



Examination of Physico-Chemical Traits and Eutrophication Status of Kaliyasot River in Bhopal, Madhya Pradesh

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ABSTRACT:

India is one out of those developing countries which are cladding the burning problem of environmental pollution. Out of which pollution of water is becoming more and more grave day by day due to human activities. Mostly, industries discharge their chemical effluents without proper treatment into the water source which alters the water quality. Quality of water is reviewed to be a key contributor to both health and disease for human beings. The water quality is primarily influenced and disturbed by both natural as well as by anthropogenic activities. The quality of surface water is principally affected by human activities through exploitation of water resources, effluents discharge and agricultural chemicals. The aquatic system is largely replaced by these factors, resulting in decrease quality of water, biodiversity depletion, habitat loss and in overall decreasing the quality of life for local populations. Hence, it is salient to prevent and control water pollution and to implement regular monitoring programs. The study area selected for the study of physico-chemical trait of water is Kaliyasot River of Bhopal.

INTRODUCTION:

Water is one of the most vital and believable wealth on our Earth [1-6]. Water is natural renewable resource obtainable to us. All Earth's living organisms depends on water for their survival and growth. Water is profited for men in many ways [7]. Water is necessitated to us for washing, consumption, irrigation, generation of hydroelectricity etc. [8]. Because of increased human population, increased use of fertilizers, industrialization and other anthropogenic activities water gets highly polluted [9]. Thus, it is necessary that the quality of drinking water should be checked at regular interval of time because of contaminated water, which may cause different water borne diseases [10,11]. Lakes and reservoirs have been called the Ecological Barometers of the health of a city as they play important role in the regulation of the microclimate of any urban area [12]. The water quality of the surface water sources has vigorous effects on urban ground water recharging network because of existence of direct interaction between surface and groundwater. Reservoirs are one of the applicable water resources used for drinking, fishing, irrigation and flood control prospective [13-15]. In the course of the last decade widespread modifications in water quality of Aquatic bodies has been reported owing to immense use of synthetic fertilizers in agriculture, rapid industrialization and urban decline [16,17]. The health and water quality of Aquatic ecosystems are very delicate issues and are virtually determined through its traffic status. The water body is expanding enriched by an ecological process- Eutrophication. The zesty nature of the biological productivity and eutrophication owing to natural and intensified anthropogenic activity leave no signal judgment variables as a true measure of the nutrient status of a given aquatic system [18,19]. Water resources principally in the developing countries are unfortunately facing grave problems owing to various human activities and unsustainable use of these resources [20].

STUDY AREA:

To supervise the water quality for hygiene and health point of view the present study of Kaliyasot River water has been done. The Kaliyasot dam of Bhopal is located on Kaliyasot River which is a tributary of River Betwa in Northern India. The river arises from the spill of Bhoj Taal of Bhopal; at about 3 kms from its origin point of Kaliyasot Dam is constructed. The only National Park of Bhopal "Van Vihar" is located in the catchment area of Kaliyasot River. A continuous stretch of Kaliyasot River is seen only at the downstream of Kaliyasot Dam. Throughout its travel from its origin to end (before joining river Betwa at Bhojpur) is about 29 kms. The flow of Kaliyasot River is very confined except for the monsoon season. This study has cardinal importance and will be helpful in the field of sustainable development plan. The Kaliyasot River is under great environmental stress because of siltation, human enforcement, high macrophytic growth and sewage input from different localities. High values of phosphate, nitrate, sulphate, hardness, pH, alkalinity and soil influence from different catchment area and basin effects the water quality of the Kaliyasot River.

SAMPLING STATIONS:

1. Kaliyasot Dam Spill
2. Near J.K. Hospital
3. Road Bridge, Salaiya
4. Road Bridge, Mandideep
5. Near Shiva Temple, Bhojpur

MATERIALS AND METHODS:

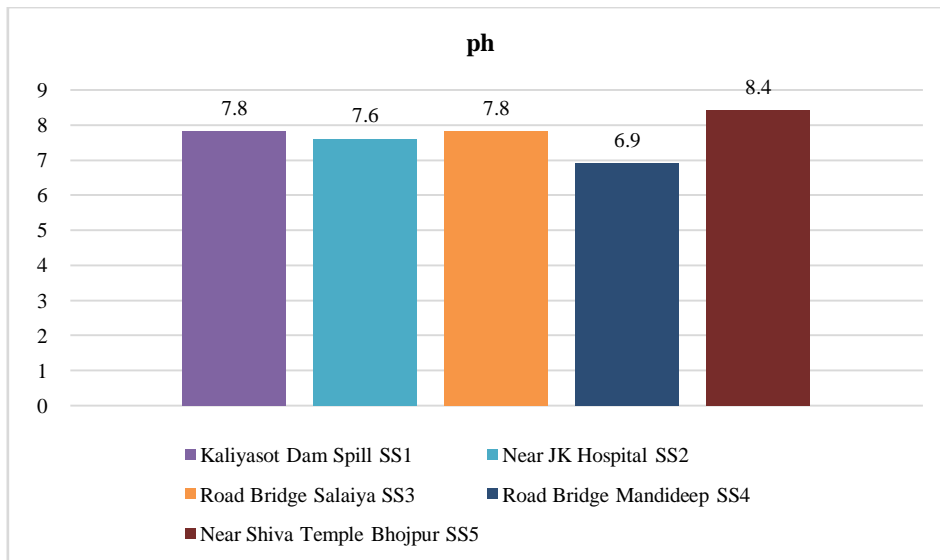
5 sampling stations were taken from different point of the Kaliyasot river in the month of April 2021. The goal of sampling is to collect small quantity of water from the water source for the purpose of analysis of water and to analyze the physico-chemical attributes present in water. The method used for the water analysis were applied as prescribed by APHA (1985) and NEERI (1986).

RESULTS AND DISSCUSSION:

The results are obtained shown in table- 1.

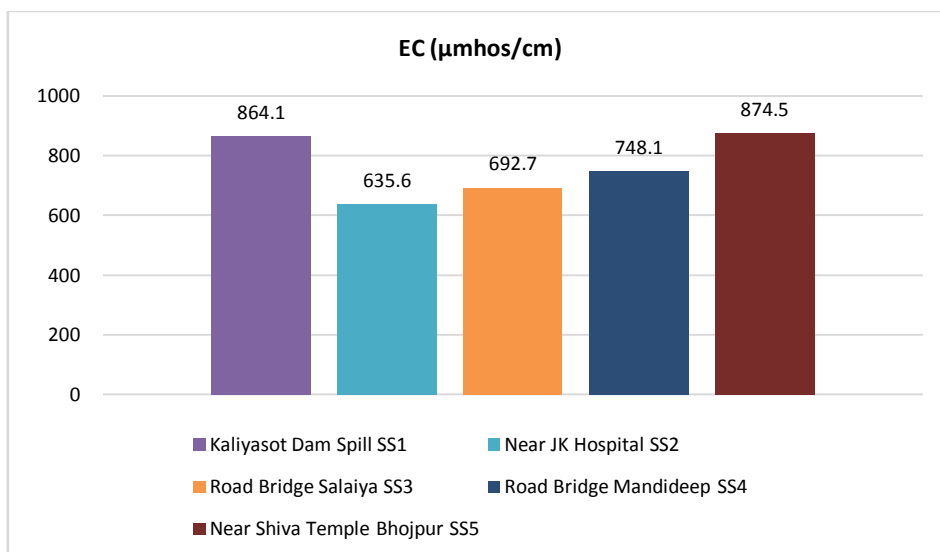
Sno.	Parameters	Unit	Kaliyasot Dam Spill SS1	Near JK Hospital SS2	Road Bridge Salaiya SS3	Road Bridge Mandideep SS4	Near Shiva Temple Bhojpur SS5
1	pH	-	7.8	7.6	7.8	6.9	8.4
2	EC	µmhos/cm	864.1	635.6	692.7	748.1	874.5
3	Turbidity	N.T.U	28.9	20.1	20.9	21.8	27.9
4	Alkalinity	mg/l	312	264	277	326	305
5	Hardness	mg/l	230	279	218	284	310
6	TDS	mg/l	290	180	233	292	278
7	Nitrate	mg/l	10.9	10.36	14.9	10.6	37.4
8	Phosphate	mg/l	5.57	0.36	0.2	0.27	0.51
9	Chloride	mg/l	131	70.6	78.5	94.1	111.2
10	DO	mg/l	3.3	4.2	4.1	4.9	10.8
11	BOD	mg/l	24.1	9.1	8.4	4.5	3.5
12	COD	mg/l	115.3	38.2	38.4	38.4	10.1
13	Fluoride	mg/l	0.76	0.34	0.33	0.45	0.88

pH: The growth and appetite of the aquatic animals reduces when water is acidic in nature means pH less than 7. In this study pH value ranged from 6.9 to 8.4. Lower values of pH recorded at SS4 and higher values recorded at SS5. When pH is higher fish production is increased. For fishes criteria of pH recommended by EPA is 6.5 -9.0.



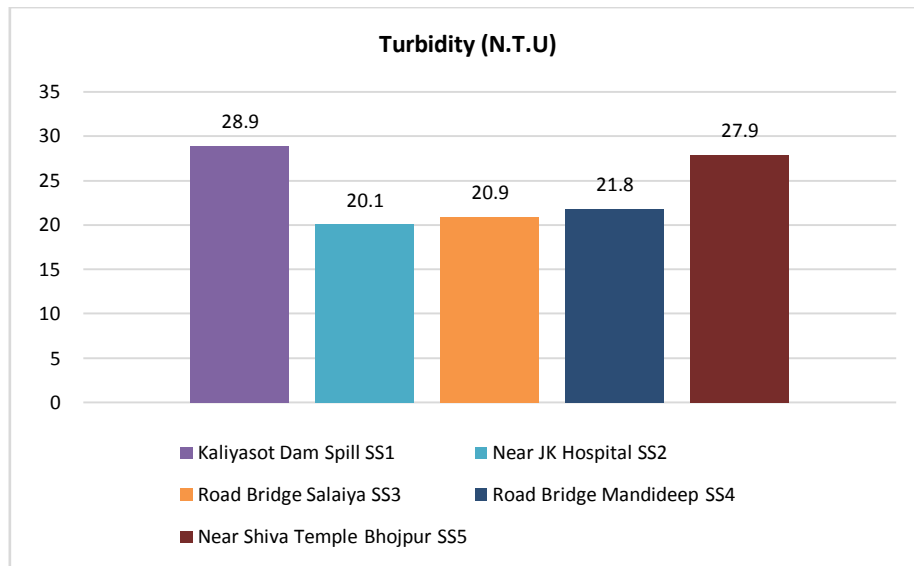
ELECTRICAL CONDUCTIVITY (EC):

It is because of ionization of dissolved solids and suits a measure of total dissolved solids. It is important parameter to select the suitability of water for agricultural purpose. In the present study lower value of EC was recorded 635.6 $\mu\text{mhos/cm}$ at SS2 while higher value of EC was noted 874.5 $\mu\text{mhos/cm}$ at SS5 in a sample. When there is higher concentration of acid, base and salt in water, there will be higher EC.

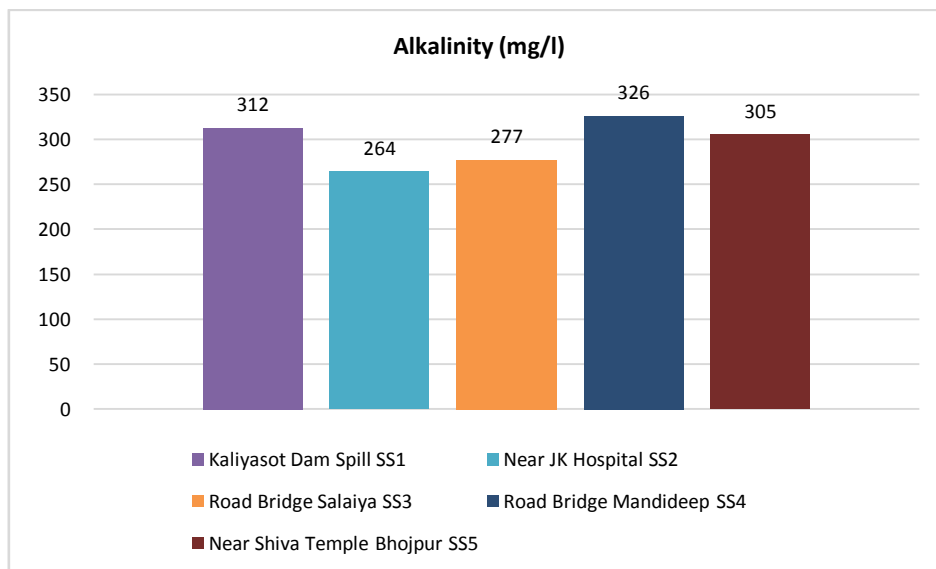


TURBIDITY:

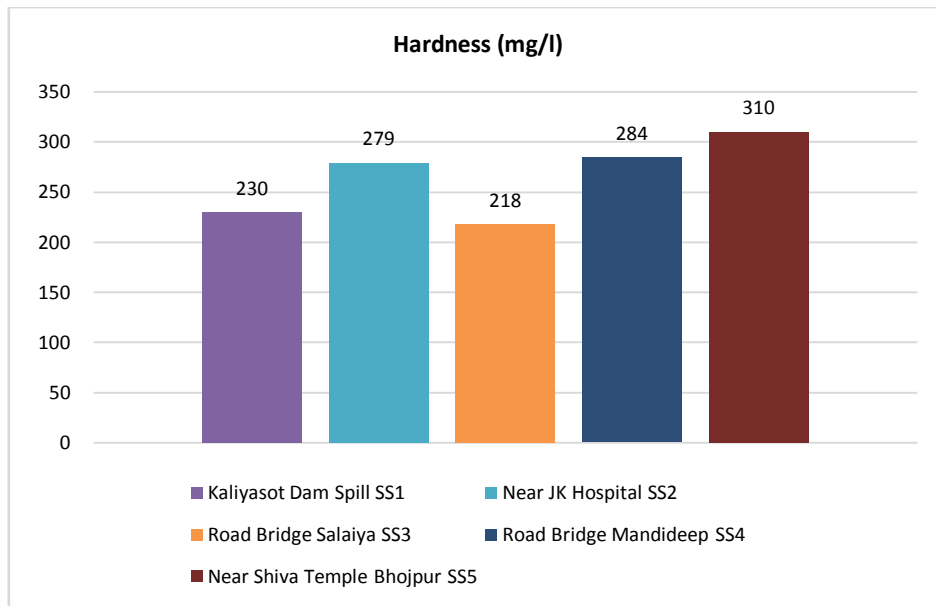
Uncleanliness of water is called turbidity which is due to presence of clay, suspended matters, silt, colloidal organic particles and other microscopic organisms. It deals with the certain light scattering and light absorbing properties of water. It has remarkable effect and microbiological quality of drinking and irrigation water. Lower values of turbidity of river water were recorded 20.1 NTU at SS2, higher value was recorded 28.9 NTU at SS1. Due to surface runoff along with silt and organic debris turbidity increases during rainy period.

**ALKALINITY:**

It is because of salt of weak acids and bicarbonates to highly alkaline water. In the present study values of alkalinity ranged from minimum 264 mg/l at SS2 to maximum 326 mg/l at SS4.

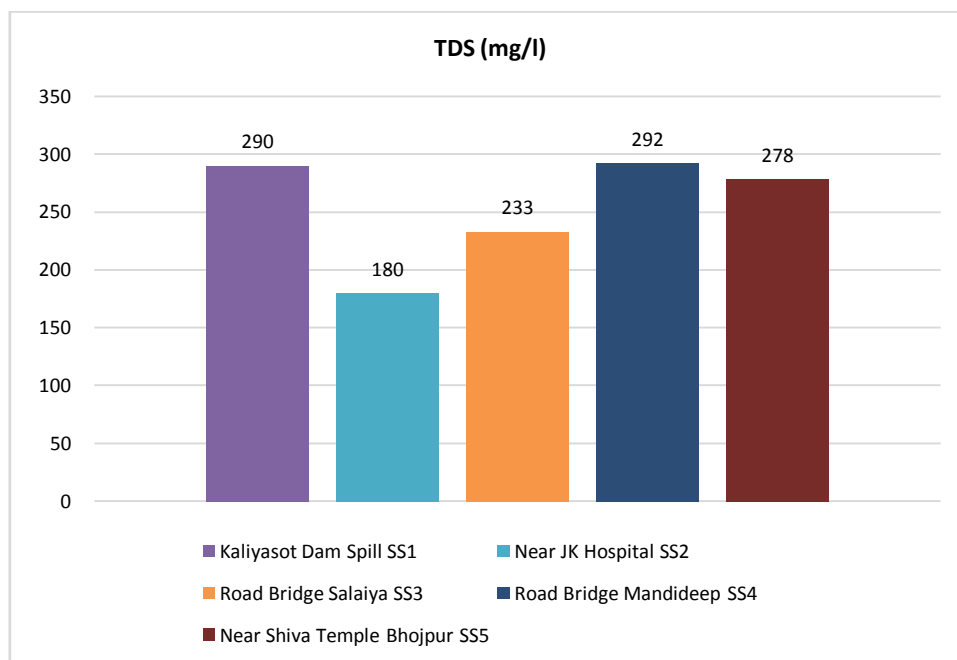
**HARDNESS:**

It is produced by cation of Ca^{++} and Mg^{++} . In the present study the values of hardness ranged from 218 mg/l to 310 mg/l at SS3 and SS5 respectively.



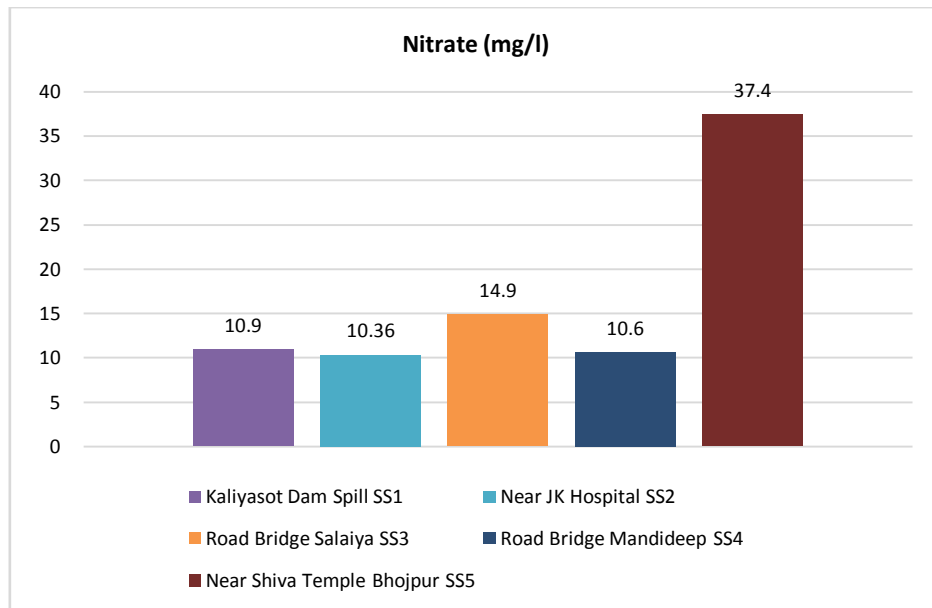
TOTAL DISSOLVED SOLIDS (TDS):

Its higher values reflect uncleanliness in water. Its values increased in monsoon. In the present study TDS values varied from minimum 180 mg/l to maximum 292mg/l at SS2 and SS4 respectively.



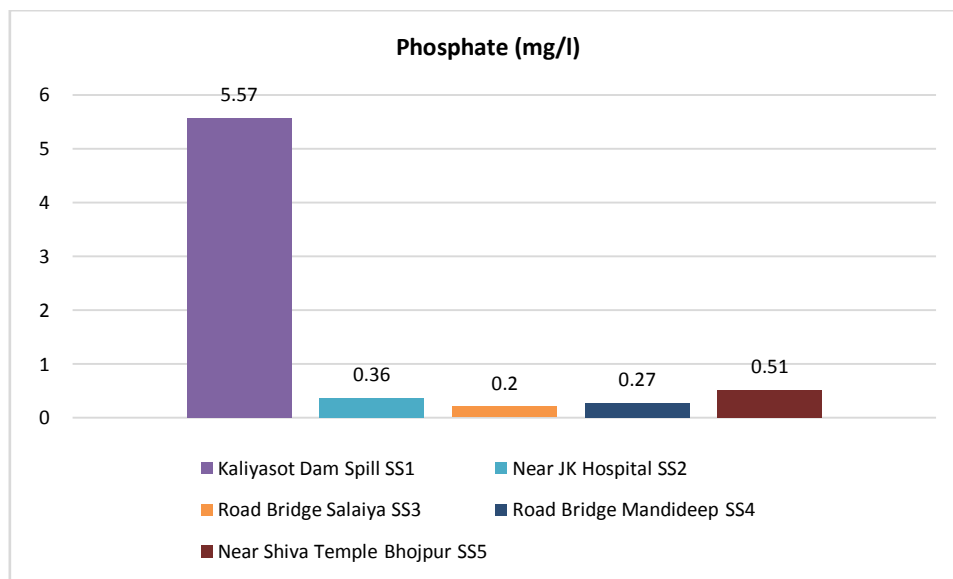
NITRATE:

Nitrate concentration depends upon geochemical conditions such as the extent to which nitrogenous fertilizer used in agriculture. Nitrates and phosphates are responsible for heavy macrophytic growth in the river. In the present study lower value of nitrate 10.36 mg/l at SS2 and higher value recorded 37.4mg/l at SS5.



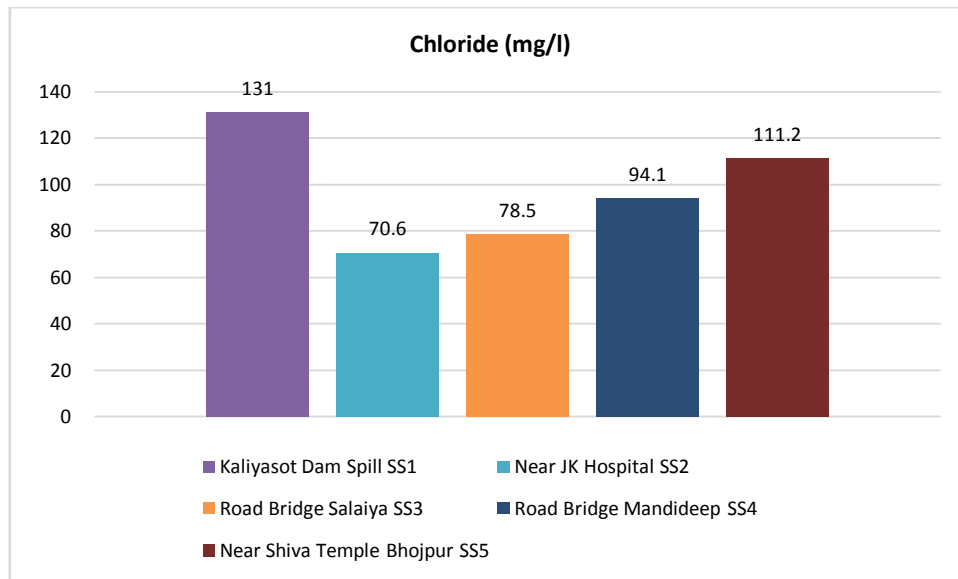
PHOSPHATE:

It is very important nutrient for the plant growth. Its higher value in water reservoir is due to agricultural wastage and use of fertilizers because of land runoff and anthropogenic wastage. It may enter through surface water. In this study lower values of phosphate recorded 0.2mg/l at SS3 and higher value of recorded 5.57mg/l at SS1.



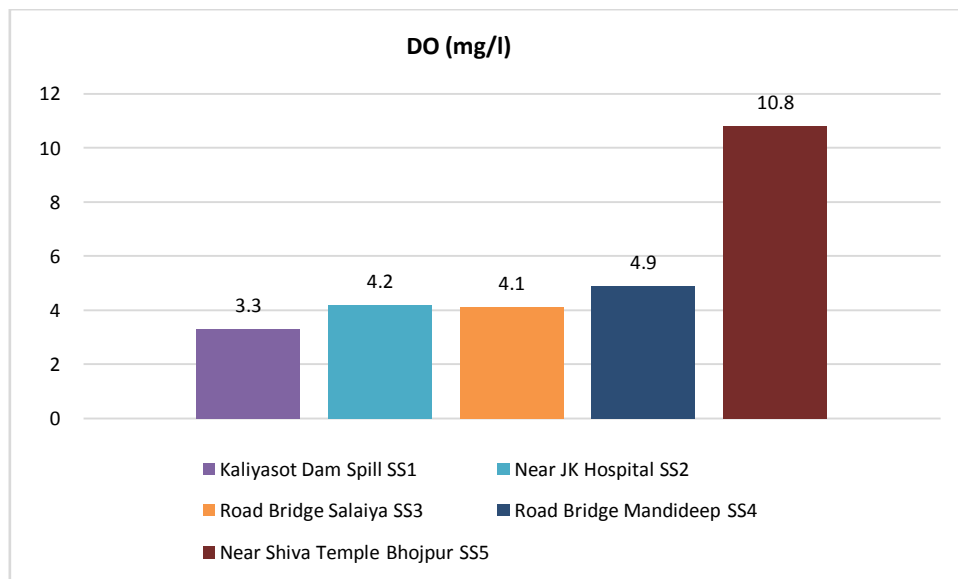
CHLORIDE:

It naturally occurs in all types of water. Its high concentration in water is the indicator of pollution due to higher organic wastes of animal origin or industrial effluents. Its higher concentration creates health issues. In present analysis it varied from 70.6 mg/l at SS2 minimum to 131 mg/l at SS1 maximum.



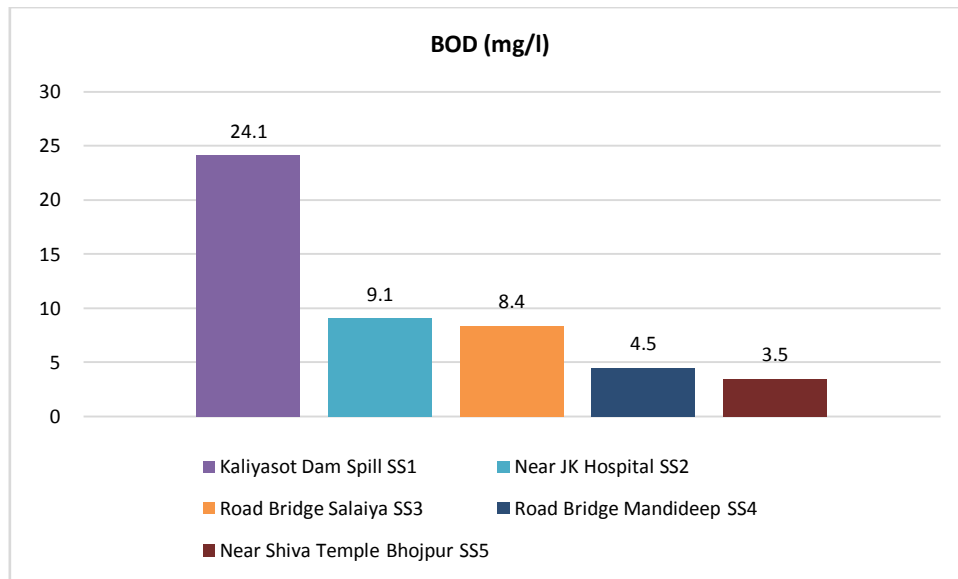
DISSOLVED OXYGEN (DO):

It is one of the most significant parameters in water quality assessment. When temperature is high there is depletion of DO in water due to increased microbial activity. The value of DO in Kaliyasot river noted from minimum 3.3mg/l at SS1 to maximum 10.8 mg/l at SS5. When DO is lower water becomes unfit for aquatic animals.



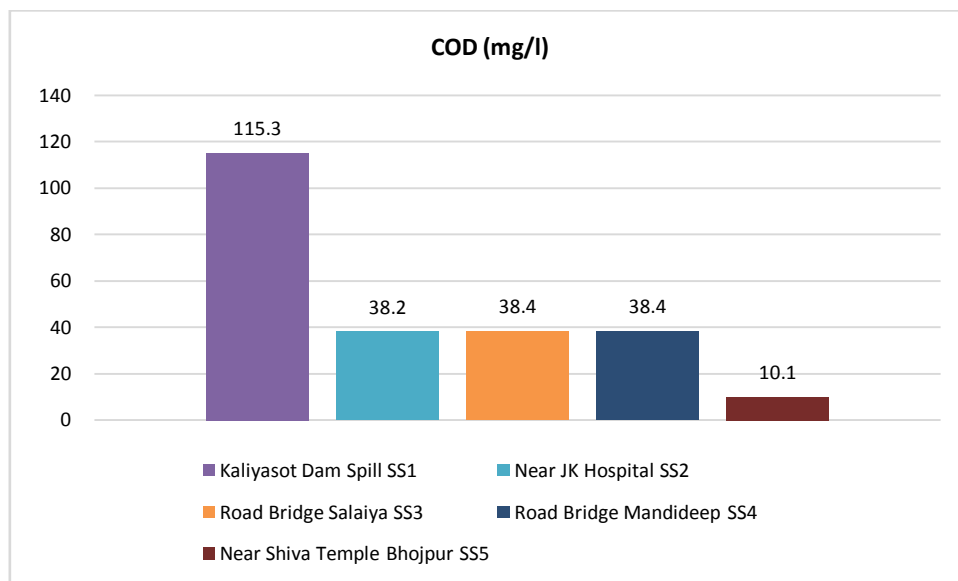
BIOCHEMICAL OXYGEN DEMAND (BOD):

Its recommended limit is 6.0-100 mg/l. in the present analysis BOD levels of Kaliyasot river were found in the range of 3.5mg/l to 24.1 mg/l at SS5 and SS1 respectively. When its value becomes high it shows the presence of decomposable organic matters in the water source. It reflects the pollution of water caused by organic pollutants.



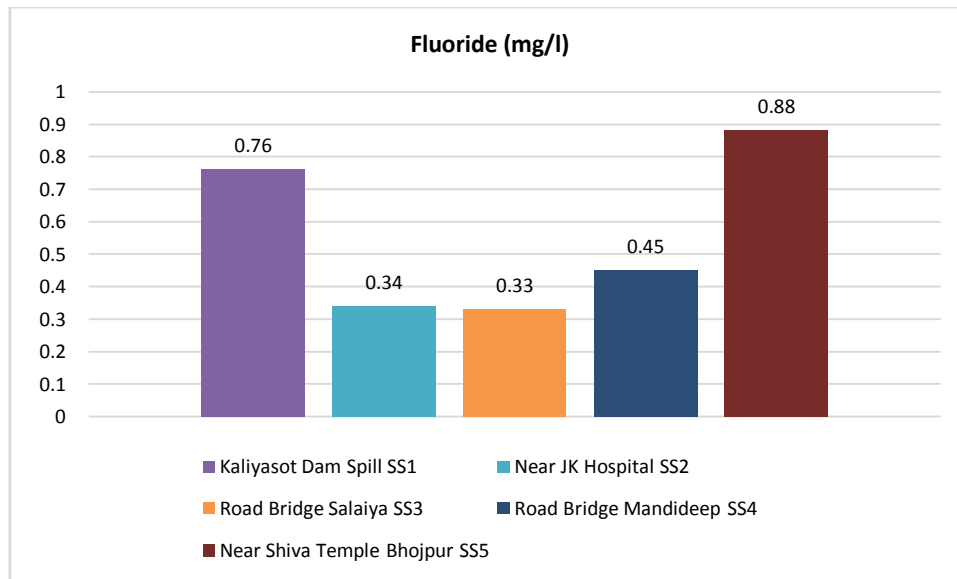
CHEMICAL OXYGEN DEMAND (COD):

When pollution level is increased in water it shows the increased value of COD. In the present study COD ranged from 10.1 mg/l to 115.3 mg/l at SS5 and SS1 respectively.



FLUORIDE:

It is an important component of water. It is very important for good dental health. When it is present in excess amount causes fluorosis. Recommended value by WHO is 0.8-1.0 mg/l. In the present study value of fluoride ranged from minimum 0.33 mg/l to maximum 0.88 mg/l at SS3 and SS5 respectively.



CONCLUSION:

After analysis of different physico-chemical parameters, results shows that Kaliyasot river water is affected by various anthropogenic activities. This shows that the Kaliyasot river is polluted but its water can be used for irrigation purposes.

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