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Study of Water Quality Analysis of Surface Water Bodies of Jabalpur City

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Abstract : Water is a crucial component of the environment; but surface water and groundwater quality have long been deteriorating due to both natural and human-related activities. Natural factors that influence water quality are hydrological, atmospheric, climatic, topographical and lithological factors such as anthropogenic activities that adversely affect water quality are mining, livestock farming, production and disposal of waste (industrial, municipal and agricultural), increased sediment run-off or soil erosion due to land-use change and heavy metal pollution. Many of the water bodies of the Jabalpur town have been completely vanished due to change of land use pattern, encroachment, urbanization and anthropocentric activities. Water resources management is a critical issue facing global concern. Water pollution occurs when harmful substances—often chemicals or microorganisms—contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment. Water bodies can be polluted by a wide variety of substances, including pathogenic microorganisms, putrescible organic waste, fertilizers and plant nutrients, toxic chemicals, sediments, heat, petroleum (oil), and radioactive substances. To some extent a river is a self-renewing resource. If polluting discharges to a river are intermittent, the river is often able to return to a clean and unpolluted condition as the pollutants are flushed out and carried down to the sea. Water quality monitoring is an essential part of keeping the planet healthy and sustainable. As we continue to build cities, clear land for farming and make other man-made changes to the natural environment, water quality monitoring becomes increasingly important. Land based activities can have a huge impact on water systems and it's critical that we realize how these affect waterbodies, both above and below ground.

Introduction - Water is one among the prime necessities of life required for growth and activity of all living beings on globe. It is also known as 'blue gold'. About 98% of planet's water is salt water which is unusable for drinking, only 0.036% freshwater that is found in rivers and lakes. Colorless, tasteless, and odor less water is always pure. Most living organisms have 60% water in their body. Evolution of life on Earth was impossible without presence of water. Jabalpur is the district head quarter situated and situated in the 'MahaKaushal' region of Madhya Pradesh 308 Km from capital Bhopal (M.P.) also known as 'Sanskar Dhani' and located at longitude 23.1815 N and latitude 79.9864 E and Mean Sea Level 403 M It is rich in small water bodies. Jabalpur is a medium size historical city of Madhya Pradesh India and had 52 Tals(tanks) 85 Tallaiyas and does an of Ghats(banks used by people). But with the evident of time only 8 tanks are remaining all six ghats and 8 tanks facing severe threats of pollution continuously. An example of such pollution is the discharge of domestic sewage efluent to rivers. In small quantities it does no serious harm and may indeed be beneficial, providing a source of organic carbon that provides nutrients to the animals in the river. But if inadequately treated or in excessive quantities, sewage efluent can seriously damage the plant and animal life of a river by reducing the oxygen content of the water. In extreme cases, where the oxygen content is reduced to zero (or nearly so), the river will support very little life, and will become foul smelling and grossly offensive. A river in such a state is obviously not desirable as a water source for potable supply.

Water quality monitoring is an essential part of keeping the planet healthy and sustainable. In the physicochemical properties of water, standard methods prescribed in literature were used. Turbidity, pH, Conductivity, Dissolve Oxygen, and B.O.D. were determined in the laboratory. The Physio- Chemical parameters were determined as per standard methods of APHA (2002) and by Indian standard-2296 (1982). pH of water sample measured by pH meter using standard solutions, temperature of water sample measured by thermometer, Conductivity measured by conductivity meter, Turbidity of water sample measured by turbidity meter, BOD also analysed using BOD incubator. The Water quality Index was calculated with the help of online Water quality Index calculator tool.

Water Quality Indices: Water quality indices are tools to evaluate the Water quality index. Determine conditions of water quality and, like any other tool require knowledge about principles and basic concepts of water and related issues. It is a well-known method of expressing water quality that offers a stable and reproducible unit of measure which responds to changes in the principal characteristics of water. WQI is a mechanism for presenting a cumulatively derived numerical expression defining a certain level of water quality. In other words, WQI summarizes large amounts of water quality data into simple terms e.g., excellent, good, bad, etc. for reporting to management and the public in a consistent manner.

Water Quality Index Level	Water Quality Status
91-100	Excellent
71-90	Good
51-70	Average
26-50	Fair
0-25	Poor

Details Of Sampling Location

Sampling Location	Latitude	Longitude
Gwarighat	23.1100°N	79.9277°E
Tilwaraghat	23.1079°N	79.8758°E
Jilharighat	23.1059°N	79.9310°E
Bhedarghat	23.1306°N	79.7969°E
Pariyat 1	23.2501°N	79.9816°E
Pariyat 2	23.2510°N	79.9719°E
Supatal	23.1664°N	79.9063°E
Adhartaal	23.2093°N	79.9517°E
Hanuman Tal	23.1817°N	79.9378°E
Ranital lake	23.1738°N	79.9184°E
Sangram Sagar	23.1397°N	79.8829°E
Ganga Sagar	23.5552°N	79.8972°E
Devtal	23.1564°N	79.9118°E
College Nala (JNKVV)	23.2120°N	79.9580°E

Material Method: Jabalpur is the district head quarter situated and situated in the 'MahaKaushal' region of Madhya Pradesh 308 Km from capital Bhopal (M.P.) also known as 'Sanskar Dhani' and located at longitude 23.1815 N and latitude 79.9864 E and Mean Sea Level 403 M It is rich in small water bodies. River Narmada flows and passes from through the whole Jabalpur city as well nearby area of district and hence used in municipal supply as major drinking water source for the city people. For the present study several samples from river ghats and historical lakes were selected. The samples were taken on the date 15 and 16 October 23 and test were conducted on 16 October 23. The samples were collected from the sub surface of the water bodies in polypropylene bottles Samples were collected in from the sampling sites Jabalpur. In the physicochemical properties of water, standard methods prescribed in literature were used. Turbidity, pH, Conductivity, Dissolve Oxygen, and B.O.D. were determined in the laboratory. The Physio- Chemical parameters were determined as per standard methods of APHA (2002) and by Indian standard-2296 (1982). pH of water sample measured by pH meter using standard solutions, temperature of water sample measured by thermometer, Conductivity measured by conductivity meter, Turbidity of water sample measured by turbidity meter, BOD also analysed using BOD incubator. The Water quality Index was calculated with the help of online Water quality Index calculator tool.

Detailes Of Sampling Location

Sampling Location	Date	Time	Latitude	Longitude
Gwarighat	15/10/23	18:13	23.1100°N	79.9277°E
Tilwaraghat	15/10/23	23:42	23.1079°N	79.8758°E
Jilharighat	15/10/23	18:52	23.1059°N	79.9310°E
Bhedarghat	05/11/23	14:52	23.1306°N	79.7969°E
Pariyat 1	16/10/23	08:19	23.2501°N	79.9816°E
Pariyat 2	16/10/23	09:37	23.2510°N	79.9719°E
Supatal	15/10/23	17:01	23.1664°N	79.9063°E
Adhartaal	16/10/23	07:17	23.2093°N	79.9517°E
Hanuman Tal	16/10/23	09:22	23.1817°N	79.9378°E
Ranital lake	16/10/23	08:54	23.1738°N	79.9184°E
Sangram Sagar	05/11/23	11:52	23.1397°N	79.8829°E
Ganga Sagar	05/11/23	13:43	23.5552°N	79.8972°E
Devtal	05/11/23	18:53	23.1564°N	79.9118°E
College Nala (JNKVV)	16/10/23	06:53	23.2120°N	79.9580°E

The water quality analysis was conducted to analyse the impact of idol immersion on the water quality and its physicochemical parameters. The samples were collected after 1 week of idol immersion from Adhartaal and Hanuman Tal Lake

Sampling After Immersion Of Idol

Adhartal	06/11/23	15 23	23.2093°N	79.9517°E
Hanuman Tal	06/11/23	10:01	23.1817°N	79.938°E

Water Quality Parameters

1. **Colour and odour**: Colour and odour from lake is first sign of its pollution.
2. **pH**: High pH levels are undesirable since they may impart a bitter taste to the water. Furthermore, the high degree of mineralization associated with alkaline water will result in the encrustation of water pipes and water-using appliances. The combination of high alkalinity and calcium with low pH levels may be less corrosive than water with a combination of high pH, low alkalinity and calcium content. High pH levels also depress the effectiveness of disinfection by chlorination, thereby requiring the use of additional chlorine or longer contact times. A range of pH 6.5-8.5 was determined because it would achieve the maximum environmental and aesthetic benefits.
3. **Turbidity**: Turbidity is a measurement of the cloudiness of water, measured by passing a beam of light through the water and measuring photometrically. Cloudiness is caused by material suspended in water. Clay, silt, organic matter, plankton and other microscopic organisms cause turbidity in natural water. This has been recognized as a valuable

limiting factor in the biological productivity of the water bodies.

4. Electrical conductivity (EC): EC is the measure of the ability of an aqueous solution to convey an electric current. This ability depends upon the presence of ions, Dissolved oxygen (their total concentration, mobility, valence and temperature.

5. Dissolved oxygen (DO): Dissolved oxygen analysis measure the amount of gaseous oxygen (O2) dissolved in an aqueous solution. A small amount of oxygen, up to about ten molecules of oxygen per million of water, is normally dissolved in water.

6. Biochemical Oxygen Demand (BOD): The biochemical oxygen demand abbreviated as BOD, is a test for measuring the amount of bio-degradable organic material present in a sample of water. The results are expressed in term of mg/L of BOD which microorganisms, principally bacteria will consume while degrading these materials. As the measurement of BOD takes too long time (20 days at 20p C), the determination of BOD after 5 days incubation is preferred (BOD).

Result: The observation recorded after the investigation of the water quality parameters and discussion of results with regards to standard values of the concerned authorities and agencies.

Table & graph (see in last page)

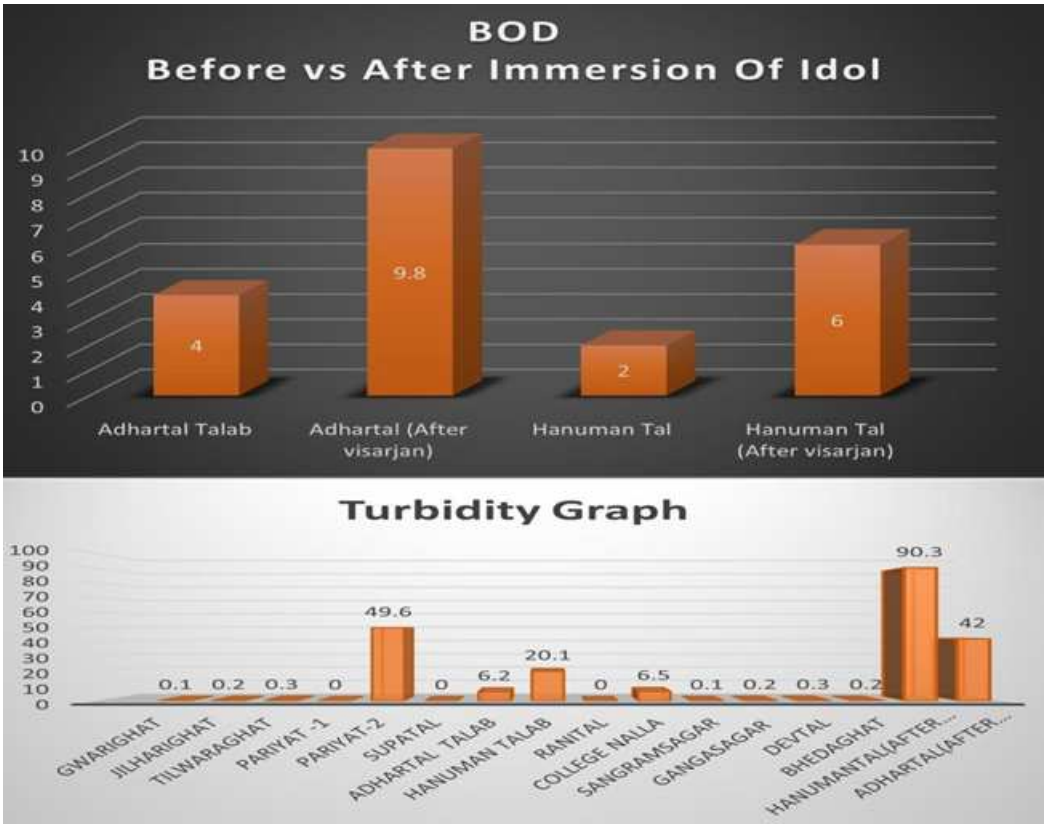
Conclusion: Studies carried out in present investigation revealed that one of the most important causes of water pollution is unplanned urban development without adequate attention to suitable management of sewage and waste material and negligence of the concerned authorities. The study identifies a number of factors leading to contamination of water of water bodies such as bathing, washing, cleaning, religious rituals and animal related activities. The emission and disposal of dairy waste and efluents directly into waterbody without any treatment contaminates and degrades the quality of water to the large extent which is serious matter of concern as seen in the case Pariyat River. From the mythological point of view, the rivers and lakes are the holy places for the Idol immersion, but this results in the change in the water physicochemical parameters such as increase in biological oxygen demand (BOD) of water which affects the aquatic ecosystem of the water body. The observation shows that the pH and electrical conductivity also increases with the increase in pollutants while in case of Hanuman Tal, Adhartaal and Pariyat which is a matter of concern. **The religious activities in waterbodies not only causes the pollution in the waterbodies but also responsible for degrading the water quality as they increase the organic matter accumulation in the water which also leads to bacterial activity in the water which also increases the BOD.** Even after many guidelines regarding waste disposal and management, waste disposal and daily household garbage can be seen on the banks of waterbodies, sewage drainage are directly connected to water bodies for sewage disposal and drainage and waste collection near waterbodies is still into practice.

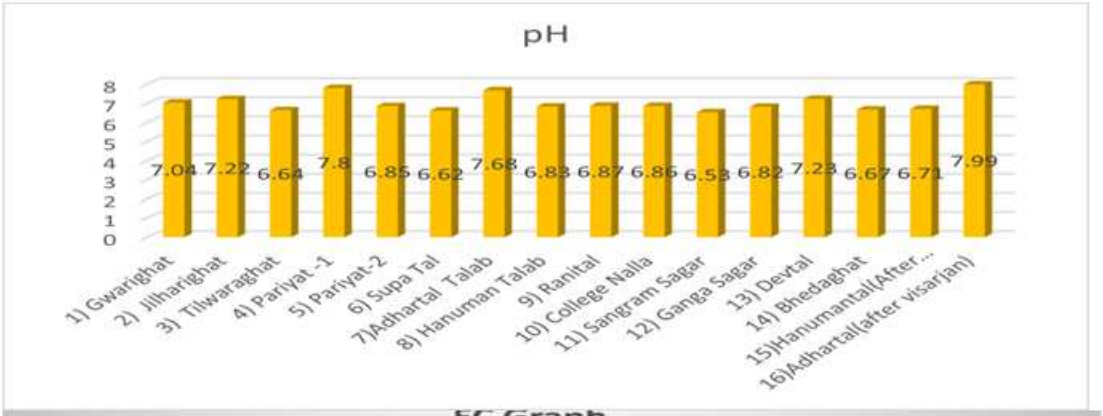
References:-

1. Arora Gargi, Sharma Atul, Bhatia R.K ASSESSMENT OF GROUND WATER QUALTIY NEAR LINED OMTI NALA & UNLINED MOTI NALA: A CASE STUDY IN JABALPUR CITY
2. Auroa Gargi, Sharma Atul, Bhatia R.K., Jabalpur Engineering College, JBP, MP, 2018 IJCRT| Vol-6, issue 2 April 2018|ISSN:2320-2882
3. Bhattacharya Sayan, Ghosh Uday Chand, Effects of Idol Immersion on the Water Quality Parameters of Indian Water bodies: Environmental Health Perspectives.
4. Devendra Dohare, Shriram Deshpande and Atul Kotiya Research (2014) Journal of Engineering Sciences, Vol. 3(5), 26-31,
5. Evaluation of portability of different water sources at District Jabalpur, Madhya Pradesh
6. Gharat and Nisar Shaikh Impact of Ganesh Idol Immersion Activities On The Water Quality of Govathane Lake, Uran (Maharashtra) India Dharati.
7. Jain, Verma, Bhatia Impact of Dairy Efluent on Environment Rajarajan G. Irshad A. Assessment of water Quality of Pariyat River at Panagar Region in Jabalpur City (M.P.) ISSN: 2321-9653
8. Jha M. and Tignath S (2009) Assessment of Impacts of the Surface Water Environment in and Around Jabalpur City MP, Journal Earth Science India, Vol.2 (II), April, 2009, pp. 111 – 116
9. Mishra Vijay Shrikant, Kaur Gurdeep, Chandok Volume 9, Issue 4 Quality Index (W.Q.I.) of Pariyej Lake Dist. Kheda – Gujarat. Current World Environment Vol. 6(2), 225-231 (2011)
10. Ramkrishnan R, (2010), Characterization and assessment of ground water quality of Bhopal city by its Physico-chemical studies with special reference on certain trace elements. Ph.D. Thesis, Barkatullah University, Bhopal.
11. Shrivastava Apurva, Thakur C.S., Dept. of Civil Engineering, Shri Ram Group of Institution, Jabalpur M.P, India. Determination of Water quality index by using physico-chemical Properties of various Lake in Jabalpur (M.P.).
12. Thakor, Bho, Dabh, Pandya and Nikitraj, Chauhan. Water
13. Tignath S. and Jha M., (2007), On the Efficacy of Jabalpur Water Supply System Sci-fronts: A Journal of multiple Sciences, vol.1, Dec.2007, p. 141144.
14. Verma Sanjay Kumar & Akhtar Saleem, Assessment of Pollution in Lakes of Jabalpur Town, Proceeding of International conference on Interdisciplinary Research in Engineering, Management, Pharmacy and Science, ICIREMPS- 2K15, at SIRT Bhopal M.P, 19-22 March, 2015. pp 31-39, 2015

15. Verma Sanjay Kumar, Akthar Saleem (2015), assessment of water pollution in lakes of Jabalpur, Takshshila Group of Institutions, JBP, MP, India
16. Verma Pradeep, Chandawat Deepika, Solanki Hitesh Arvind, Water Quality Analysis of an Organically Polluted Lake by Investigating Different Physical and Chemical Parameters.
17. Water Quality Analysis of Devtal and Ganga Sagar Lake at Jabalpur (M.P.) Volume-5, Issue-9, September-2016 • ISSN No 2277 - 8160
18. Water Quality Assessment in Different Festivals at Pariyat River before Its Linkage with Hiran River Jabalpur (M.P.) Vol. 4, Issue 4, pp: (62-67), Available at: www.researchpublish.com

Sampling Location	pH	Electrical conductivity	BOD	Turbidity	DO	COLOUR
Gwarighat	7.04	359.3	0.9	0.1	7.6	Colourless
Tilwaraghat	6.64	385.2	1.5	0.3	7.8	Colourless
Jilharighat	7.22	365.8	0.2	0.2	7.7	Colourless
Bhedarghat	6.67	367.3	1.1	0.2	8.1	colourless
Pariyat 1	7.80	489.5	1.6	0.1	7.0	Colourless
Pariyat 2	6.68	344.8	7	49.6	4.8	Muddy
Supatal	6.62	959.9	0	1.4	7.2	Pale yellow
Adhartaal	7.68	539	4	6.2	-	Greenish
Hanuman Tal	7.99	584.9	9.8	42	6.9	Greenish
Ranital lake	6.85	1123	2	20.1	-	Greenish
Sangram Sagar	6.71	1310	6	90.3	6.4	Greenish
Ganga Sagar	6.87	1470	5	0.2	6.8	colourless
Devtal	6.53	346.6	1.3	0.1	7.1	Colourless
College Nala (JNKVV)	6.82	330.3	1.4	0.2	6.9	Colourless




pH
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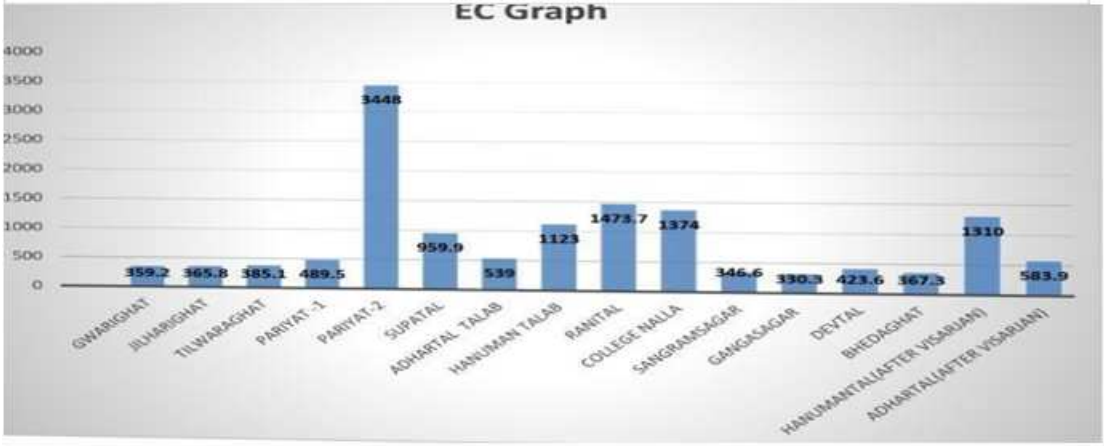
1) Gwarighat
2) Jilharighat
3) Tilwaraghat
4) Pariyat -1
5) Pariyat-2
6) Supa Tal
7)Adhartal Talab
8) Hanuman Talab
9) Ranital
10) College Nalla
11) Sangram Sagar
12) Ganga Sagar
13) Devtal
14) Bhedaghat
15)Hanumantal(After ...
16)Adhartal(after visarjan)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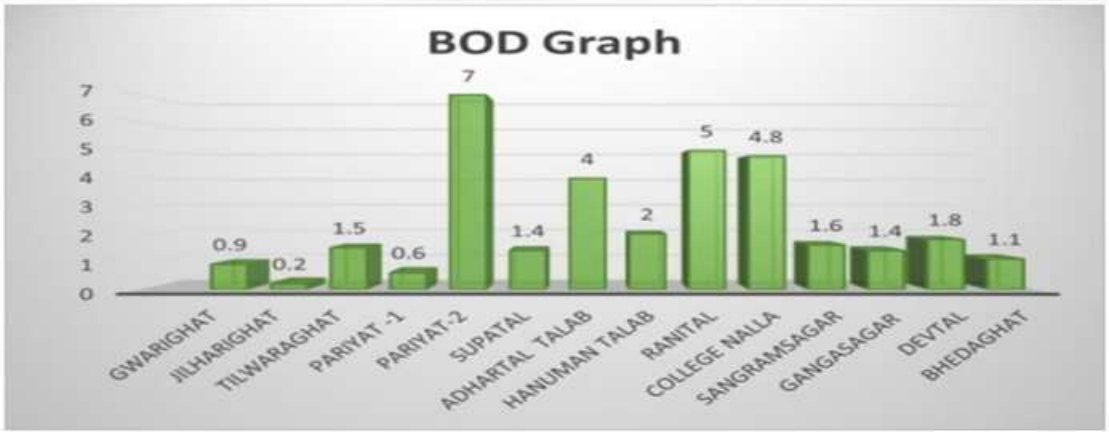
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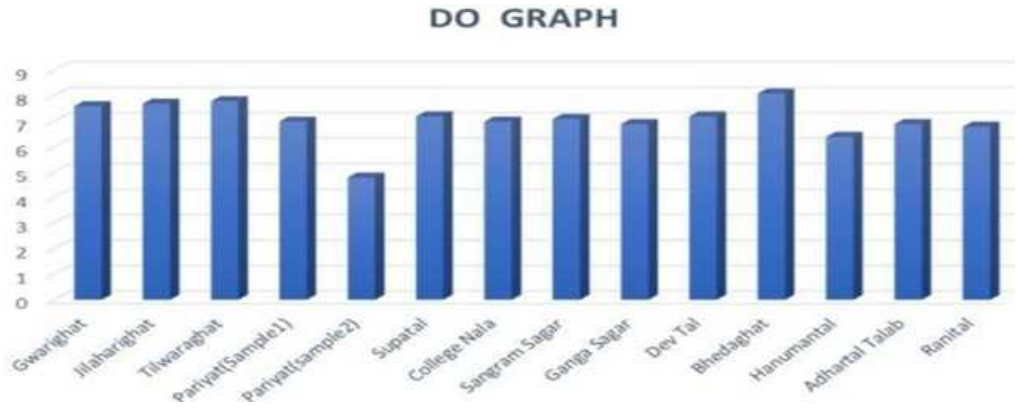
DO GRAPH
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Ganga Sagar
Dev Tal
Bhedaghat
Hanumantal
Adhartal Talab
Ranital