Chelonian Conservation And Biology

Vol. 19No.1 (2024) | https://www.acgpublishing.com/ | ISSN - 1071-8443

DOI:doi.org/10.18011/2024.01(1). 957-969

DETERMINATION OF WATER QUALITY PARAMETERS OF KELO RIVER

Reenu Mishra[1]
[1]K.G.Arts & Science College, Raigarh (C.G)
reenu.mishra.ap@gmail.com

P.K.Sing[2]
[2]Govt. College Janjgir, (C.G)

M.M.Vaishnav[3]
[3]Govt. Gramyabharati College, Hardibazar, Korba (C.G)

Kavita Patel[4]
[4]OPJU, Raigarh (C.G)

ABSTRACT

Water is a wonderful gift of nature to mankind. It has its own unique properties. It is also known as universal solvent. It is essential for all living beings. Chemically water is consisting of two part of hydrogen and one part of oxygen. Its weight is 18 .The natural water is combination of following – (1)$H_2{}^{17}O$, (2) $H_2{}^{18}O$ (3)$HD^{16}O$ (4) $H_2{}^{16}O$ (5)$HD^{17}O$(6)$HD^{18}O$ (7) $D_2{}^{18}O$(8) $D_2{}^{17}O$(9) $D_2{}^{16}O$. Because both hydrogen and oxygen have isotope, so there nine combinations is possible.[1] depending upon the combination of those component the properties of water vary from place to place. For example density of water varies from source to source at 4^0C.

Type of Water	Density at 4^0C
(1) Rain Water	0.9999990
(2) Snow Water	0.9999977
(3) Ocean Water	1.0000015
(4) Water of crystallization in various minerals	1.0000024
(5) Water of plants	1.0000017
(6) River Water	1.0000000

Water is used for several purposes. Without water life is impossible in universe. Water is found in three different forms-solid, liquid and vapors. Our planet is known as blue planet as most of the part is covered with water, but we still face crises, becoz 97% total surface water is marine water, only 3% of it is fresh water which includes glacier also. River is one of major source of surface water. River water can be used for different purpose like

drinking, irrigation, domestic use, in industry and many more. If we want to use water for any one of these purpose, we first check the water quality. Water quality is measured by various parameters. WQI is used for this purpose. On the basis of water quality parameters the degree of pollution is measured. It is also necessary to calculate parameters before using water at any purpose. In our present study we discuss the water quality parameters of Kelo River in Pree Monsoon, Monsoon & Post Monsoon. session. In present work I discuss some of them. In this study I choose kelo river water from seven different spots and analyze water quality parameters. Water is polluted by different reasons. Anthropogenic activity, Industrialization, Cultivation, Use of pesticide and fertilizers, Domestic waste, Sewage, irrigation, municipal waste etc. are responsible for aquatic pollution. Water quality parameters tell us whether the water is suitable for the purpose in which we want to use water. And it also tells us the level of pollution.

KEY WORD- Aquatic pollution, WQI, Anthropogenic activity, Water pollution, Kelo River, domestic waste, Raigarh,

INTRODUCTION

Kelo is life line of Raigarh. It is Mahanadi basin. Kelo, one of main tributary of Mahanadi, is about 95 km long and merge into Mahanadi.[2] It is used for several purposes. Several industries(small and large), steel plant, thermal power plant, Sponge Iron steel industries are situated in the bank of Kelo River. Some of them are as follows

Anjani Steel Ltd. Raigarh
Nalwa Steel & Power Ltd. Raigarh
Nav Durga Fuel Pvt. Ltd. (Srishtii TMT)
M/S Keshav Sponge & Energy Pvt. Ltd. Village- Taraimal, P.O. Gerwani
O.P.Jindal Industrial Park, Punjipathara
M/S Om Shree Rupesh Steel Pvt. Ltd. Village- Chiraipani near Gerwani
M/S Maa Sharda Steel pvt. Ltd. Village Gerwani
M/S Salasar Steel & Power Ltd., Gerwani
M/S Shri Shyam Ispat Pvt. Ltd. Village- Taraimal
M/S Singhal Energy Pvt. Ltd. Village Taraimal, P.O. –Gerwani, Distt. Raigarh
M/S Jindal Power Limited P.O. Tamnar, Distt. - Raigarh
M/S Jindal Steel &Power Ltd. Village- Punjipathra

Industrial effluents, domestic sewage, agricultural run-off, municipal carporation dump the waste water in Kelo River.

Kelo is life line of Raigarh. Kelo is one of the main tributary of Mahanadi. Its water is used for several purposes. In present study we collect water sample from eight different spot. And analyze the different water quality parameter. Various species of bacteria that are commonly found in nature are grouped as Total coli-form.[3] Animal discharge from leaching of animal manure, septic and sewage discharge , water run-off, waste of human

and domestic animals are sources of Coli forms.[4]Hardness is the measure of concentration of Ca^{++} and Mg^{++} in water.[5]Heavy metals are persistent , non-biodegradable, and bio-accumulate through food- chain, they did not decay with time, may be useful for plants and animals when present in small amount but can be harmful when exceeding specific threshold. [6]

METHOD

SAMPLE COLLECTION

Water sample is collected from five different spot and labeled. Water sample was collected in plastic bottle.

Table-1 Sampling Spot

S.No	SAMPLEING SPOT	SAMPLE NAME
1	CHAKRAPATH	S-1
2	CHATT-GHAT	S-2
3	RANIGHAT	S-3
4	KELO -DAM	S-4
5	LAKHA	S-5
6	CHIRAIPANI	S-6
7	TARAIMAL	S-7
8	GERWANI	S-8

The analytical methods used for the determination water quality parameters are described by Trivedi and Goel (a), APHA (b) and Kodarkar et al. (c).

INSTRUMENTAL METHODS FOR DETERMINATION OF WATER QUALITY PARAMETER

Table-2 Standard Methods

S. No.	Name of Parameter	Method
1	Temperature	Thermo-metrically
2	pH	pHmetry
3	EC	Conductometry
4	Turbidity	Nephelometric

5	Total solid	Gravimetric
6	Total dissolved solid	Do
7	TSS	Mathematical method
8	Total alkalinity	Volumetric
9	Total Hardness	Volumetric
11	Fluoride	Spectrophotometrically
12	Chloride	Silver nitrate
13	Fe	Instrumental
14	NO3	By Spectrophotometer
15	PO4	By Spectrophotometer
16	SO4	By Spectrophotometer
17	E. Coli	By Spectrophotometer
18	Totla Acidity	Titration with base
19	Zn	AAS
20	As	AAS
21	Pb	AAS
22	Fe	AAS
23	Hg	AAS

Table-3 ACCEPTABLE LIMIT, PERMICIBLE LIMIT[7,8]

S. NO.	PARAMETER	UNIT	ACCEPTABLE LIMIT	PERMICIBLE LIMIT
1	Temperature	0C		
2	pH		6.5-8.5	
3	EC	µmho/cm		
4	Turbidity	NTU	1	5
5	Total solid	mg/L		
6	Total dissolved solid	mg/L	500	2000
7	TSS	mg/L		
8	Total Alkalinity	mg/L	200	600
9	Total Hardness	mg/L	200	600
10	Ca -Hardness	mg/L	75	200
11	Mg - Hardness	mg/L	30	100
12	Fluoride	mg/L	1.0	1.5
13	Chloride	mg/L	250	1000
14	NO_3^-	mg/L	45	45
15	SO_4^{--}	mg/L	200	400
16	PO_4^{3-}	mg/L		
17	Metallic elements-Fe	mg/L	0.3	1

18	Cd	mg/L		
19	As	mg/L		
20	Hg	mg/L		
21	Zn	mg/L		
22	Total Coli forms	CFU/100ml		
23	Faecal Coli forms			

Table-4 Pree-Monsoon

S. NO	Parameter	Chakra path	Rani Ghat	Chatt Ghat	Kelo Dam	Lakha	Chiraipani	Taraimal	Gerwani
1	Temperature	38	37	37	39	39	39	36	36
2	pH	8.04	7.4	7.66	7.68	7.73	7.88	7.90	7.68
3	EC	410	402	422	402	1684	1538	872	480
4	Turbidity	16.9	12.2	39.7	23.9		22.4	51.3	17
5	Total solid	814	389	392	206	1234	230	140	145
6	Total dissolved solid	254	254	272	106	1078	40	20	15
7	TSS	560	135	120	100	156	190	120	130
8	Total Alkalinity	117.29	47.71	52.77	46.54	117.29	88.90	43.50	30.40
9	Total Hardness	55.83	53.41	59.29	58.58	52.45	39.66	101.988	89.68
10	Ca - Hardness	33.9	30.05	31.5	32.36	30.23	27.74	36.2	63.94
11	Mg - Hardness	21.93	23.36	24.79	26.22	22.22	11.92	65.78	25.74
12	Fluoride	0.64	0.63	0.68	0.38	0.36	0.68	1.09	0.52
13	Chloride	18.47	18.47	18.47	15.56	12.56	26.25	28.19	24.3
14	NO_3^-	16.8	24.5	15.4	19.0	18.59	19.2	18.4	22.6
15	SO_4^{--}	104	124	116	134	112	19.9	0.52	1.09
16	PO_4^{3-}	6	7.5	6.5	4.5	6.8	4.7	6.9	3.7
17	Metallic elements-Fe	0.37	0.23	2.39	0.22	0.45	1.81	1.09	0.52

18	Cd	0.240	0.006	0.035	0.125	0.004	0.007	0.005	0.865
19	As	0.40	1.125	0.72	1.865	0.47	2.27	2.82	1.87
20	Hg								
21	Zn	0.001	-bdl	bdl	bdl	bdl	0.001	bdl	0.001
22	Total Coli forms	35	20	0.0	22	-	0.0	02	05
23	Faecal Coli forms	20	17	0.0	07	-	0.0	0.0	02
24	DO	3.5	5.2	2.8	3.8	3.4	3.4	4.2	3.1
25	BOD	1.6	4.1	1.8	1.4	2.4	1.6	2.0	1.8
26	COD	450	170	260	210	220	300	310	320

Table-5 Monsoon

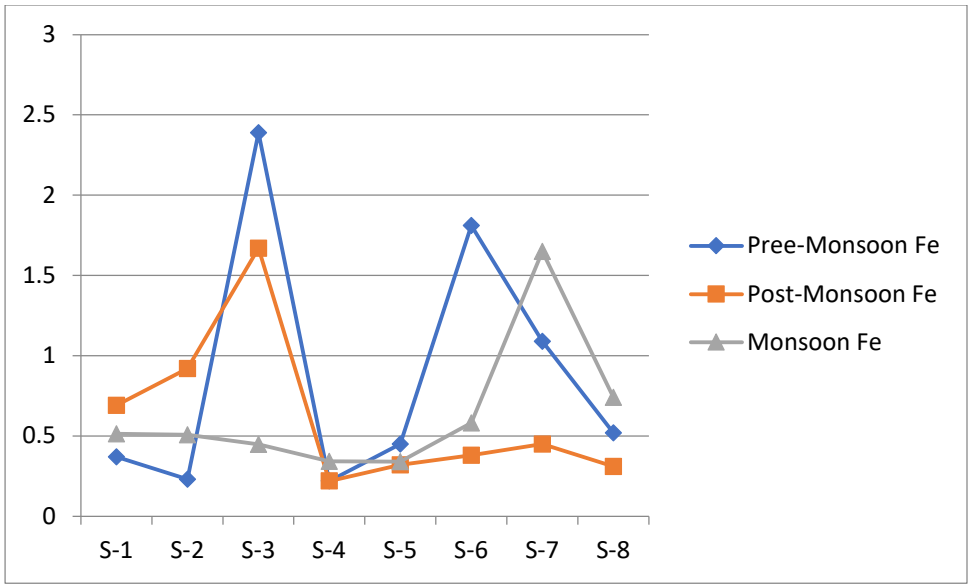
S. NO	**Parameter**	**Chakra path**	**Rani Ghat**	**Chatt Ghat**	**Kelo Dam**	**Lakha**	**Chiraipani**	**Taraimal**	**Gerwani**
1	Temperature	28	28.4	28.6	29	29.5	30	30.5	28
2	pH	7.22	7.2	6.01	6.56	7.2	6.52	7.4	6.72
3	EC	944	1278	1576	910	780	1676	980	106
4	Turbidity	90	76	70	60.8	40.5	180	64.3	39
5	Total solid	1420	1178	1349	820	560	2266	970	599
6	Total dissolved solid	670	828	949	570	320	966	450	69
7	TSS	750	350	400	250	240	1300	520	530
8	Total Alkalinity	22.64	32.93	12.35	18.52	13.56	12.35	20.56	20.58
9	Total Hardness	73.44	106.08	446.76	63.24	67.45	85.67	107.45	89.76
10	Ca - Hardness	14.72	31.07	49.06	11.45	23.14	9.81	57.34	13.08
11	Mg - Hardness	9.11	7.08	80.44	8.6	44.11	15.17	50.11	14.16
12	Fluoride	18.40	27.50	17.00	22.1	23.56	19.4	26.67	21.7
13	Chloride	12.74	13.72	475.3	14.7	4.5	6.86	7.8	13.72

14	NO_3^-	18.40	27.50	17.00	22.1	23.5	19.4	26.5	21.7
15	SO_4^{--}	108	127	122	130	126	28.7	118	125.2
16	PO_4^{3-}	4.5	3.8	4.2	2.1	5.6	5.6	4.3	1.7
17	Metalic elements-Fe	0.69	0.92	1.67	0.22	0.32	0.38	0.45	0.31
18	Cd	0.141	0.002	0.025	0.100	0.001	0.006	0.002	0.728
19	As	0.025	0.675	0.23	bdl	0.005	bdl	0.034	0.003
20	Hg	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	Zn	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Total Coli forms	46	28	20	12	37	18	14	17
23	Faecal Coli forms	23	18	06	04	07	10	03	09
24	DO	2.5	4.5	3.4	4.5	2.8	2.8	4.2	3.1
25	BOD	1.2	4.5	2.1	1.6	2.2	2.1	2.5	2.2
26	COD	520	250	340	256	258	360	360	370

Table –6 Post- Monsoon

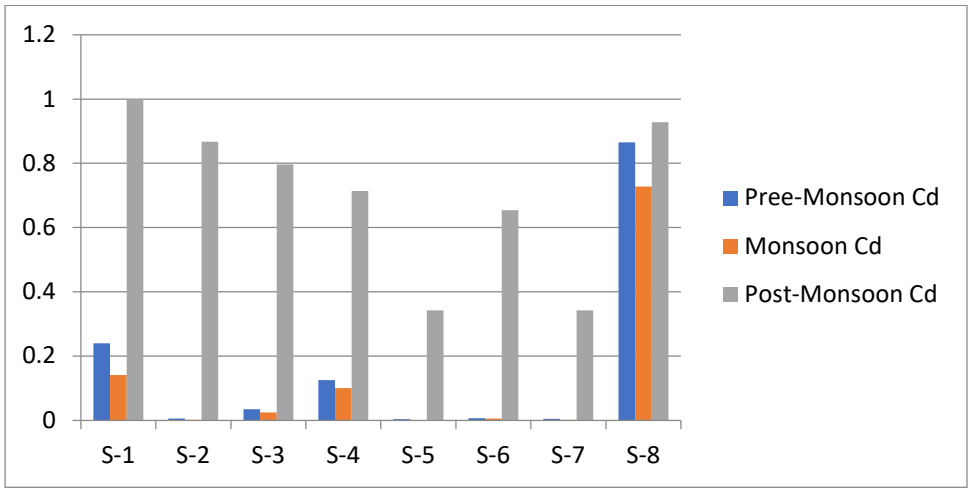
S. NO	**Parameter**	**Chakra path**	**Rani Ghat**	**Chatt Ghat**	**Kelo Dam**	**Lakha**	**Chiraipani**	**Taraimal**	**Ger-wani**
1	Temperature	25	25.4	25.6	27	27.4	26	25	25
2	pH	7.9	8.3	8.92	8.0	8.1	7.8	7.9	7.8
3	EC	944	1278	1576	910	780	1676	980	106
4	Turbidity	80	65	60	50.5	30.5	150	44.3	29
5	Total solid	464.5	179.7	118.11	66.45	126.6	85.1	640	120.3
6	Total dissolved solid	257.17	85.3	45.44	7.25	101.2	77.6	560	20.3
7	TSS	139.75	54.4	147.5	38.5	75	82.5	80	100
8	Total Alkalinity	156.42	61.745	32.9	34.795	73,39	47.14	47.14	57.67
9	Total Hardness	707.378	67.23	54.312	83.485	200.01	99.1	400	365

10	Ca - Hardness	403.178	45.12	34.122	33.265	150.91	65.9	265	142
11	Mg - Hardness	304.200	22.11	20.19	50.220	49.1	33.2	135	223
12	Fluoride	0.425	0.395	4.45	0.615	0.57	0.235	0.61	0.67
13	Chloride	**130.43**	**20.56**	**15.63**	**230**	**10.97**	**131.27**	240	253
14	NO_3^-	18.3	18.75	7.56	5.85	9.35	6.3	6.3	8.9
15	SO_4^{--}	450	320	235	260	380	280	750	360
16	PO_4^{3-}	5.3	4.1	5.2	4.1	7.3	6.4	5.3	2.1
17	Metallic elements-Fe	0.5132	0.5066	**0.4482**	**0.3412**	**0.34**	**0.5801**	1.65	0.74
18	Cd	0.9997	0.8671	0.7960	0.7137	0.342	0.654	0.342	0.9281
19	As	0.0227	0.6774	0.2388	0.7800	0.002	0.004	0.005	0.6310
20	Hg	0.001	bdl	Bdl	bdl	bdl	bdl	bdl	bdl
21	Zn	0.7767	0,8297	0.7481	0.8379	bdl	bdl	bdl	0.7156
22	Total Coli forms	40	24	20	10	29	14	12	16
23	Faecal Coli forms	26	17	08	02	09	08	04	05
24	DO	2.8	4.8	3.2	4.2	3.2	1.8	2.3	2.0
25	BOD	1.4	4.2	2.2	1.8	2.4	1.2	1.8	1.2
26	COD	480	190	280	240	250	330	330	340



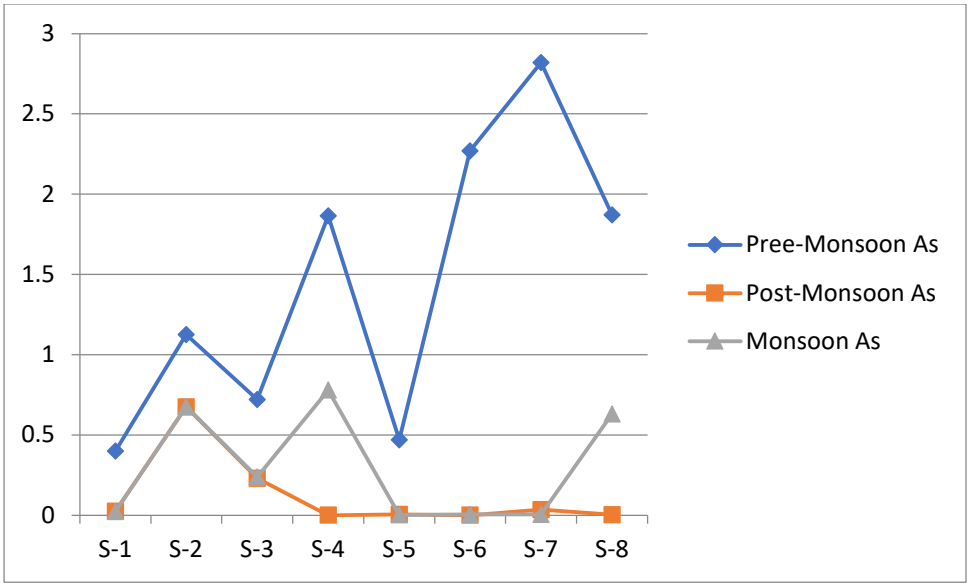
x-axis- Sampling spot, y- axis Concentration of Fe in mg/L.

Fig.1: Concentration of Fe at 8 sampling spot in mg/L



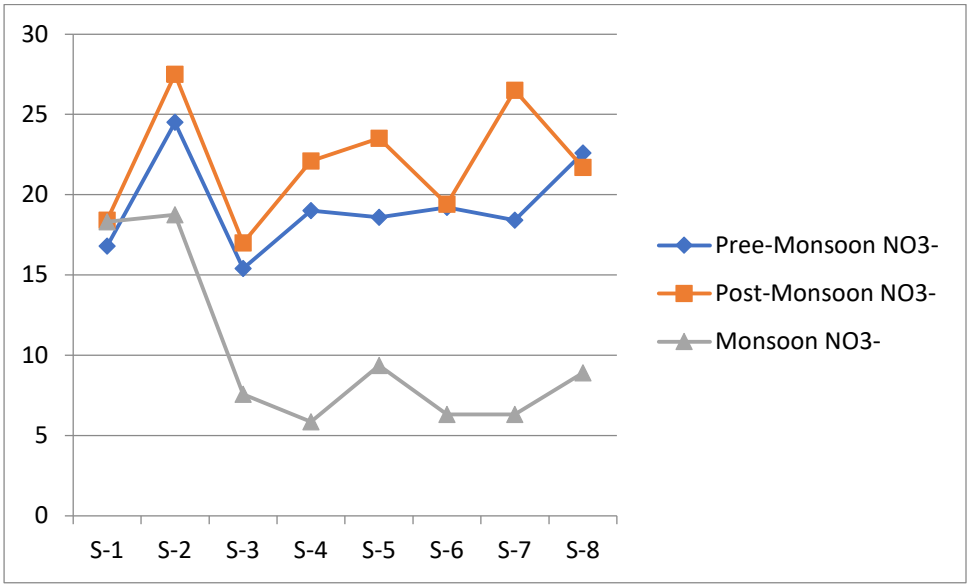
x-axis- Sampling spot, y- axis Concentration of Cd in mg/L.

Fig-2: Concentration of Cadmium in 8 sampling spot in mg/L



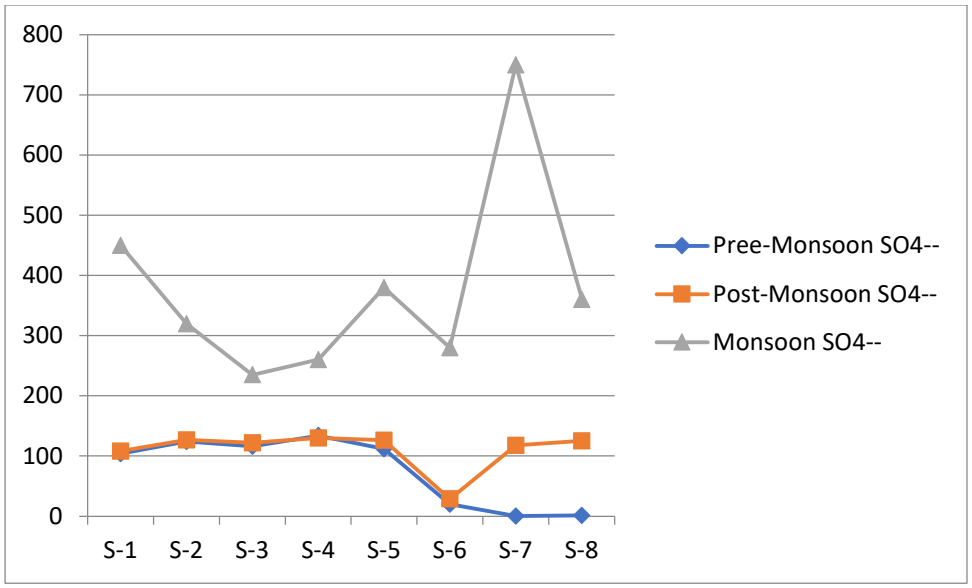
x-axis- Sampling spot, y- axis Concentration of As in mg/L

Fig-3 : Concentration of As at 8 sampling spot in mg/L



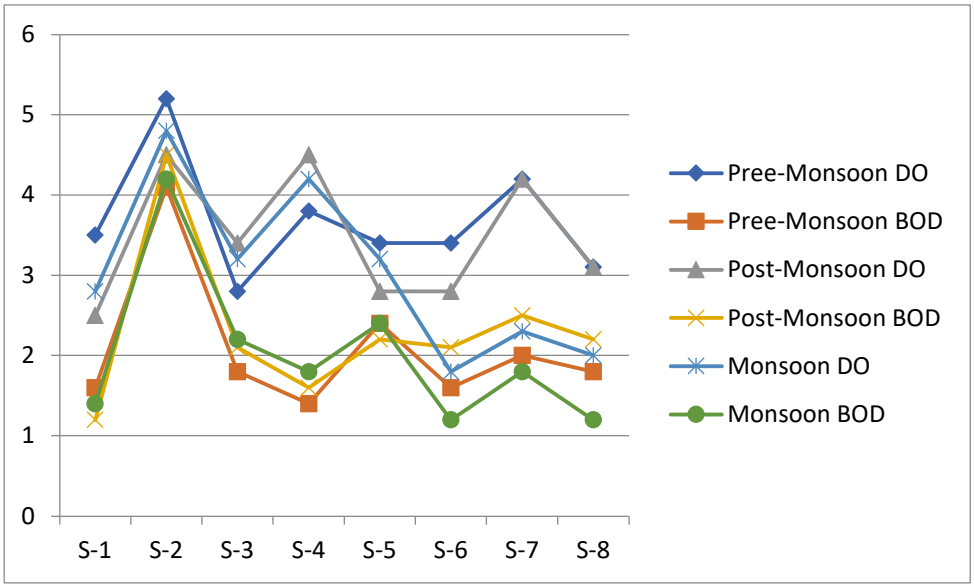
x-axis- Sampling spot, y- axis Concentration of Nitrate in mg/L.

Fig-4 Concentration of Nitrate at 8 sampling spot in mg/L



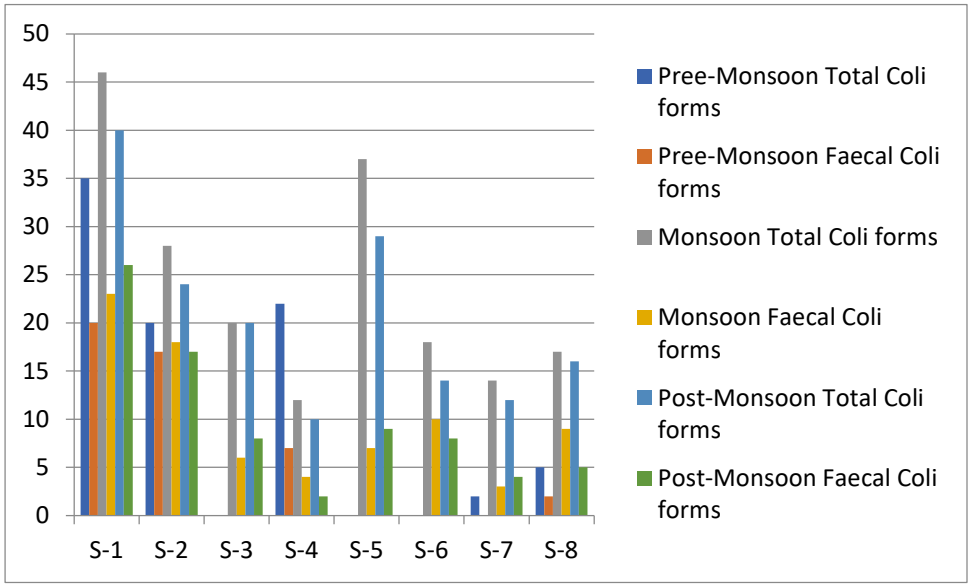
x-axis- Sampling spot, y- axis Concentration of Sulphate in mg/L.

Fig-5 : Concentration of sulphate at 8 different spot in mg/L



x-axis- Sampling spot, y- axis Value of DO & BOD.

Fig- 6 : DO &BOD level at 8 different sample spot



x-axis- Sampling spot, y- axis Value of Total coli-form and Fecal coli- form.

Fig-7 :Total coli-form and Fecal-Coli form at 8 different sample spot

Result and Discussion

Physico-chemical parameters of five sampling spot summarized in tables. The observed value is compared with various standard values like- BIS, ICMR and WHO. The ph value is in between 7.5 to 8.9. The hardness value is high for sampling spot 7 Tarimal, indicates the presence of bivalent cations. The high value of alkalinity in spot 2 indicates the high concentration of anions. The iron concentration is high in sample spot 4.The presence of heavy metal indicates the hazardous situation. As concentration is high in sampling spot2,4 and8. High value of Cd is found in sampling spot1. The concentration of iron in every sampling spots indicates Fe bacteria may present .Presence of Coli form and fecal coli form indicates the present of diseases causing bacteria.

CONCLUSION

Water is a precious gift of nature. It's our duty to keep the water sources clean. The above study indicates the presence of pollution in Kelo river water. The effluents of industries located on the bank of river, domestic waste dump by municipal corporation and pollutant sources affects the value of water quality parameters. The presence of heavy metals like As, Cd and Hg in water can cause great threat. The low DO value indicates the presence of pollutant in river water. The presence of coli form indicates the presence of disease causing micro-organism. Sampling spot x shows the high concentration value of Arsenic in monsoon season. It can be dangerous for health as Arsenic is carcinogenic in nature and can show hazardous health effects. The present study indicates the pollution level of Kelo

river water. So it is necessary to stop pollution level of river water and removal of heavy metals from river water.

REFERENCES

1. Water Pollution by V.P.Kudesia and Ritu Kudesia
Fourth Thoroughly Revised and Enlarged Edition 1998.
2. Brajesh K. Shrivastava and Masood Alam, "Nature Environment and Pollution Technology "Vol.6, PP- 609-613, 2007.
3. Metcafe and Eddy "Waste water Engineering, Treatment, Disposal Reuse" 'Tata McGraw – Hill, second edition 1979.
4. Divya, A.H., Solomon P.A.,"Procedia Technology" 24 (2016) 631-638, International conference on Emerging Trends in Engineering Science and Technology (ICETEST 2015)
5. P. Ramya, A. Jagadeesh Babu et al "A study of the study of hardness in ground water sample by EDTA tritrimetric method "International Journal of recent scientific research ,Vol.6,Issue6, pp.4504-4507,June 2015.

6. Suparna Kumar Das, Ajmer Singh Grewal, Mrityunjan Banerjee "A brief review; Heavy Metals and their analysis, volume 11, issue-1 , November-December 2011, Article-003 a.Trivedi R. K. and Goel P K , Chemical and biological methods for water pollution Studies. (Environ media, Karad, Maharashtra, India)(1986).

7. APHA. AWWA, WPCF, Standard method for the examination of water and waste water, 19 th Edn. American Public Health Association, Washington D.C.(1995).

8.Kodarkar et al, Methodology for water analysis .IAAB. Publ.2. Hyderabad (1998).

9.APHA Standard methods for the examination of water and wastewater. American Public Health Association, Washington, D.C.(1998).

10. BIS 1991, India Standard for drinking water specification IS 10500, Bureau of Indian Standard , New Delhi