

Imprints of COVID -19 Pandemic Lockdown on Water Quality of River Mandakini, Chitrakoot, Satna (M.P.)

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Abstract: The epidemic of novel COVID- 19 was reported in India in January 2020 and increased day by day due to movement of people from abroad to India and the to the different parts of country. The COVID- 19 has been declare as pandemic because of its high transmission rate of COVID over more than 210 countries of the world. Under this Scenario when there is no medicine for its treatments , the only solution to this problem is to break the chain of transmission and restrict the count of infected people .To contain a corona virus outbreak the government of India announced the nationwide lockdown with effect from midnight of 24th March 2020 followed by the extension of lockdown periods. The various provisions were made under lockdown for closing the industries and transportations. It has been very interesting to note that behavioral changes in nature are highly positive and its gives an appearance that the earth is under repairing work during lockdown. In this study various Physico-chemical and Biological parameters were studied during lockdown phase in comparison to pre lockdown phase. This study showed a very impressive recovery of the water quality during the lockdown phase as compared to pre lockdown status of water quality.

Keywords: Water Quality, COVID-19, Lockdown, D.O. and B.O.D.

INTRODUCTION

The origin of deadly pandemics corona virus (COVID-19) has been reported in December 2019 from the city of Wuhan China. Recognizing the rate of spread of this virus with the personnel contacts various countries have imposed complete lockdown in order to maintain forced social distancing and break the chain of spread of corona virus (Paital 2020).The total lockdown has elevated pandemonium among people but help in reducing the pace of spreading the virus amongst society. However under this lockdown period nature started to response vary positively and started giving several signals of improvement to natural parameters of the Environment. It appears that the earth is rejuvenating under the lockdown period.

With the understanding of this natural recovery and attempt has been made to assess the water quality of river Mandakini at Chitrakoot which is life line and major source of water supply for Chitrakoot. The concentrations of pH, D.O., B.O.D. and C.O.D. have been measured at hot spots on the bank of River Mandakini. The water quality parameters were comparing between the pre lockdown phase and lockdown phase. Two major locations of Mandakini River has been selected namely Sphaticshila (SS) and Ramghat (RG) analyzed and showed a impressive recovery of the water quality during the lockdown phase as compare to pre lockdown status of water quality. This shows that the earth is under self repairing phase during lockdown. The recent observation reflected that water pollution has reduced across the River Mandakini.

STUDY AREA

The River Mandakini originates from the hills of Khillora near Pindra village, Majhagawan block (25° 09'24.8") District Satna Madhya Pradesh with an elevation 156 meter above the mean sea level the catchment area of River is 1956.3Km.². The basin of River Mandakini is shared by the states of M. P. and U.P. the perennial reach of River Mandakini is Sati Anusuya afterwards it passes through Sphaticshila, Janaki Kund, Pramod Van and, Ramghat and finally joins River Yamuna At Rajapur (U.P.).Though the River Mandakini has a very small catchment area but it has great historical and religious importance in Hindu ethos. Mandakini receives large quantity of pollution due to mass bathing and discharge of waste water from nearby settlements. The objective of this study is to find out change in water quality during lockdown phase.

MATERIAL AND METHODS:

In the present study the two sampling stations were selected namely Sphaticshila and Ramghat. The distance between two stations was about 4km .Both of these stations are consider more sacred .The samples were collected before lockdown and during lockdown period from both the stations. The samples were analyzed for various physico-chemical and biological parameters .All the measurements in the laboratory were performed as per APHA AWWA WPCF 2005. Microbial quality of water was determined using Most Probable Number (MPN) method.

RESULTS AND DISCUSSION:

Water samples were collected from Sphaticshila and Ramghat. Samples were analyzed for various physico-chemical parameter and the results obtained are given in table-1, Fig.-3 & 4. Major parameter are discussed below

pH

The pH of the River observed alkaline in nature which varies from 7.9 to 8.2 before lockdown 7.3-7.6 during lockdown. The pH drives most of the chemical and biological changes in water. It acts as the driving force in controlling species distributions in aquatic habitats. The varying pH values provides space to different species to flourish within however the optimum pH range is 6.5-8.0 for most of the aquatic organisms. The variability of pH outside this range physiologically put stress on numerous species and may

affect decreased reproduction and growth, attack of disease, or even death. Hence beyond the optimum value of pH can adversely affect the biological diversity in water bodies. (Mukherjee *et al.*, 2020)

DISSOLVED OXYGEN

Dissolved oxygen (DO) is one of the most important indicators of water quality on which the survival of aquatic life depends. When DO become too low, fish and other aquatic organisms cannot survive. DO was observed 7.73mg/l at Sphaticshila and 7.21mg/l at Ramghat before lockdown. During the lockdown phase, improvement in DO has been observed at both the station. It was observed 8.1mg/l at Sphaticshila and 7.8mg/l at Ramghat during lockdown. Low DO affects most biological processes in water and responsible for lower biological diversity in water bodies. (Dhar *et al.*, 2020)

BIOLOGICAL OXYGEN DEMAND

Biological Oxygen Demand (BOD) is one of the most important indicators of water quality. BOD directly affects the amount of dissolved oxygen in water bodies. The greater demand for BOD more rapidly depletes the oxygen in the water bodies making lesser availability of oxygen for higher forms of aquatic life. The consequences of the high BOD are similar to the effect of less oxygen availability putting aquatic life under stress, suffocation and could be lethal. The major sources of increase of BOD due to domestic effluents, BOD vary from 15.56 to 33.3 mg/l during the pre-lockdown phase while it observed between 9.43-22.4 mg/l during the lockdown phase. Higher BOD affects most biological processes in water and can ultimately lead to reduced biological diversity in streams. (Jaafar *et al.*, 2020)

CHEMICAL OXYGEN DEMAND

Chemical oxygen demand (COD) is an indicator of contamination that shows the amount of dissolved matter in water susceptible to being oxidized. COD is responsible for the reduction of DO in water bodies. Higher concentration of COD is responsible for quick deterioration of oxygen in water bodies and reduces oxygen availability for higher forms of aquatic life. COD varies from 53.75 to 73.17 mg/l during the pre-lockdown phase while it observed between 36.3-52.34mg/l during the lockdown phase. However, improvement in COD has been observed at all locations in the lockdown phase due to the reduction of activities. (Issmat *et al* 2020)

TOTAL COLIFORM

Total coliform is very important parameter for drinking water quality the permissible limit for total coliform is 1/100ml but in our study the total coliform was observed 476/100ml at Sphaticshila and 684/100ml at Ramghat before lockdown and during lockdown it was reduced to 336/100ml at Sphaticshila and 493/100ml at Ramghat though there was reduction in total coliform number but water is unsafe for drinking without disinfection.

Water quality index & its status is given in table- 2. WQI before and during lockdown was calculated given in table- 3, Fig. 2. It was observed that WQI before lockdown at Sphaticshila was very poor and at Ramghat it was unsuitable for drinking and during lockdown water quality index at Sphaticshila was observed poor and at Ramghat it was unsuitable for drinking .It was observed that water quality improved during lockdown phase.

Table-1: Physico-chemical data of river Mandakini before and during lockdown

Parameter	Before lockdown		During lockdown	
	Sphaticshila	Ramghat	Sphaticshila	Ramghat
Temp.(°C)	21.7	21.9	29.7	30.2
Turbidity(NTU)	2.1	18	1.02	1.73
pH.	7.9	8.2	7.3	7.6
TS(mg/l)	846	887	326	368
TDS(mg/l)	721	760	264	327
TSS(mg/l)	98	108	22.6	54.3
T. Alk.(mg/l)	268	283	155	160
T.Hard.(mg/l)	243	296	168	202
Cl ⁻ (mg/l)	26.75	28.64	15.99	20.76
D.O.(mg/l)	7.73	7.21	8.1	7.8
B.O.D.(mg/l)	15.56	33.3	9.43	22.4
C.O.D.(mg/l)	53.75	73.17	36.3	52.34
PO ₄ ⁻ (mg/l)	0.43	1.4	0.1	0.7
NO ₃ ⁻ (mg/l)	0.53	0.92	0.31	0.71
F ⁻ (mg/l)	0.93	1.56	0.8	1.2
Total coli (MPN/100ml)	476	684	336	493

Table-2: Water quality index and status of water quality.

Water quality index	Description status	Category
0-25	Excellent quality	A
26-50	Good quality	B
51-75	Poor quality	C
76-100	Very poor quality	D
>100	Unsuitable for drinking	E

Table-3: Water quality index before and during lockdown

Parameter	Before lockdown		During lockdown	
	Sphaticshila	Ramghat	Sphaticshila	Ramghat
WQI	82.81	191.88	51.12	104.14
	Very Poor	Unsuitable for drinking	Poor	Unsuitable for drinking

Fig-1:Water quality at different stations before lockdown and during lockdown.

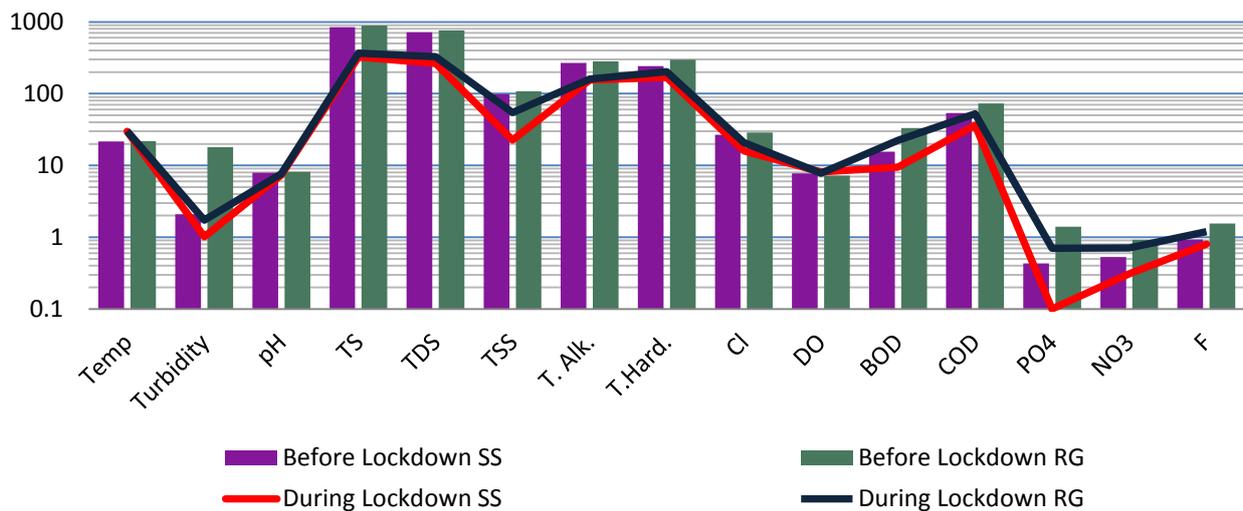
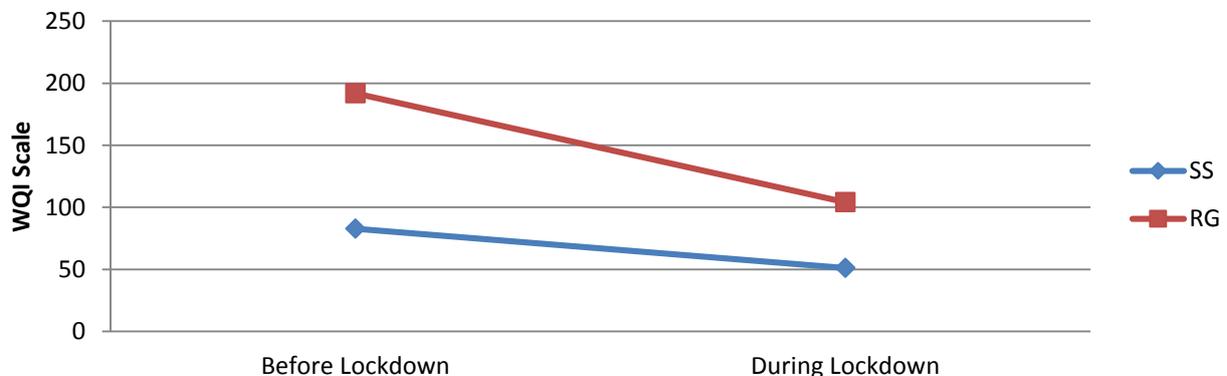
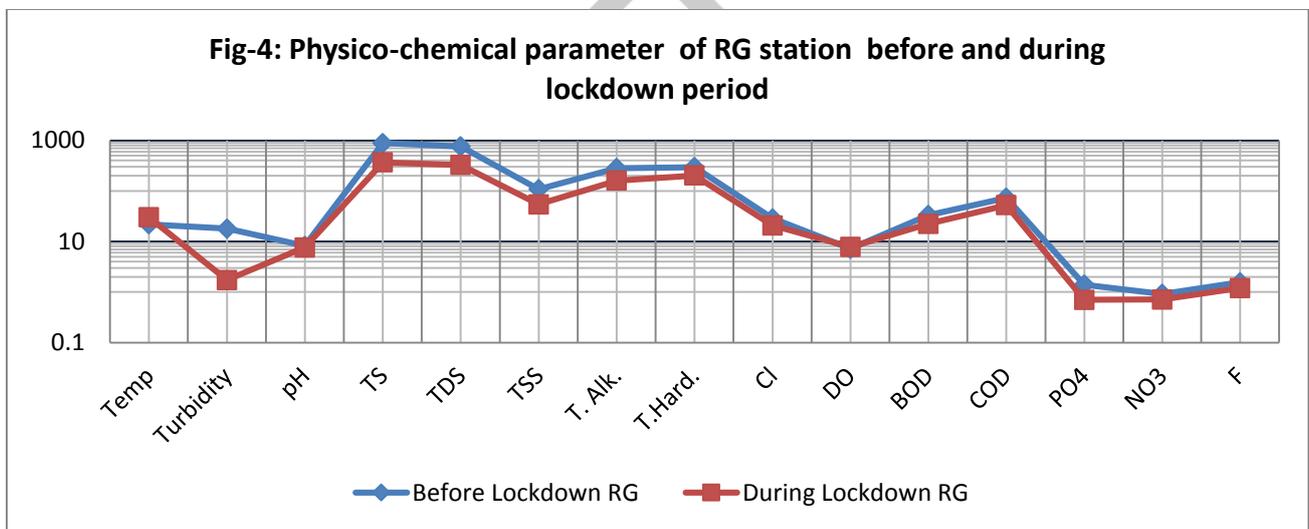
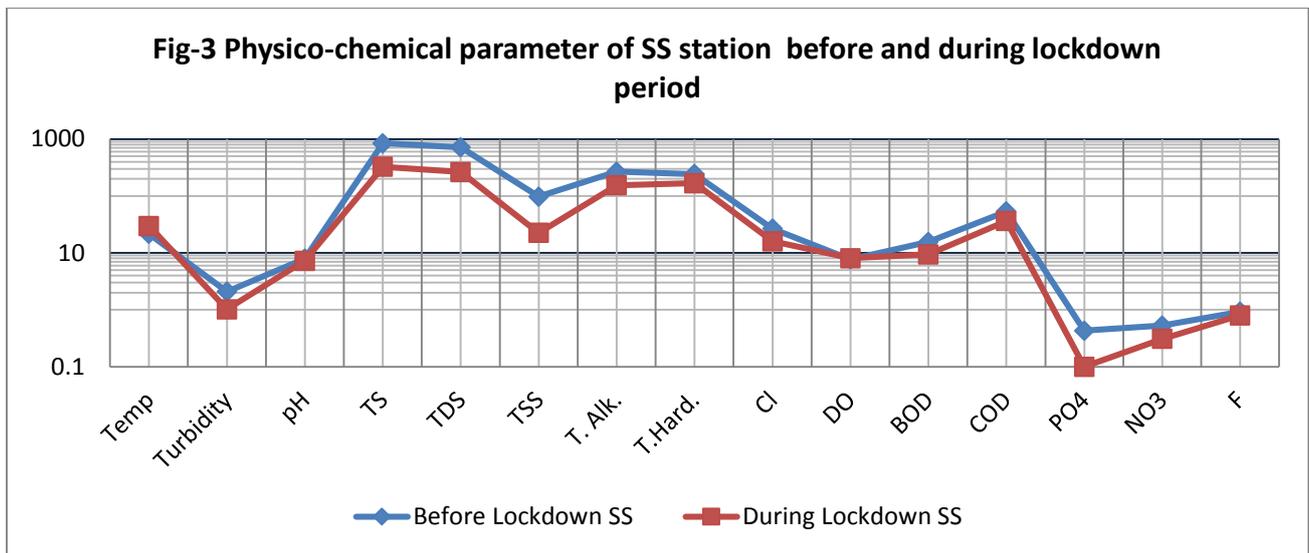


Fig-2:Trend of WQI (Before Lockdown and During Lockdown)





Conclusion

During the lockdown period, there has been a general improvement in water quality in the Mandakini River as a result of the restrictions imposed during the lockdown. The concentrations of pH, DO, BOD and COD showed reduction respectively during the lockdown phase, as compared to the pre-lockdown phase in Mandakini River. The Covid-19 lockdown situation in almost the entire world has shown the importance of nature in our day to day life and gave a true picture of the overexploitation of the natural resources and proved that we are responsible for the degradation of nature and putting risk to our wellbeing as well. This lockdown showed that the solution for nature's cleanliness lies in our hands goes through the path of preservation of natural resources and sustainable development. The cleanliness observed in the river Mandakini during the lockdown is much better than the several efforts and actions where a huge amount of the money was invested. There are several issues due to the lockdown at the front of social and economic wellbeing which cannot be appreciated at all but some positive lessons related to nature gave us a way forward for restraining from the natural calamities if care for nature is established with honesty.

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