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Effect of covid-19 lockdown on physico-chemical properties of Kot Dam water body of Jhunjhunu District, Rajasthan

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Abstract- During the study period, we observed pH, total hardness, total dissolved solids, alkalinity, chloride, chemical oxygen demand (COD), biological oxygen demand (BOD), magnesium, calcium and electrical conductivity declined after the lockdown period. In addition, the dissolve oxygen concentration of Kot dam increased after the lockdown period compared to before lockdown period. The temperature of Kot dam was also increased, but it is happening due to seasonal changes in environmental temperature. Because during the sampling before the lockdown period (April month), the environmental temperature is lower as compared to the post-lockdown period (June month). Floride concentrations remained unchanged before and after the lockdown period. The pH of Kot dam water also dropped after the lockdown period (6.98) compared to before the lockdown period (7.16). The average TDS of Kot dam also declined after the lockdown (363.88mg/l) as compared to before the lockdown period (386.66mg/l). Dissolved oxygen value was found 4.4 mg/l after the lockdown and 3.6 mg/l before lockdown. The average total hardness was highest during the before lockdown (173.33mg/l) as compared to after lockdown period (153.33mg/l). The average alkalinity was highest before lockdown (122mg/l) and lowest after lockdown period (121.33mg/l). The concentration of chloride, magnesium and calcium ions was highest found in before lockdown as compare to after lockdown period. The electrical conductivity of water also declined after the lockdown period as compared to before the lockdown period. Chemical and biological oxygen demand (COD and BOD) were also declined after the lockdown period as compared to before lockdown period. The study clearly indicates the water quality of Kot dam increased due to lockdown. As a result of the lockdown, industrial and vehicular movements and activity cease, this leads to a reduction in the rate of pollutants entering the aquatic ecosystem.

Key words: Lock down, Kot Dam, physicochemical parameter, water, pollution, ecosystem

INTRODUCTION

The word "water quality" refers to the physical, chemical and biological properties that consumers use to determine whether or not water is acceptable.[1] As a result, water quality is a significant determinant of societal well-being.[2] Water quality assessment entails the examination of physicochemical, biological and microbiological factors, as well as consideration of the ecosystem's abiotic and biotic conditions.[3,4] The physicochemical qualities of water play an important role in the biodiversity and distribution of zooplankton in aquatic ecosystems. Domestic trash, sewage, industrial and agricultural effluents pollute the majority of aquatic ecosystem including rivers and ponds.[5] Humans are affected directly or indirectly by the water system and its biota. The physico-chemical properties and stability of an aquatic environment have a vital role in life. Any aquatic body's biological production is directly proportional to its physico-chemical properties.[6,7] The most

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acceptable source for measuring the water quality of any aquatic body is physico-chemical parameters. The ecosystem's biodiversity is affected by even minor changes in physicochemical parameters. The physicochemical features of water play an important role in the functioning of any aquatic system.[8] Water quality in any ecosystem gives important information about the available resources for maintaining life in that ecosystem as well as determining the health of the water body.[9,10] Temperature, rainfall, dissolved oxygen and free carbon dioxide are all important physical and chemical characteristics that influence the aquatic ecosystem. Wetlands are one of the most prolific ecosystems on the planet. They are biological diversity's cradles, providing the water and basic productivity that innumerable plant and animal species need to survive.[11] Several studies on the ecological condition of freshwater bodies have been conducted in various parts of India.[12-16] Researchers investigated the physico-chemical properties of a semi-permanent pond in Rajasthan, India.[17-19] But no more studies have been conducted on the physicochemical properties of Kot Dam. In order to present, a study was carried out on the impact of COVID-19 lockdown on the physicochemical properties of Kot Dam water.

MATERIAL & METHODS

Kot Dam is present in the Jhunjhunu district of Rajasthan and it is situated between latitude 27°39'2" N and longitude 75°25' 10" E. The Kot Dam is a type of human made Dam which is located 13 km. away from Udaipurwati town in Jhunjhunu district of Rajasthan. It is located in north-eastern Rajasthan and encompasses the Shakambhari hills. Kot Dam was constructed in 1923-24 for the purpose of water storage, drinking and irrigation. The samples were collected from three different predetermined stations of Kot Dam and their geographic locations are station I (27°39'07" N- 75°25"12"E), station II (27°39'05"N-75°25'06"E) and station III (27°39'01" N-75°25'11"E). Station I is located in front of residential area, station II in opposite site of temple and station III is located near the front side of Dam (Figure 1). The present study of the physicochemical properties of Kot Dam water was analysed from April, 2021, to June, 2021. During the study, various physicochemical parameters were analysed, which werepH, temperature, electrical conductivity, total dissolved solid, total hardness, dissolved oxygen (DO), fluoride, chloride, nitrate, chemical oxygen demand (COD) and biological oxygen demand (BOD). The physio-chemical parameters of Kot Dam were compared with those before and after the lockdown period. The physicochemical parameters of water samples were determined according to A.P.H.A. (2005)[20].

Fig. 1- Water Sampling stations of Kot Dam

RESULTS & DISCUSSION

During the study, various physico-chemical parameters were analysed, which were pH, temperature, electrical conductivity, total dissolved solid (TDS), total hardness, dissolved oxygen (DO), fluoride, chloride, nitrate, chemical oxygen demand (COD) and biological oxygen demand (BOD). Table 1: The various physico-chemical parameters of three sampling stations of Kot Dam in relation to before lockdown and after lockdown periods during the study. Figure 1 represents the average physico-chemical parameters of Kot Dam before lockdown and after the lockdown period.

During the before lockdown period; the maximum temperature was observed at station II (16.5°C), followed by station I (16.2°C) and the minimum was recorded at station III (16.0°C). After the lockdown period; maximum temperature was observed from sampling station II (22.7°C) followed by station III (22.4°C) and the minimum temperature was observed from station I (22.0°C). But this variation occurs due to variation in environmental factors. In March to April month environmental temperatures are low due to the late winter season, but in June, environmental temperatures reach their maximum level due to the summer season. During the before lockdown period; the highest pH was recorded from station III (7.32) followed by station II (7.26) and the lowest pH was recorded from station I (6.92). After the COVID lockdown, the highest pH values were observed from station II (7.20) followed by station II (6.92) and station I (6.83).

In the case of pH value, it declined after the lockdown period as compared to before the lockdown period. An average pH value of 7.16 was observed before lockdown period and a 6.98 value after lockdown period.

During the before lockdown period; maximum TDS (total dissolved solids) was found from station I (410 mg/l) followed by station III (380 mg/l) and minimum TDS was found from station II (370 mg/l). After the lockdown period, maximum TDS (total dissolved solids) was observed from stations I (380 mg/l) followed by stations III (360 mg/l) and station II (350 mg/l). The average TDS value was highest before lockdown period (386.66 mg/l) and the lowest after lockdown period (363.33 mg/l). Before the lockdown period; highest dissolved oxygen values were obtained from station II (3.9 mg/l) followed by station III (3.5mg/l) and the lowest dissolved oxygen value was obtained from station I (3.4 mg/l).

After the lockdown period; highest dissolved oxygen value was obtained from station II (4.6 mg/l) followed by station III (4.4 mg/l) and minimum value was obtained from station I (4.2 mg/l). Average dissolved oxygen content was sharply increased after the lockdown period as compared to before lockdown period. During the study average dissolved oxygen content was highest found after the lockdown period (4.4 mg/l) and lowest recorded before lockdown period (3.6mg/l).

During the before lockdown period; total hardness was highest found from station I (180mg/l) and minimum found from station II and III (170 mg/l). After the lockdown period maximum total hardness value were observed from station I (160 mg/l) and station II and III contained 150mg/l value respectively. Average value of total dissolved solids was declined after lockdown period. Average value of total dissolved solids was observed 173.33 mg/l before lockdown period while 153.33 mg/l observed after lockdown period.

During the study highest alkalinity of water was observed from station I (128 mg/l) and lowest observed from station II (124 mg/l) and station III (114 mg/l) respectively before lockdown period. After the lockdown period; highest alkalinity of water was observed from station III (126 mg/l) followed by station I (124 mg/l) and lowest alkalinity was observed from station II (114 mg/l). Alkalinity of Kot Dam was also declined after lockdown period. Before lockdown period average alkalinity was observed 122 mg/l, while after lockdown period average alkalinity was observed 121.22 mg/l.

Before the lockdown period; highest chloride values were observed from station II (mg/l) followed by station III (89 mg/l) and the lowest chloride value was observed from sampling station I (89 mg/l). After the lockdown period; the highest chloride content was observed from station I (74 mg/l), followed by station III (72 mg/l) and the minimum chloride content was observed from station II (68 mg/l). Before lockdown period, average chloride content was observed 90.33mg/l while after lockdown period, average chloride content was observed at 71.33 mg/l. The average concentration of chloride clearly indicates that the chloride content declined after the lockdown period. Fluoride concentrations were the same in all three stations (.1 mg/l) during the study period before and after lockdown.

Before lockdown, station I had the highest concentration of magnesium ions (15.84 mg/l), followed by station II (12 mg/l) and station III (12 mg/l). After lockdown period, the maximum concentration of magnesium ions was observed from station I (13.92 mg/l) followed by stations II and III (10.08 mg/l). Average magnesium ion concentrations also declined after lockdown period (11.36 mg/l) as compared to before lockdown period (13.28 mg/l). Before lockdown periods; the electrical conductivity of water was highest at station I(660 mg/l), followed by station III(610 mg/l) and station II(570 mg/l).

After lockdown period; the highest electrical conductivity was observed from station II (560 mg/l) followed by station I (550 mg/l) and station III (530 mg/l). The electrical conductivity of Kot Dam also declined after the lockdown period. The average electrical conductivity was 546.66 mg/l observed after the lockdown period, while 613.33 mg/l was observed before lockdown period. Before lockdown period; stations II and III had the highest concentration of calcium ions (48 mg/l), while station I had the lowest (45.6 mg/l). After lockdown period; maximum calcium ions concentration was found from station II and III (43.2 mg/l) and minimum were found from station I (42.4 mg/l). Before lockdown period maximum biological oxygen demand (BOD) of Kot Dam was observed from stations I (18.2 mg/l) followed by station II (16.6 mg/l) and station III (16.2 mg/l). After lockdown period maximum biological oxygen demand was observed from station I (18.2 mg/l) followed by station III (11.9 mg/l) and minimum biological oxygen demand was observed from station II (10.4 mg/l). After lockdown period biological oxygen demand of Kot Dam was also declined

and average value were found 13.5mg/l while before the lockdown period average value was found 17 mg/l.

During the study period, before lockdown chemical oxygen demand (COD) highest observed from station I (49.6 mg/l) followed by station II (41.32 mg/l) and station III (40.8mg/l). After lockdown period maximum COD was observed from stations I (48.96 mg/l) followed by station II (34.48 mg/l) and minimum value of COD was observed from station III (33.06 mg/l). Average value of COD of Kot Dam was highest observed before lockdown period (43.90 mg/l) while lowest COD of Kot Dam was observed after lockdown period. Present study clearly water quality of Kot Dam was increase after the lockdown period as compare to before lockdown period.

Table 1- Physicochemical parameters of different sampling stations of Kot Dam before lockdown and after lockdown period

Sl. No.	Physicochemical Parameters	Unit	Before Lockdown			After Lockdown		
			SS1	SS2	SS3	SS1	SS2	SS3
1	Temperature	°C	16.2	16.5	16.0	22.0	22.7	22.4
2	pH	-	6.92	7.26	7.32	6.83	7.20	6.92
3	TDS	Mg/L	410	370	380	380	350	360
4	DO	Mg/L	3.4	3.9	3.5	4.2	4.6	4.4
5	Total Hardness	Mg/L	180	170	170	160	150	150
6	Alkalinity	Mg/L	128	124	114	124	114	126
7	Chloride	Mg/L	89	93	89	74	68	72
8	Fluoride	Mg/L	0.1	0.1	0.1	0.1	0.1	0.1
9	Magnesium	Mg/L	15.84	12	12	13.92	10.08	10.08
10	EC	Mg/L	660	570	610	550	560	530
11	Ca+	Mg/L	45.6	48	48	42.4	43.2	43.2
12	BOD	Mg/L	18.2	16.6	16.2	18.2	10.4	11.9
13	COD	Mg/L	49.6	41.32	40.8	48.96	34.48	33.06

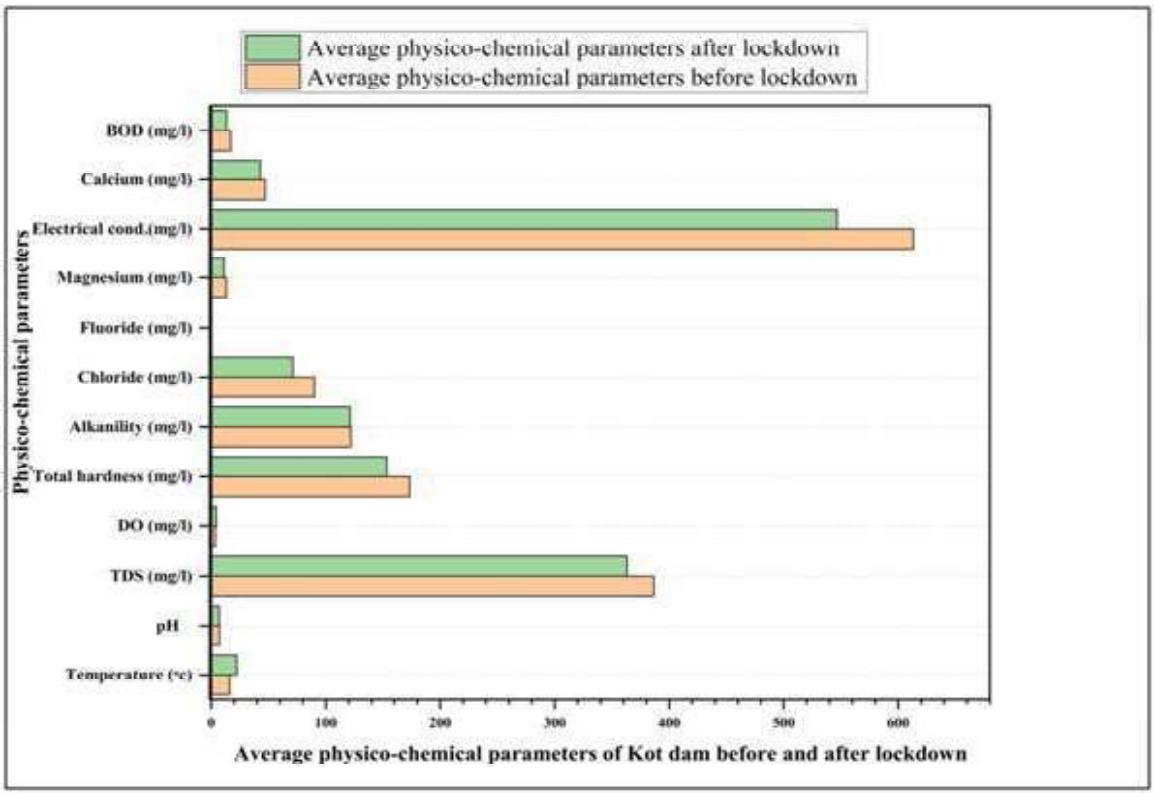

Figure 1- Average physico-chemical parameters of Kot Dam before and after lockdown period

CONCLUSION

It was observed that the water quality of Kot dam improved after the lockdown period as compared to before the lockdown period. During the study, we observed that pH, total hardness, total dissolved solids, alkalinity, chloride, chemical oxygen demand (COD), biological oxygen demand (BOD), magnesium, calcium and electrical conductivity declined after the lockdown period. In a similar manner, the dissolved oxygen concentration of Kot Dam was also increased after the lockdown as compared to before the lockdown period. We also observed that the concentration of chloride, magnesium and calcium ions also decreased after the lockdown period as compared to before the lockdown period (Table 1). In the current study we observed dramatic declinations in various physico-chemical parameters of Kot Dam water. Those are the pH and TDS levels that also declined after the lockdown period as compared to before the lockdown period. Average total hardness, average alkalinity concentration also declined during the post lockdown period. That is an indication of water quality improvement. Chemical and biological oxygen demand (COD and BOD) also declined after the lockdown period. The present study clearly indicates that the water quality of Kot Dam has increased due to the lockdown period.

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