Physico-Chemical Study of Wainganga River Water, During COVID And After COVID at Various Locations

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***Abstract*: Water is one of the significant natural resources present on the earth and it is very important for human beings. The quality of river water is affected by two factors, namely nature and human. Natural factors affect the condition of the river like overflow in heavy rain and human beings affect the quality of river like waste water. This paper deals the study of the influence of environmental parameters of the water in the river. There are several ways to assess the quality of water for drinking, irrigation and industrial use. This study aims to determining the quality of river water with water quality index using Weighted Arithmetic Index method based on major physiochemical water quality parameters including turbidity, total alkalinity, chloride, pH, total hardness, calcium, magnesium, total dissolved solids, iron, sulphate, fluoride, in Wainganga River at Chhapara, District Seoni, State Madhya pradesh. Water Quality Index, indicating the water quality in terms of index number, offers a useful representation of river water quality. A number of parameters affect the usability of water for a particular purpose.**

***Keywords*: Water Quality, wainganga river, Chhapara, Seoni, M.P., Water quality index. Physio-Chemical parameters, WHO Parameters**

1. INTRODUCTION

Rivers are the essential natural resources for the development of human life and are being polluted by industrial and domestic waste discharges, which affect the physio-chemical and microbiological properties of the river water (Kumar et al 2017). The physical and chemical condition of water resources can affect the community composition and abundance of microbes as they exhibit different responses to such conditions. Rivers are an essential ecosystem as they are resources of water for drinking, recreation as well as fisheries purposes. Wainganga River has valuable importance in the development of Chhapara Village. Agricultural developments as well as human interference and anthropogenic activities significantly put pressure on the ecology of the water bodies (Sangani et al 2018). The fresh water is of vital concern for mankind, because it is directly linked to human welfare. The surface waterbodies, which are the most important sources of water for human activities are unfortunately under severe environmental stress (Yogendra et al 2008).

The Wainganga is a river in India originating in the Mahadeo hills in Mundara near the village Gopalganj in Seoni, Madhya Pradesh. It is a key tributary of the Godavari. The river flows south in a winding course through the states of Madhya Pradesh and Maharastra, roughly 579km. One of the major features along the river is the Bheemgarh Dam which is the biggest mud dam in Asia located in the Seoni District. Wainganga river passes through Chhapara, Keolari towns of Seoni District (M.P.)and then enter in Balaghat District. Balaghat city is located approx 3 km from bank of the River. After approx. 250 Km travel from origin in state of MP, it enters in to the state of Maharashtra. Due to the direct flow of domestic waste water river is polluted.

A water quality index (WQI) helps for understanding the water quality status of a water source and hence it has been applied for both surface and ground water quality assessment all around the world since the last few decades

Categorization of water quality started in the mid-twentieth century by Horton (1965) and by Landwehr (1974). Brown et al. (1970) developed a general Water Quality Index. More than 20 water quality indices being used till late 1970s were reviewed by Ott (1978) and by Steinhart et al. (1981). The original BCWQI was modified into the CCME WQI, which was certified by the Canadian Council of Ministers of the Environment (CCME) 2001. In India, the pioneer work on WQI was done by Bhargava (1983a, b, c), wherein the water quality is expressed as a number (ranging from 0 for highly/extremely polluted to 100 for absolutely unpolluted water) representing the integrated effect of the parameter includes the effect of weight of each pollution parameter in the sensitivity function values of the various pollution variables relevant to a particular use(Sharma et al 2011).

Figure. 1 Layout of The Study Area

Sampling and Collection of water samples

The objective of the present work is Compared to the quality of water from five different sites of Wainganga river in Seoni district, village Chhapara, for physio-chemical parameters and the results are compared with the standards given by WHO and Indian standards Buereau to determine the extent of pollution. Water samples were collected in the properly washed water bottle to month December - 2022, from the five selected sites at 10:00am to 12.00pm of River Wainganga for compare the water quality parameters. The main objective of study is compared to the physio- chemical properties of water.

Table: 1.1 After COVID Sampling sites of Wainganga river at Chhapara, District-Seoni,(M.P.)

Sampling Sites	Places	Longitude Latitude
W1	Near sidhbaba Mandir	N22,23,24E79,32,19
W2	Near shiv Temple	N22,23,22E79,32,31
W3	Near kumhari ward Temple	N22,23,36E79,32,38
W4	Near main road Bridge	N22,23,21E79,32,32
W5	Near NH-7 bridge	N22,23,1E79,32,51

2. MATERIALS AND METHODS

The water samples from the water basin were collected at an interval of before the COVID and during COVID during the time of 10:00am to 12:00pm and compared to 11 physicochemical parameters by following the established procedures. The parameters like pH, Turbidity,Total Dissolved Solids, Total Alkalinity,Total Hardness,Calcium Hardness, Magnesium Hardness, Iron, Chloride, Fluoride, Sulphate, were compared to in the laboratory Regional Office – POLLUTION CONTROL BOARD – JABALPUR under the guidance of Junior Scientist – Amiya Ekka , as per the standard procedures of APHA (1995).

In this study, for the calculation of water quality index, 11 important parameters were chosen. The WQI has been calculated by using the standards of drinking water quality recommended by the World Health Organisation(WHO), Bureau of Indian Standards (BIS). The weighted arithmetic index method (Brown et. al.,) has been used for the calculation of WQI of the waterbody.

Calculation of WQI was carried out by following the 'weighted arithmetic index method' (Brown et al. 1970), using the equation:

$q_n = 100[V_n - V_{io}] / [S_n - V_{io}]$

(Let there be n water quality parameters and quality rating or subindex (q_n) corresponding to nth parameter is a number reflecting the relative value of this parameter in the polluted water with respect to its standard permissible value.)

q_n = Quality rating for the nth Water quality parameter

V_n = Estimated value of the nth parameter at a given sampling station.

S_n =Standard permissible value of the nth parameter.

V_{io} = Ideal value of nth parameter in pure water. (i.e., 0 for all other parameters except the parameter pH and Dissolved oxygen (7.0 and 14.6 mg/L respectively)

Unit weight was calculated by a value inversely proportional to the recommended standard value S_n of the corresponding parameter.

$W_n = K / S_n$

W_n= unit weight for the nth parameters.

S_n= Standard value for nth parameters

K= Constant for proportionality.

The overall Water Quality Index was calculated by aggregating the quality rating with the unit weight linearly.

$WQI = \Sigma q_n W_n / \Sigma W_n$

The water quality status (WQS) according to WQI is shown in Table

Table 2.1 WQI range, status and possible usage of the water sample (Brown et al. 1972)

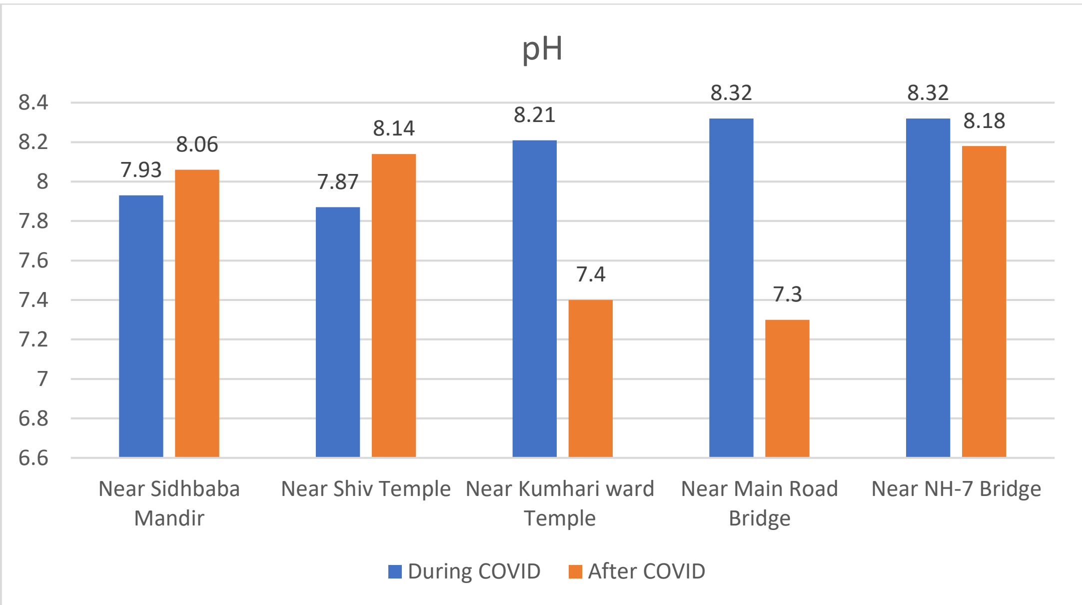
WQI	Water quality status (WQS)	Possible usage
0–25	Excellent	Drinking, irrigation and industrial
26–50	Good	Drinking, irrigation and industrial
51–75	Poor	Irrigation and industrial
76–100	Very poor	Irrigation
Above 100	Unsuitable for drinking and fish culture	Proper treatment required before use

Table 2.2 Drinking Water standards as per Bureau of Indian Standards and Unit Weight

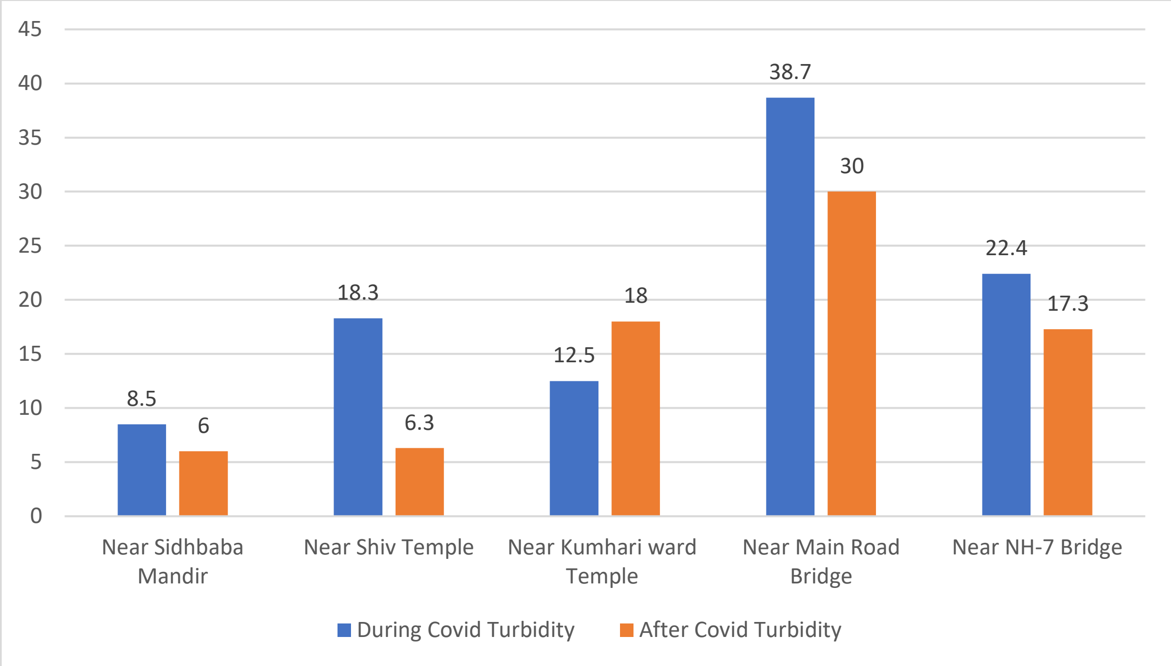
	Near Sidhbaba Mandir	Near Shiv Temple	Near Kumhari ward Temple	Near Main Road Bridge	Near NH-7 Bridge
pH	**7.93**	**7.87**	**8.21**	**8.32**	**8.32**
Turbidity	**8.5**	**18.3**	**12.5**	**38.7**	**22.4**
Total Alkalinity	**142**	**138**	**136**	**128**	**128**
Chloride	**14**	**10.8**	**11.7**	**10.8**	**11.7**
Total Hardness	**138**	**144**	**144**	**144**	**134**
Calcium	**36.8**		**39.2**	**36**	**36.8**
Magnesium	**11.5**	pH	**11.5**	**13.5**	**10.5**
TDS	**159**	**158**	**158**	**152**	**152**
Iron	**0.2**	**0.1**	**0.2**	**0.2**	**0.2**
Sulphate	**7.5**	**6.6**	**7.6**	**7.4**	**7.9**
Fluoride	**0.17**	**0.17**	**0.17**	**0.17**	**0.17**

Table 2.3 Drinking Water standards as per Bureau of Indian Standards and Unit Weight

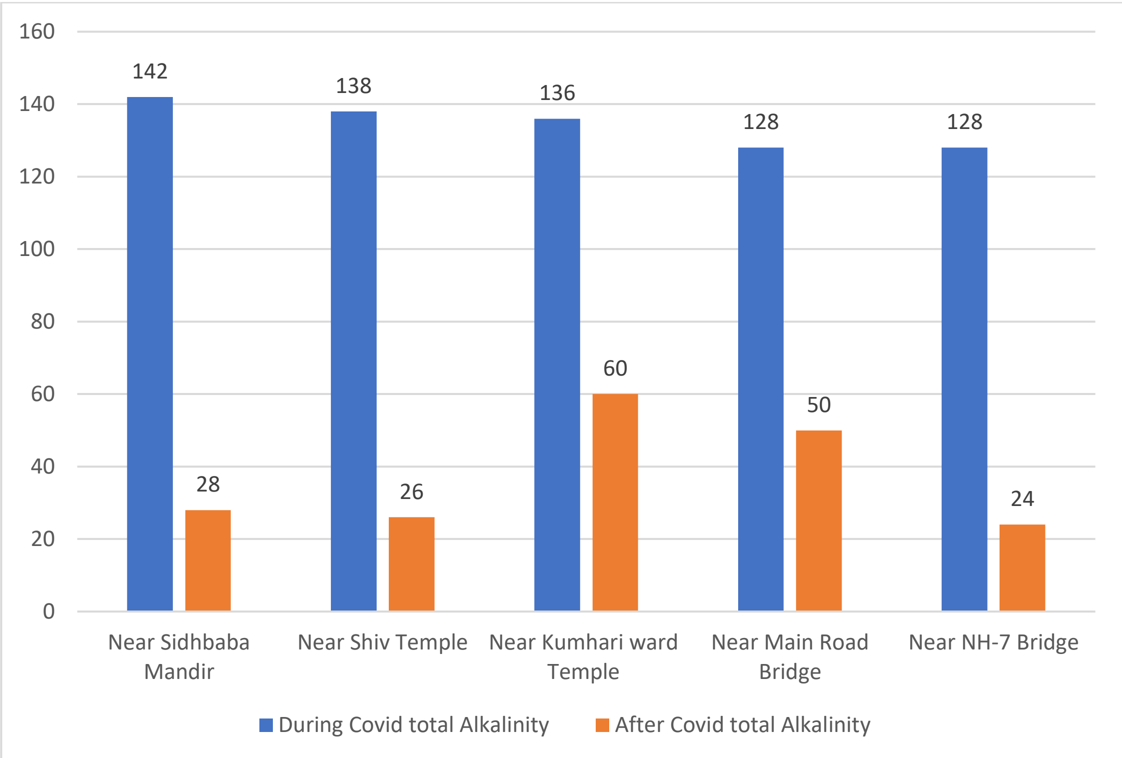
	Near Sidhbaba Mandir	Near Shiv Temple	Near Kumhari ward Temple	Near Main Road Bridge	Near NH-7 Bridge
pH	8.06	8.14	7.4	7.3	8.18
Turbidity	6	6.3	3	3	7.3
Total Alkalinity	28	26	60	50	24
Chloride	20	11.88	19.98	19.98	13.8
Total Hardness	130	136	90	80	160
Calcium	28.85	40.08	28.85	24.04	52.90
Magnesium	14.152	8.78	4.88	4.89	6.83
TDS	222	222	180	170	265
Iron	0.8	0.95	0.11	0.37	0.68
Sulphate	6	2.7	5	6	3.7
Fluoride	0.32	0.34	0.33	0.37	0.31



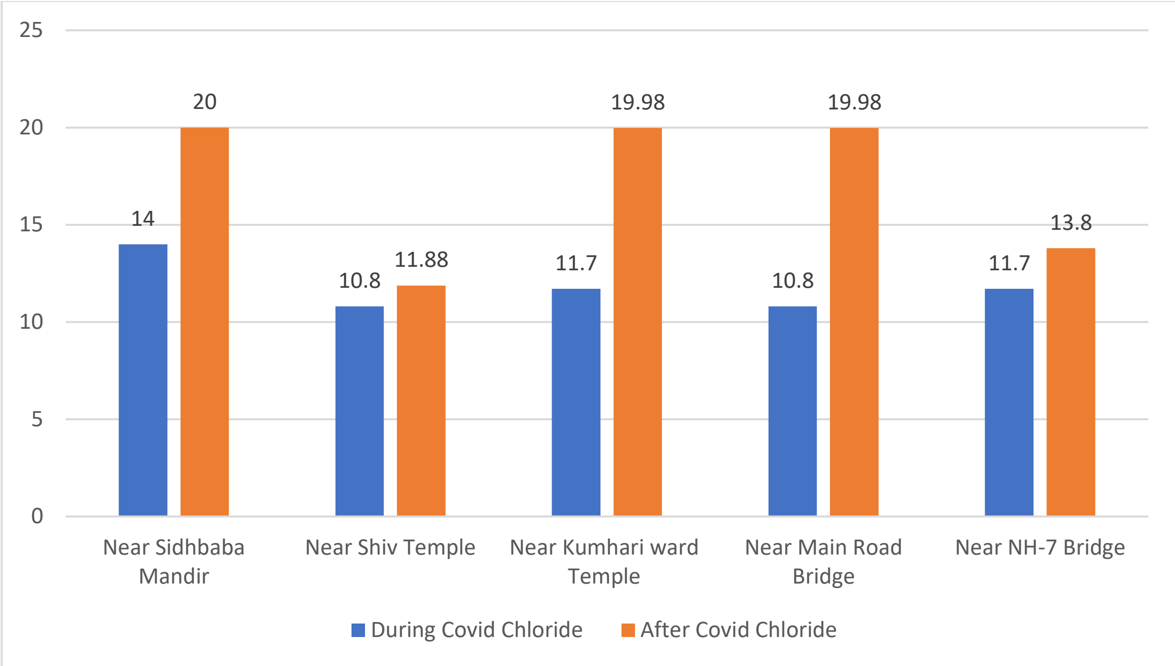
Graph 2.1 shows pH values variation of all locations



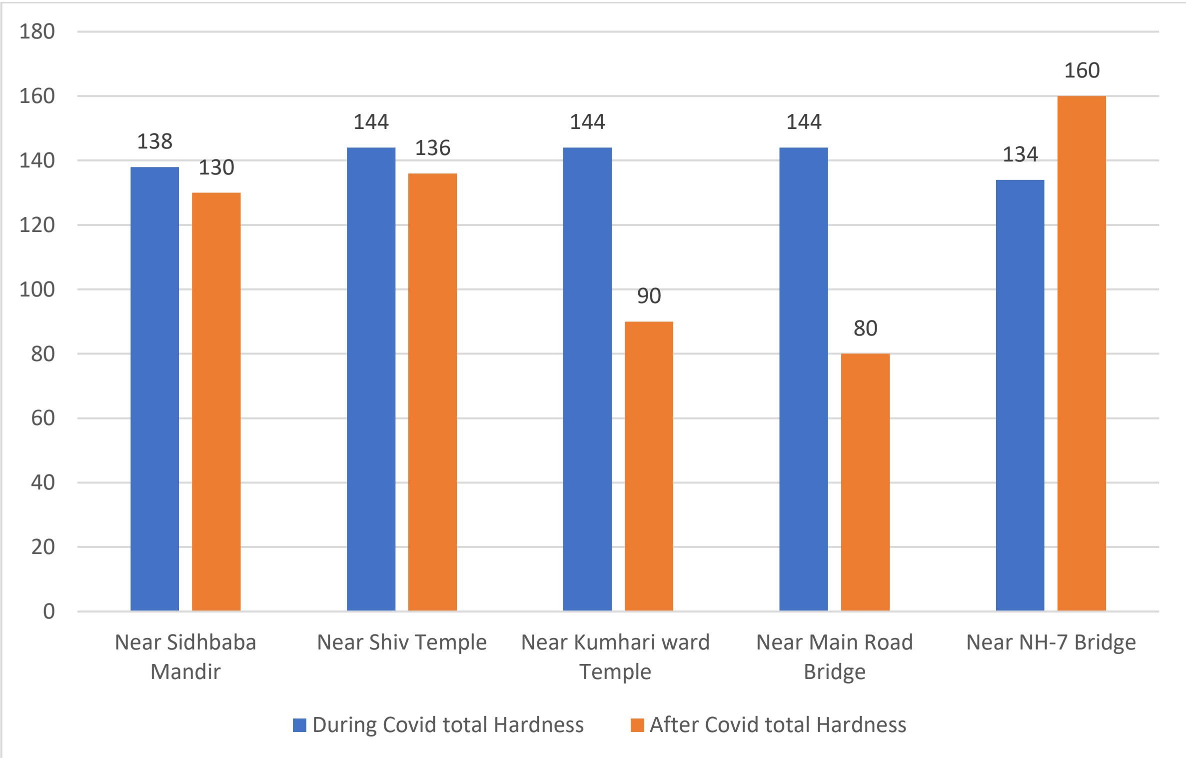
Graph 2.2 shows Turbidity values variation of all locations



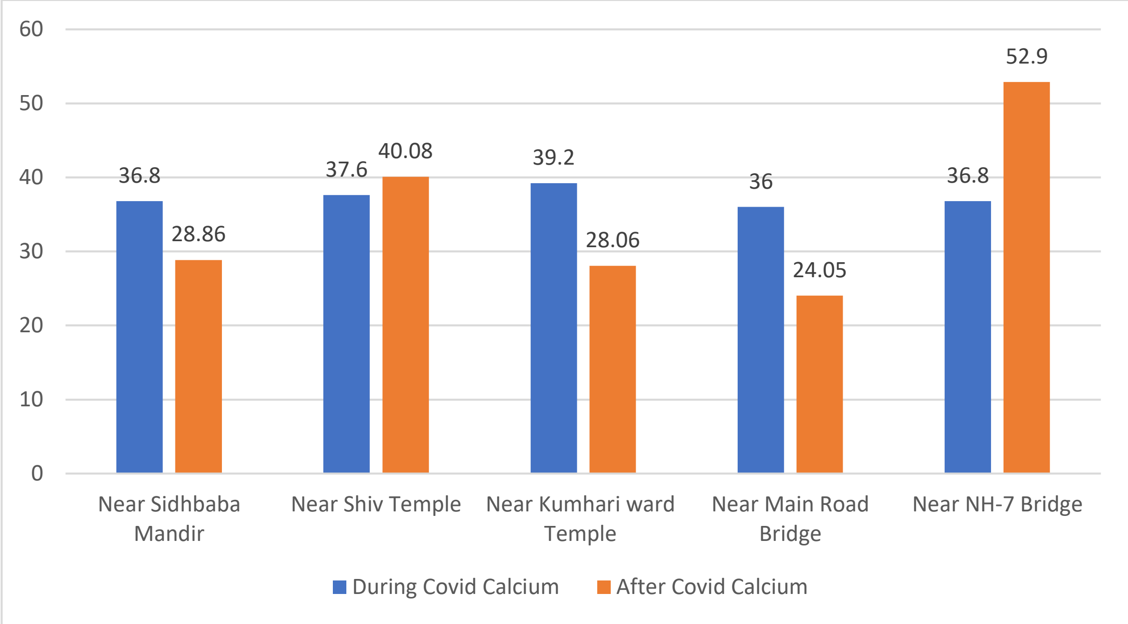
Graph 2.3 shows Total Alkalinity values variation of all locations



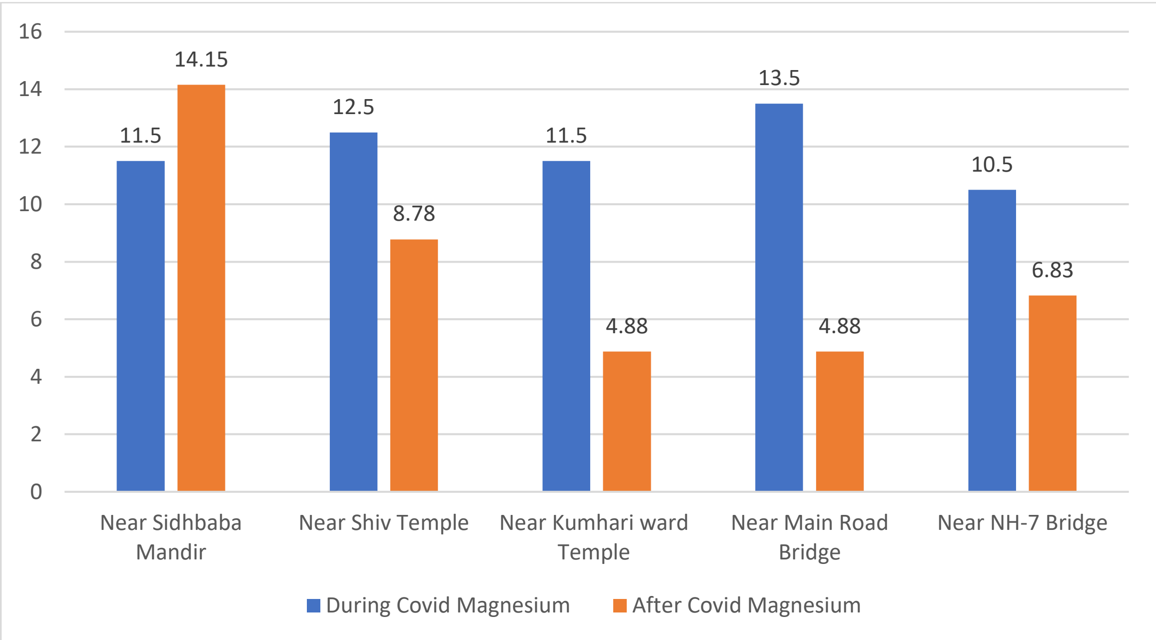
Graph 2.4 shows Chloride values variation of all locations



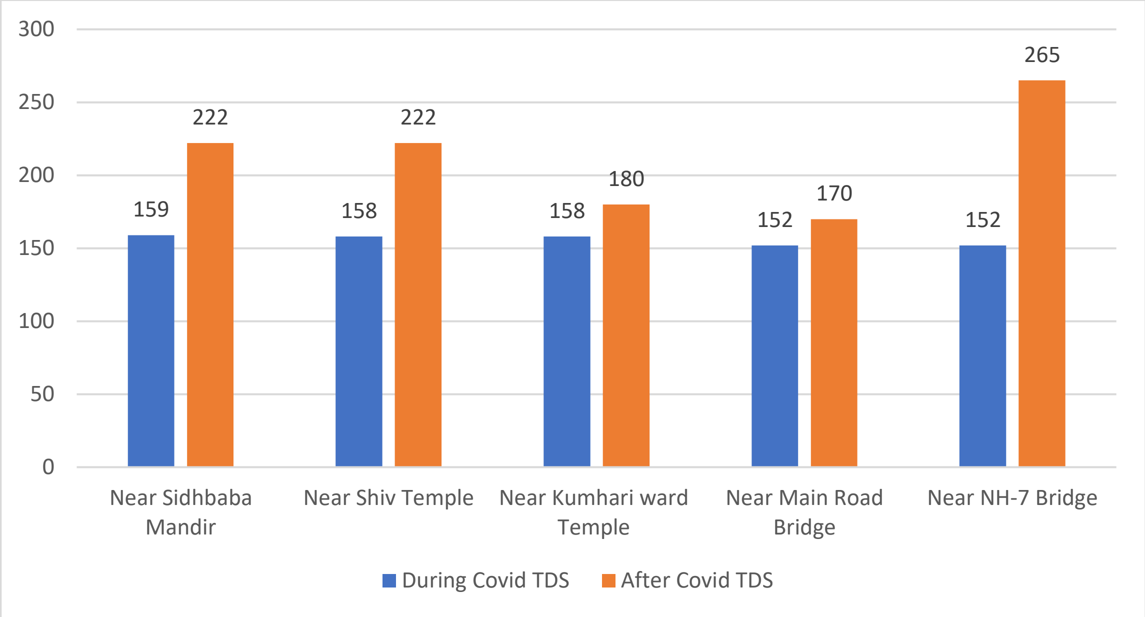
Graph 2.5 shows Total Hardness values variation of all locations



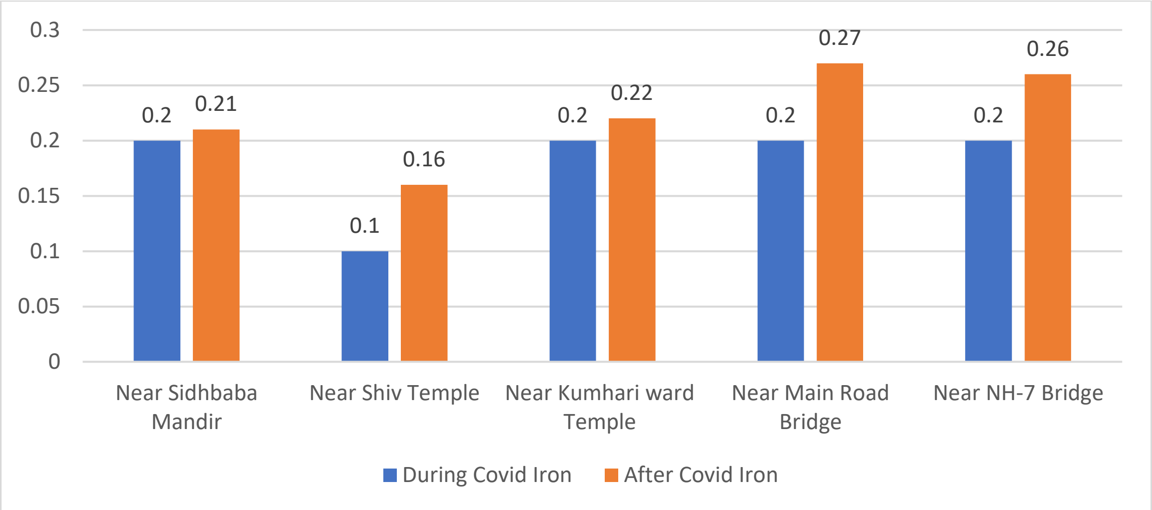
Graph 2.6 shows Calcium Hardness values variation of all locations



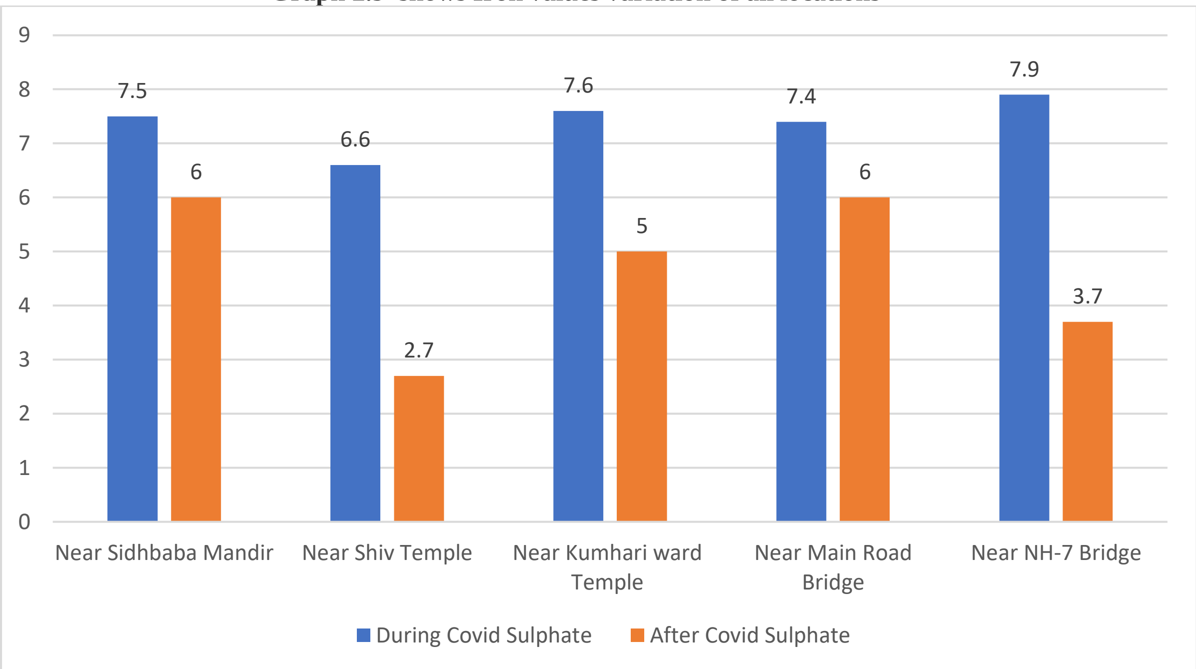
Graph 2.7 shows Magnesium Hardness values variation of all locations



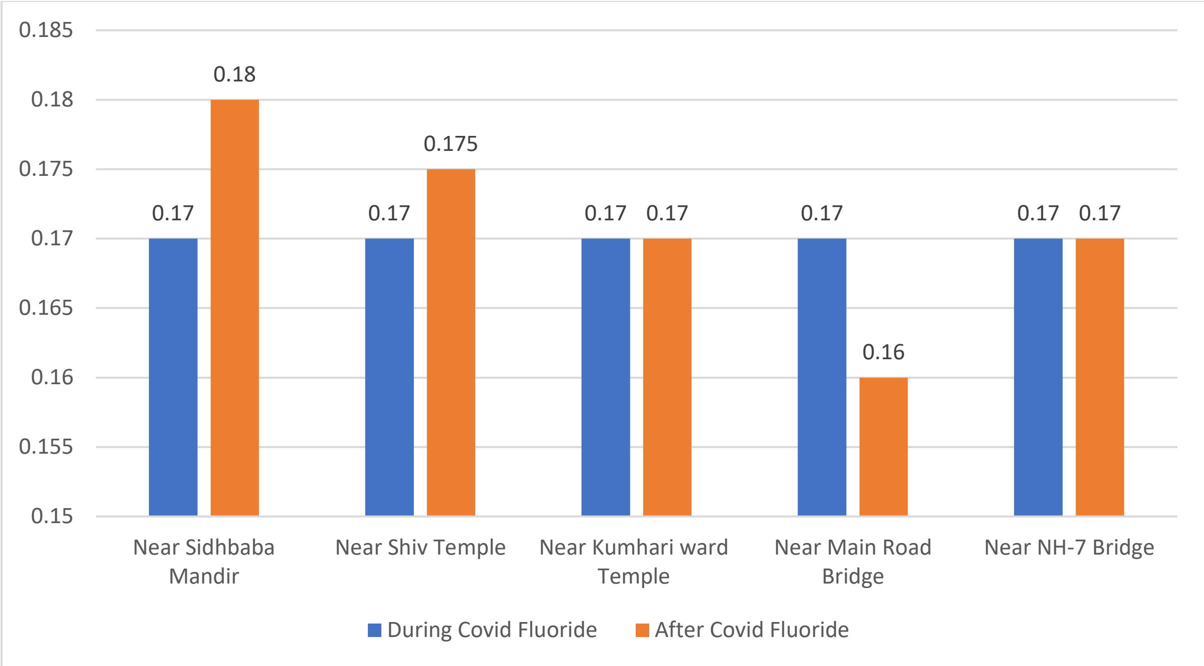
Graph 2.8 shows TDS values variation of all locations



Graph 2.9 shows Iron values variation of all locations



Graph 2.10 shows Sulphate values variation of all locations



Graph 2.11 Shows Fluorides values variation of all locations

CONCLUSION

- From the results, it has been concluded that, the water of Wainganga river during the study period was showing the variations from good quality to poor quality at site W2, shows very poor to very poor quality at site W4 and shows poor to very poor at site W5, Remaining all other sites (W1 , W3) no variation in water quality status.

- The pollution increases site 2 to site 4 continuously, after COVID time. Water quality of Wainganga river was comparatively POOR after COVID.

- Based on WQI values, it could be inferred that the water quality was poor, good, poor , very poor and poor During COVID and poor in three locations (W1,W2,W3) and very poor at site fourth and fifth (W4,W5) After COVID .

This study will help to the water quality monitoring and improve water quality and management of water quality and for making water quality suitable for drinking, irrigation and other purposes.

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