between (2 to 10 mg/L) Can be treated as drinking water which exists ready for human consumption.

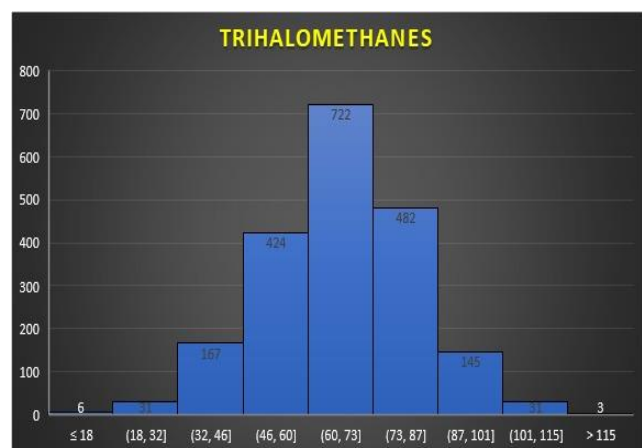
8. SULFATES/SULPHATES-



Sulphates are naturally occurring substances found in minerals, soils and rocks. The main use of sulphate is in the chemical industry. It ranges from 250 to 300 mg/l in most freshwater supplies, although much higher concentrations (1000 mg/l) are found in some geographic locations.

- in the given study for sulfate value showed a considerable variability ranging from (210 to 451 ppm) was collected.
- the water sample containing sulphates that is range between (270 mg/l to 300 mg/l) concluding that it was collected most of the times and meet the standards of WHO
- The range between 240 to 250 can be purified as it contains little amount of sulfates and can be used for use.

9. TRIHALOMETHANES



THMs chemicals are found in water treated with chlorine. The drinking water filter of THMs in water varies according to the level of organic matter in the water. THM Level between (60 to 80 ppm) can be treated as safe drinking water.

- in the given study for toc value showed a considerable variability ranging from (18 ppm to 115ppm)
- range between (60 to 73ppm) was collected most of times concluding it is safe and follow who standards

IV. PROPOSED WORK

Rough set theory is a technique of relational database mining. With help of rough set approach, we can identify the relational dependencies. Using rough set, we reduce original data and keep the significant data in the dataset. We can also say, it is a mathematical tool for discovering hidden patterns in the data. It can be used for data reduction, decision rule generation, and pattern extraction etc. identifies partial or total dependencies in data, eliminates redundant data.

Reducts-reducts and coreused to remove redundancy in the dataset. Dispensable attributes are superfluous attributes that means the final output doesnot depends on those attributes; so they are unwanted whereas indispensable attributes are important attributes. a reducts of knowledge is its essential part. To find out reducts, we need to identify indispensable attributes and the family of these indispensable attributes is called as reducts. Quick Reduct algorithm can be used to obtain reducts.

In this study we considered water data collected across from different places nine different chemical parameters as input attributes, which mostly determines the water quality and one decisional attribute. Here important attributes can be found through reducts.

The set $B=\{B1,B2,B3,B4,B5,B6,B7,B8,B9\}$ represents one conditional attributes and $D=\{D\}$ represents decisional attribute the description of conditional and decisional attributes and their values are given in table below.

Sr no.	Abbreviation used	Description	Value set of conditional attributes
1	B1	Ph	{Acidic, Alkaline, Neutral, Highly Acidic, Highly Alkaline}
2	B2	Hardness	{Very Hard, Hard, Moderately Hard, Slightly Soft}
3	B3	Total dissolved solids	{Brine Water, very highly Saline Water, Highly Saline Water, Moderately Saline Water, Slightly Saline and Pure Water}
4	B4	Chloramines	{Good, Tolerable, Average and BAD}
5	B5	Sulfates	{Not Safe/Unsafe, Safe}
6	B6	Conductivity	{Tolerable, Unsafe, Purifiable}
7	B7	Organic Carbon	{Not good, Treatment Water, Drinking Water}
8	B8	Trihalomethanes	{Drinking Water, Not Safe}
9	B9	Turbidity	{Not Turbid, Slightly Turbid, Highly Turbid}

One is conditional attribute that is {POTABLE/NON-POTABLE} referred as {D}

Information System is $T = \{U, A, D\}$

Where U is the set of all observations:

$A = \{B1,B2,B3,B4,B5,B6,B7,B8,B9\}$

$D = \{Decision\}$

After applying concepts of RST two reducts are identified

Reduct -1: A feature subset consisting of 6 attributes

$R1 = \{Ph, Hardness, Total\ dissolved\ solids, Chloramines, Trihalomethanes, Turbidity\}$

Reduct-2: A feature subset consisting of 6 attributes:

$R2 = \{Ph, Hardness, Total\ dissolved\ solids, Chloramines, Organic\ Carbon, Turbidity\}$

V. CONCLUSION

Extraction of essential data from large data is of the important feature of RST. In this paper this feature is used to identify the most affecting chemical parameter to water quality. In this study 9 parameter affecting water quality are studied. By the method of Quick reducts it is reduced to two reducts containing 6 attributes each. Also using RST helped in identification of relation between conditional and decisional attributes. The analysis is done by using “R” software. The study concludes that all the parameters does not affect water quality only few of them affect the quality.

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