

Study On Physico-Chemical Parameters and Quality Assessment of Ground Water in Janjgir-Champa District, Chhattisgarh

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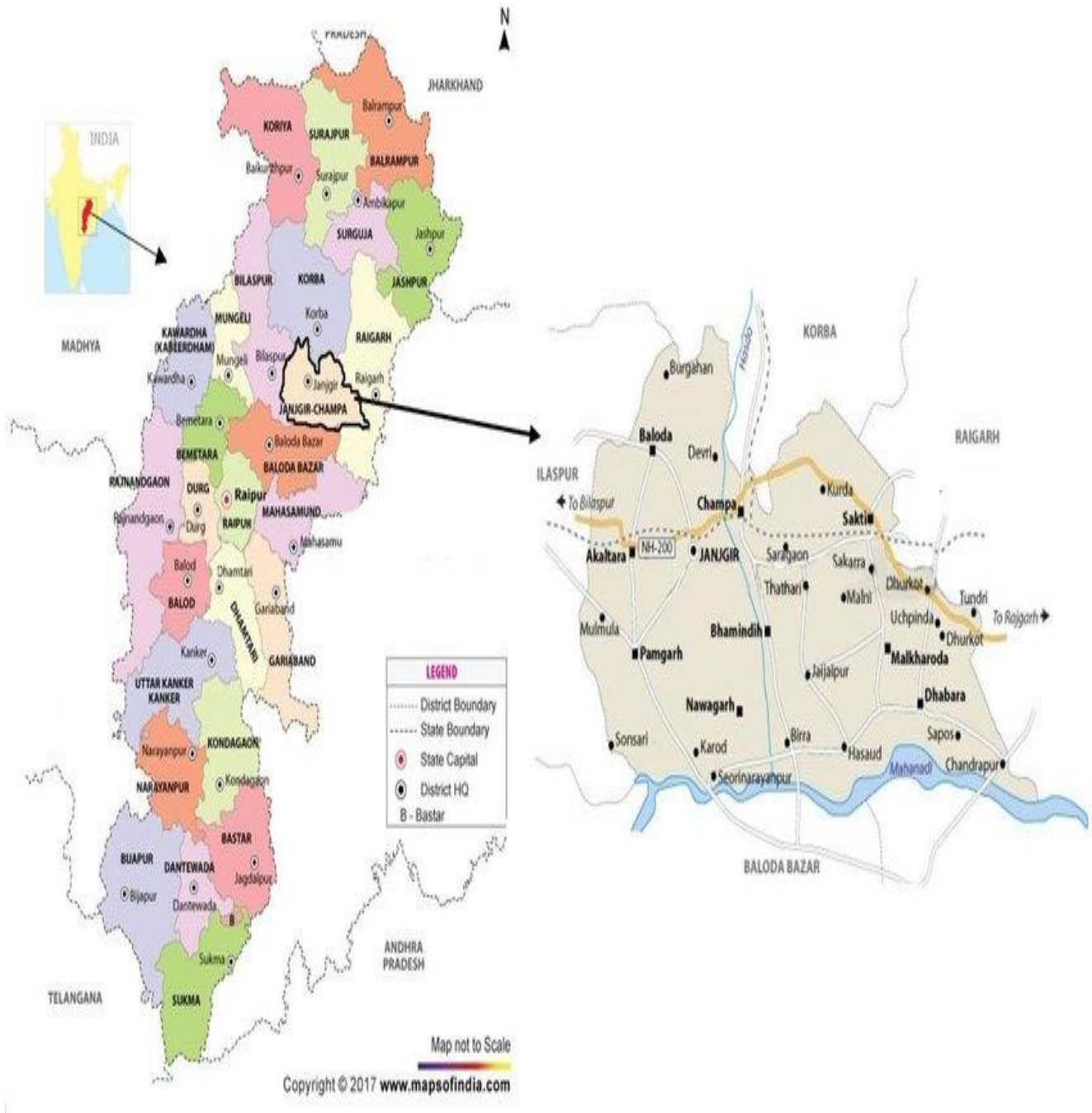
ABSTRACT :- Water is a most abundant physical substance and transparent liquid on earth. The groundwater is major source of drinking water in India. But due to rapid increasing in population, industrialization, use of fertilizers and human made activities, it is highly polluted with different harmful contaminants. Therefore it is necessary that the quality of drinking water should be checked at regular intervals like during pre monsoon and post monsoon. In the present study the groundwater samples were collected from different location of Janjgir-Champa district (Chhattisgarh) during pre monsoon and post monsoon (2022). The water quality was analyzed by different physical and chemical parameters such as PH, Total alkalinity, Total Dissolved solids (TDS), Total hardness, Chloride, Iron, Sulphate, Floride, Nitrate, DO, BOD. The results were compared with drinking water standards of Indian and World Health Organization (WHO). From the experiment it was found that the ground water samples is not polluted and can be used for drinking irrigation and domestic.

Keywords:-Ground water, physico-chemical, Assessment.

INTRODUCTION :- Water is an essential natural resource for life of human beings, plants and animals on earth. Ground water is a fundamental component of the water resources for domestic, industries and drinking purpose (Gorde S. P. et. al. 2013). Groundwater is generally less susceptible to Contamination and pollution when compared to surface water bodies (Zaman C. L. 2002). But many studies indicated that groundwater is not free from pollution. Pollution of ground water due to industrial influence and the municipal waste in water bodies. Chemical contamination of drinking water may not cause time intake may be fatal for human health and this could be reasons for the current shorter life expectancy in Chhattisgarh state and the country (Gosh M. K. et al 2013). Polluted water many disease burned like

Fluorosis, diarrhea, dysentery, typhoid hepatitis, cancer Gastroenteritis, liver intestinal infection etc. So it is necessary to analysis the extent of pollutant present in the water of this area. Groundwater is very difficult to remediate except in a small define area and therefore the emphasis has to be on prevention (Borah B. K. et al 2011). The quality of water may be described according to their Physico-Chemical and microbiological characteristics.

Study area:-



The district Janjgir-Champa is situated in the center of Chhattisgarh. Which is situated on National Highway 49. The Janjgir Champa district in Chhattisgarh is bounded by East longitudes of 82°17' to 83°19' and by North longitudes of 21°40' to 22°15' having Geographical area of 4467 Sq. km. and is surrounded

by Raigarh and Raipur district in south Bilaspur district in West Korba and Raigarh district in North and East respectively. The average rain fall 1157.1 mm (Tiwari H. and S. Shani 2021).

The present study deals with study of physico-chemical parameters of groundwater in Janjgir Champa district the analysed data were compared with standard values recommended by WHO and as per IS-10500-2012 drinking water.

MATERIAL AND METHODS :- Groundwater samples were collected from Eight different sampling sites of Janjgir-Champa district during pre and post monsoon (may-November)2022. Physico-chemical analysis of sample water was conducted in laboratory except two parameters i.e. temperature and PH which were examined at collection spot using Mercury filled glass thermometer and digital PH meter respectively (Buragohain M. et al 2009). The analysis of ground water was done using procedure of standard methods.

TABLE:-01-Chemical Parameter standard and their methods used (APHA)

S.N.	Parameters	Unit	Methods
1	Temperature	°C	Thermometric
2	pH		PH Meter
3	Turbidity	NTU	Turbidity meter
4	Total alkalinity	Mg/L	Neutralizing with Standard HCl /H ₂ SO ₄
5	TDS	Mg/L	Digital TDS meter
6	Total Hardness	Mg/L	EDTA Titrimetric Method
7	Calcium Hardness	Mg/L	EDTA Titrimetric Method
8	Magnesium Hardness	Mg/L	EDTA Titrimetric Method
9	DO	Mg/L	DO meter method
10	BOD	Mg/L	3 day incubation at 27°C and DO meter
11	Chloride	Mg/L	Argentometric Titration method
12	Fluoride	Mg/L	Spectrophotometric
13	Sulphate	Mg/L	Spectrophotometric
14	Nitrates	Mg/L	Brucine method
15	Iron	Mg/L	Spectrophotometric

The range value of each parameters consider and compare with standard values recommended by WHO and as per IS-10500-2012 drinking water.

RESULTS AND DISCUSSION :- Physico-chemical properties of ground water samples Collected from different sites.

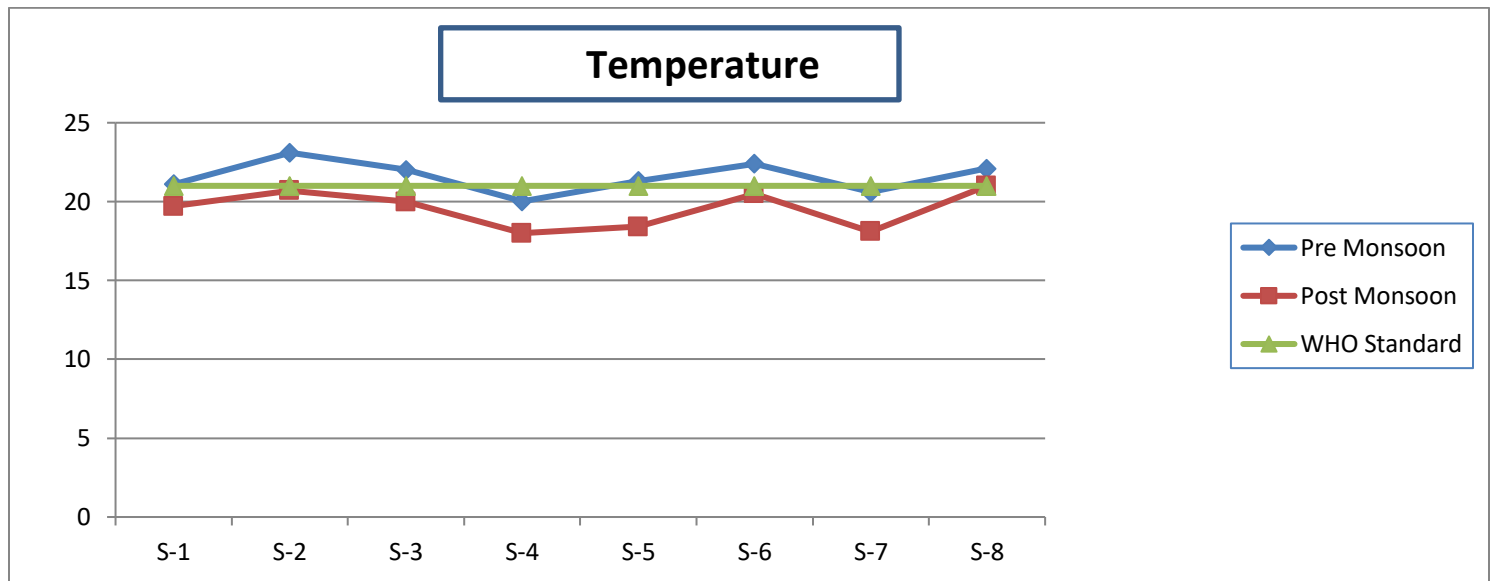
Physico-Chemical Properties of Ground water Samples Collected from Different Sites During Pre Monsoon 2022

S. N.	Parameter	WHO Standard	As Per IS-10500-2012 drinking water		Naila	Champa	Khokhara	Kera	Shivrinarayan	Khamhariya	Pithampur	Nawagarh
			Desirable Limit	Permissible Limit								
1	Temperature	15-21	-	-	21.1	23.1	22.02	20.02	21.3	22.4	20.6	22.1
2	pH	6.5-8.5	6.5-8.5	6.5-8.5	7.55	7.48	7.18	7.16	7.18	7.24	7.38	7.2
3	Turbidity	5	1	5	0.94	3.32	1.73	4.15	1.28	2.2	8.33	1.95
4	Total alkalinity	30-500	200	600	191	220	132.2	126	112	120	488	138
5	TDS	1000	500	2000	497	516	350	334	289	320	303	366
6	Total Hardness	500	200	600	221	283	159.1	140.7	137	149	285	171
7	Calcium Hardness	200	75	200	64.4	99	32.7	30.61	70.8	31.1	106	37.6
8	Magnesium Hardness	50	30	100	14.7	8.85	18.83	15.62	22.5	17.4	25.9	18.8
9	DO	4	-	-	5.68	4.33	5.34	6.5	7.5	5.8	4.64	7.46
10	BOD	2	-	-	1.78	1.23	1.56	1.60	1.96	1.65	2.20	1.70
11	Chloride	250	250	1000	84.6	118	62.98	66.77	39.5	56.2	194	57.2
12	Fluoride	1.5	1	1.5	0.31	0	0	0	0.04	0	0.94	0
13	Sulphate	400	200	400	82	0.67	0.15	1.15	0.85	1.12	219	0.06
14	Nitrates	40-50	45	No relaxation	8.5	0.03	0.0	0.90	0.24	0.06	26.9	0.03
15	Iron	2.0	1.0	No relaxation	0.3	0.1	0.0	0.1	0.1	0.1	0.31	0.0

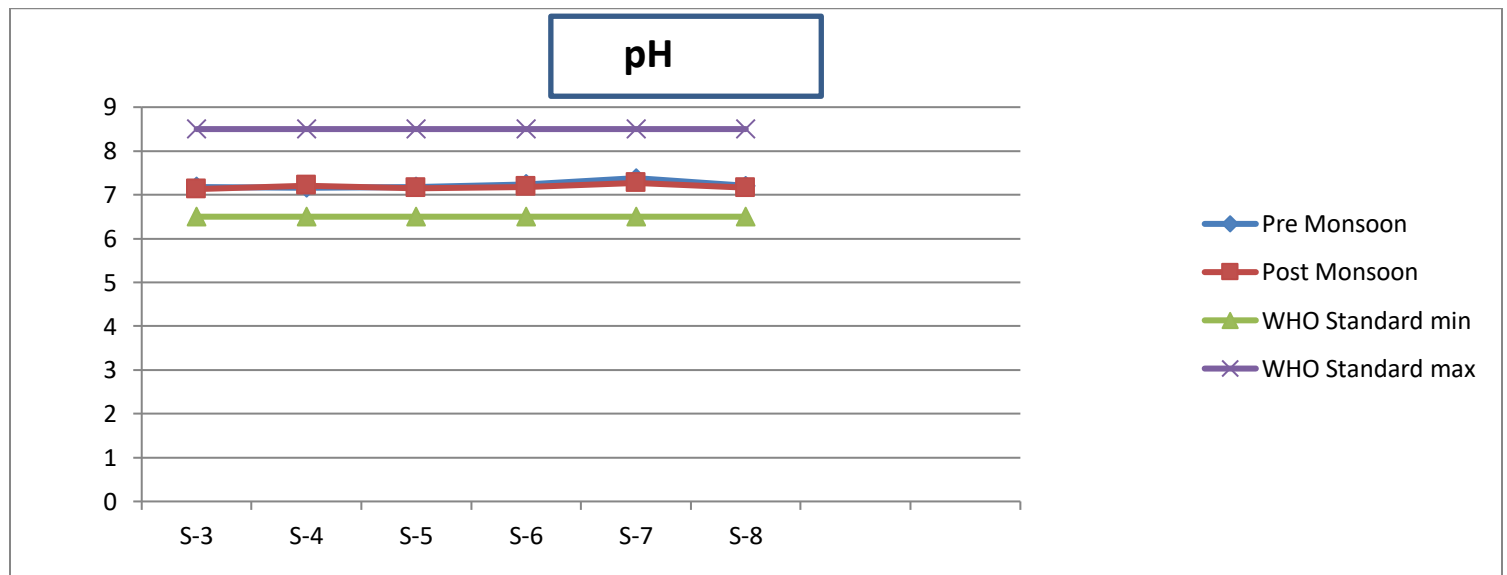
Physico-Chemical Properties of Groundwater Samples Collected from Different Sites During Post Monsoon 2022

S.N.	Parameter	WHO Standard	As Per IS-10500-2012 drinking water		Naila	Champa	Khokhara	Kera	Shivrinarayan	Khamhariya	Pithampur	Nawagarh
			Desirable Limit	Permissible Limit								
1	Temperature	15-21	-	-	19.7	20.7	20	18	18.4	20.5	18.1	21
2	pH	6.5-8.5	6.5-8.5	6.5-8.5	7.43	7.66	7.1	7.21	7.15	7.18	7.27	7.16
3	Turbidity	5	1	5	0.54	3.1	1.3	3.91	0.98	2.31	7.25	1.2
4	Total alkalinity	30-500	200	600	186	198	123	113	92.3	111	429	127
5	TDS	1000	500	2000	312	427	267	298	258	311	289	348
6	Total Hardness	500	200	600	217	256	148	127	125	134	268	162
7	Calcium Hardness	200	75	200	56.3	82.8	29	22.8	15.6	28.3	95.2	31.2
8	Magnesium Hardness	50	30	100	12.2	6.8	15	13.4	17.3	12.6	18.3	14.6
9	DO	4	-	-	5.34	4.91	5.12	6.01	7.2	4.9	4.38	7.12
10	BOD	2	-	-	1.27	.98	1.12	1.23	1.65	1.40	2.15	1.45
11	Chloride	250	250	1000	67.3	109	58	61.3	33.2	40.8	188	53.1
12	Fluoride	1.5	1	1.5	0.2	0	0	0	0.04	0	0.94	0
13	Sulphate	400	200	400	75	0.43	0.1	0.8	0.37	0.75	202	0.02
14	Nitrates	40-50	45	No relaxation	7.2	.01	0.0	0.40	0.12	0.02	23.00	.01
15	Iron	2.0	1.0	No relaxation	0.1	.03	0.0	0.06	0.03	0.07	0.25	0.0

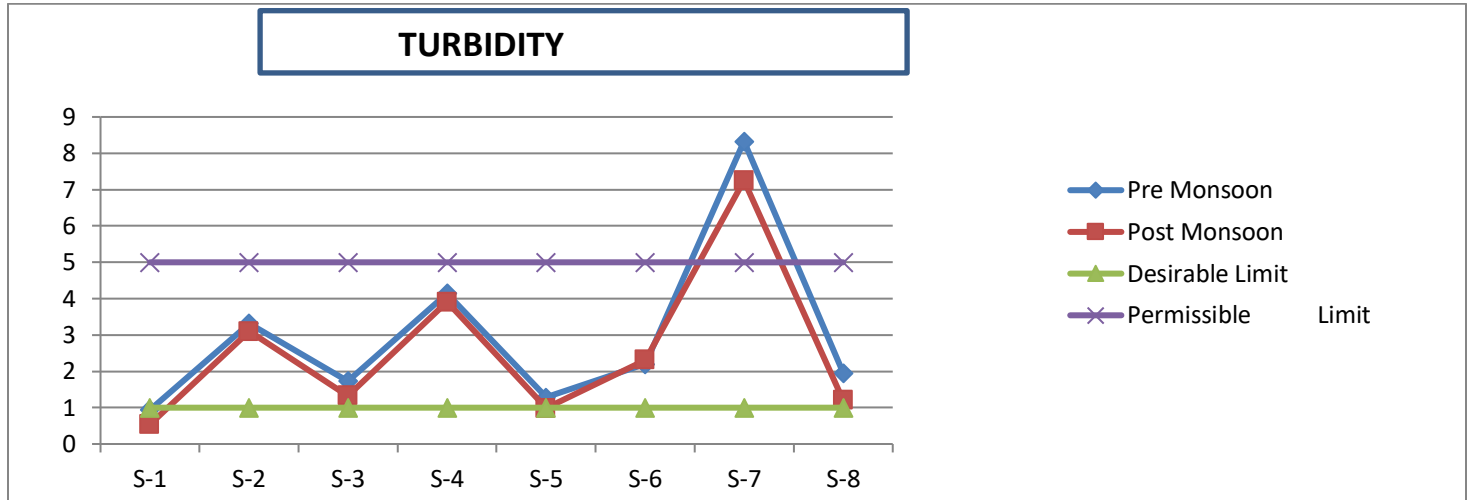
Temperature: - The temperature was found ranged in pre monsoon 20.02 to 23.12 and post monsoon 18.01 to 21.02. During the present investigation there was no great difference between the temperature of different location in Janjgir-champa district.



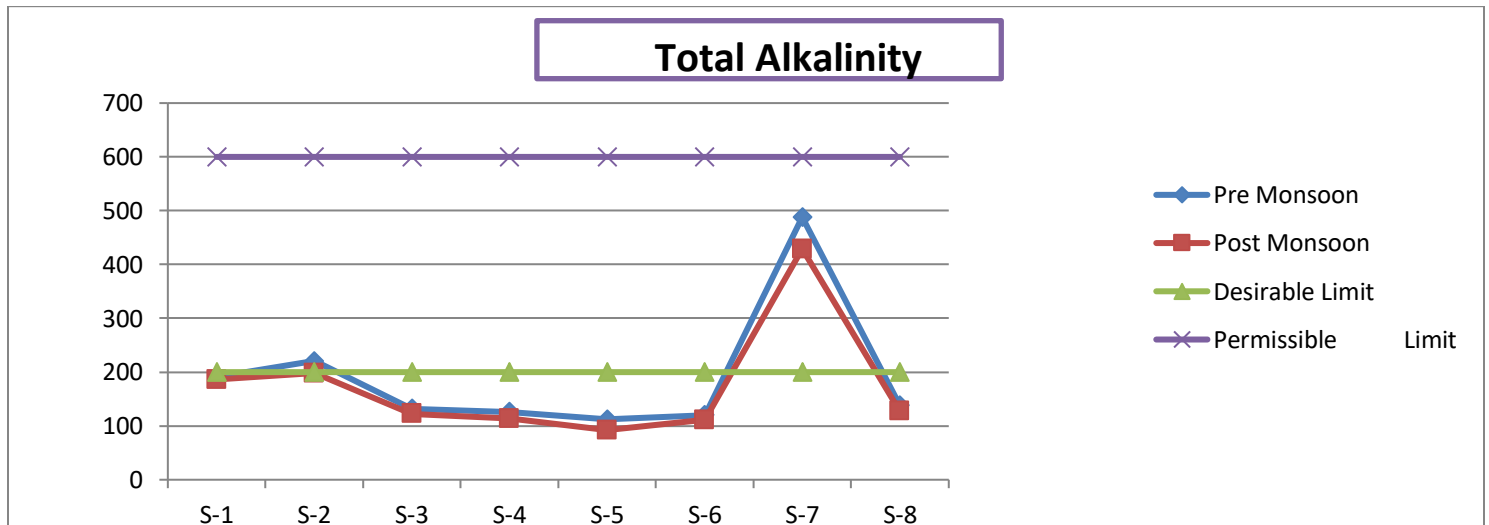
PH:-PH value of natural water changes due to biological activity and industrial contamination. PH of the samples was in the range from 7.16 to 7.55 in pre monsoon and 7.15 to 7.66 in the post monsoon.



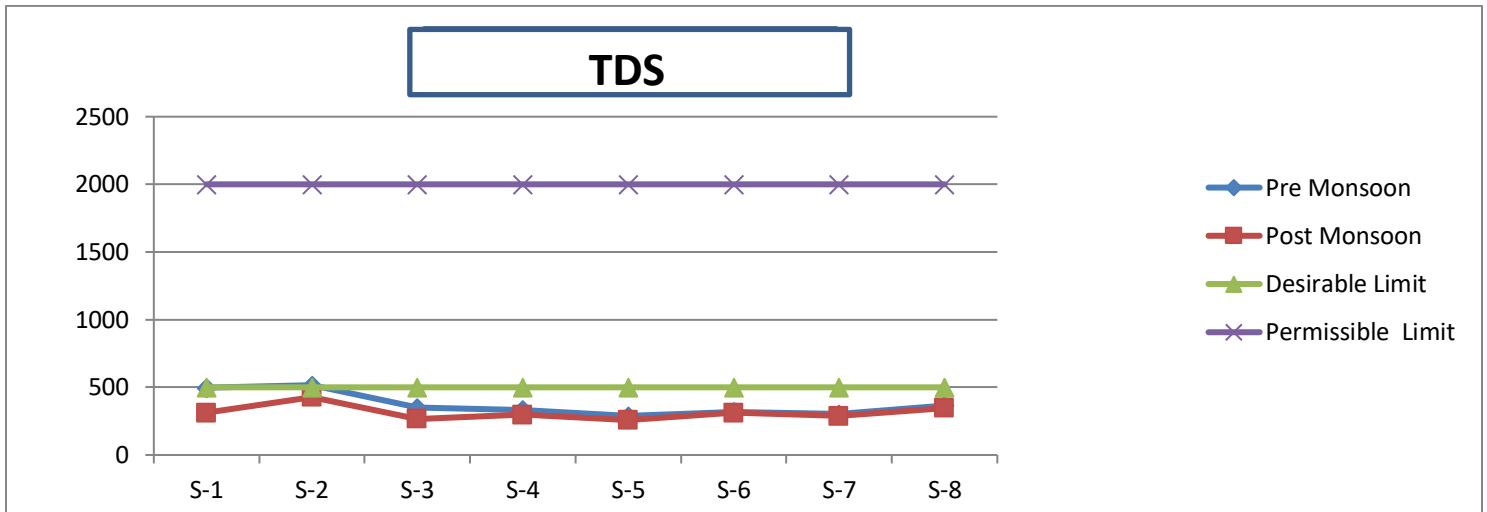
Turbidity:-Turbidity of the samples in the range of 0.94 to 8.33 NTU in pre monsoon and 0.54 to 7.25 NTU in post monsoon. Turbidity in Pithampur have found more than permissible limit.



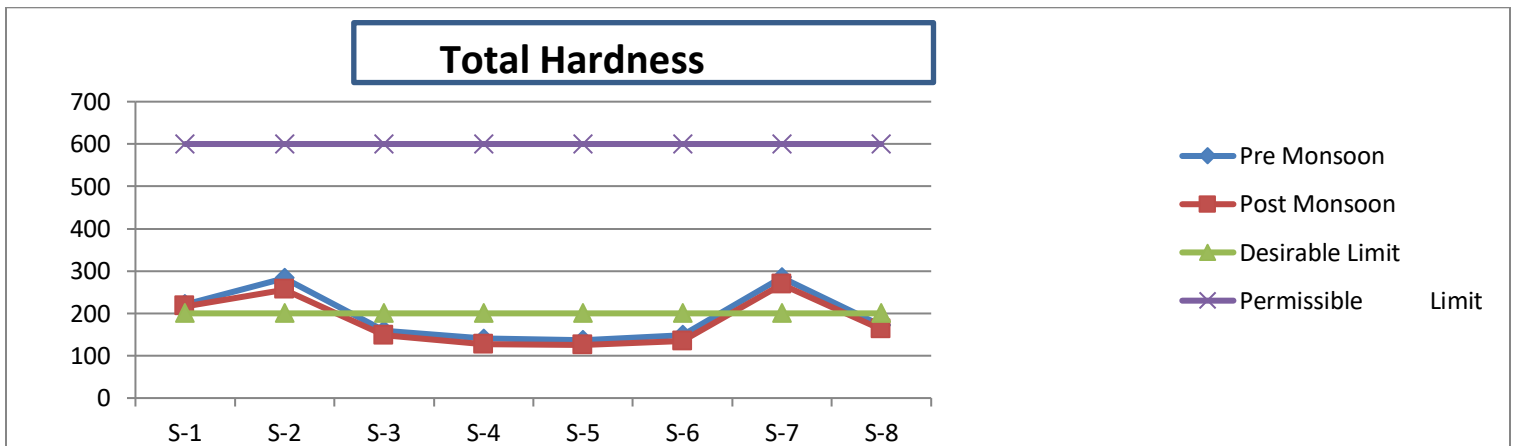
Total alkalinity:-The variation of total alkalinity is range 112.29 to 220.41 in pre monsoon and 92.3 to 198.2 in post monsoon. All samples have within the permissible limits.



TDS:- TDS of the sample in different location in the range of 302.6 to 516 in pre monsoon and 258 to 427 in post monsoon.

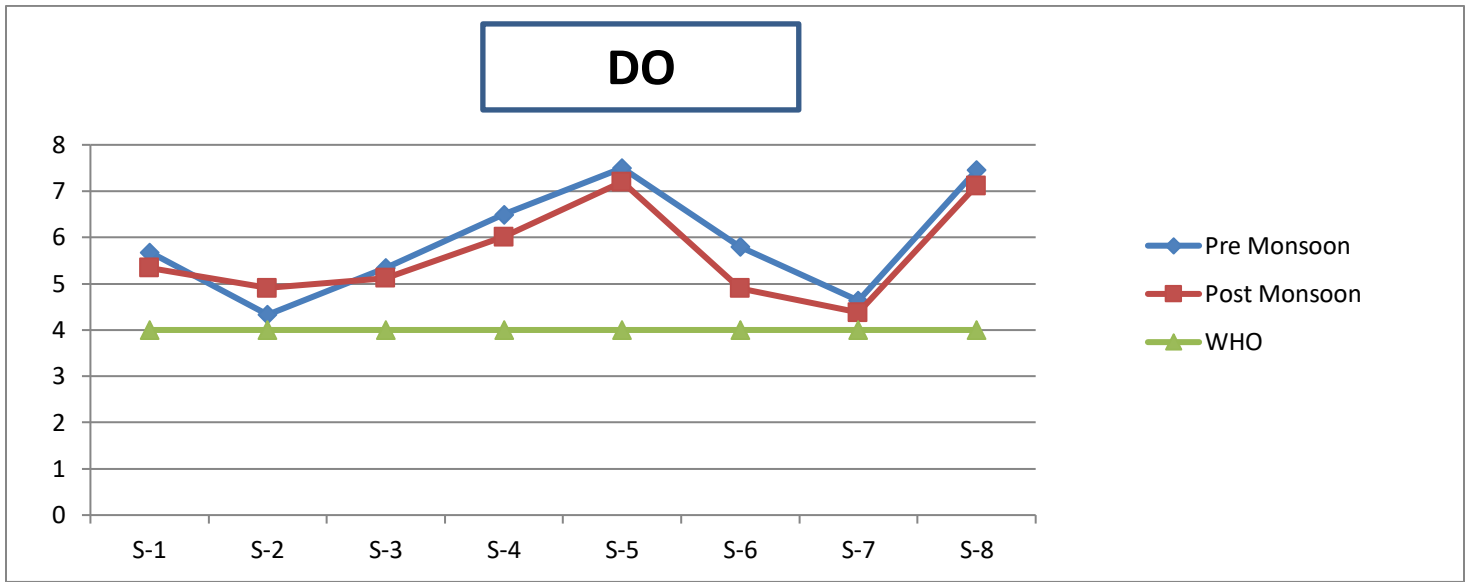


Total hardness:-The value of total hardness is range 136.68 to 284.6 in pre monsoon and 125.4 to 268.2 in post monsoon.

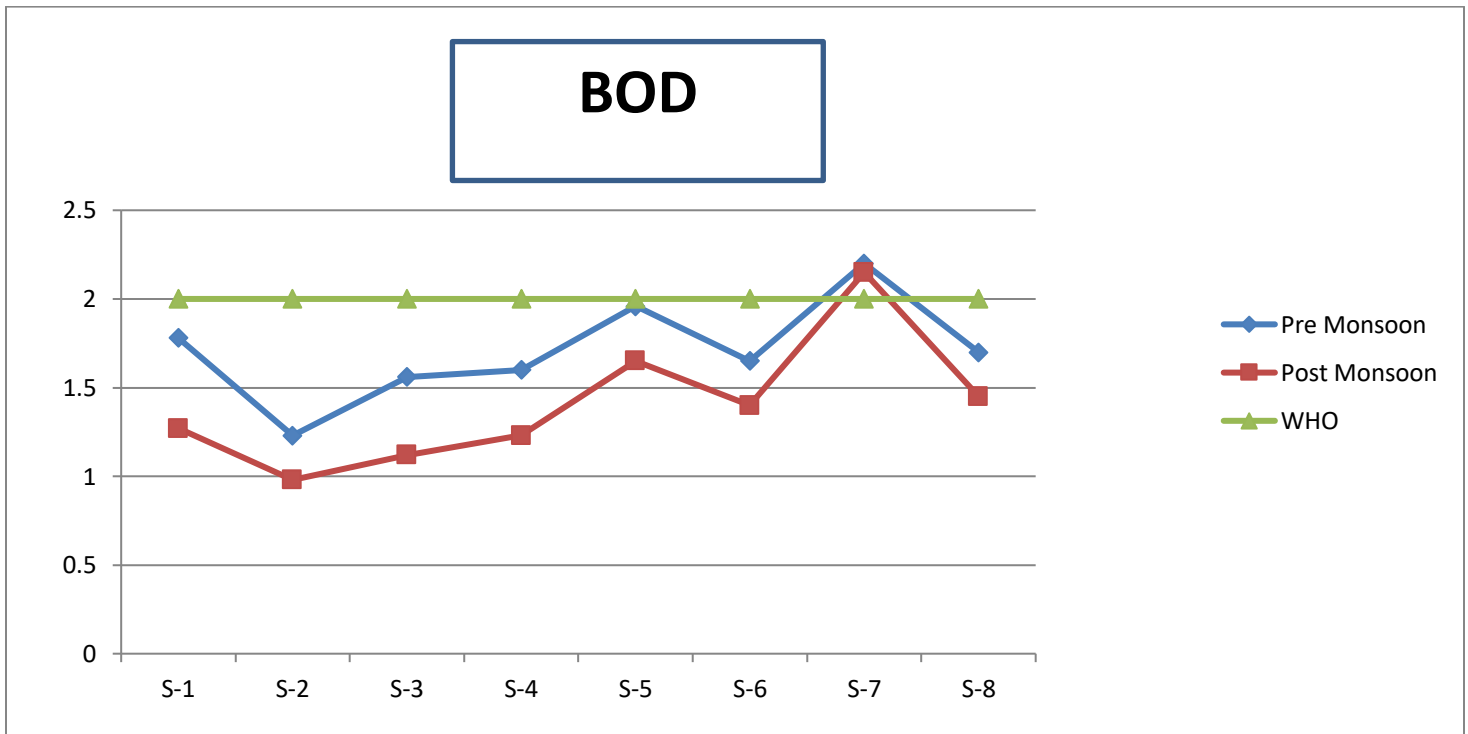


Calcium and Magnesium Hardness:- Calcium value obtained in pre monsoon 30.61 to 106.33 and magnesium is 8.85 to 25.9. In post monsoon calcium value is range 15.6 to 95.2 and the magnesium value 6.8 to 18.3.

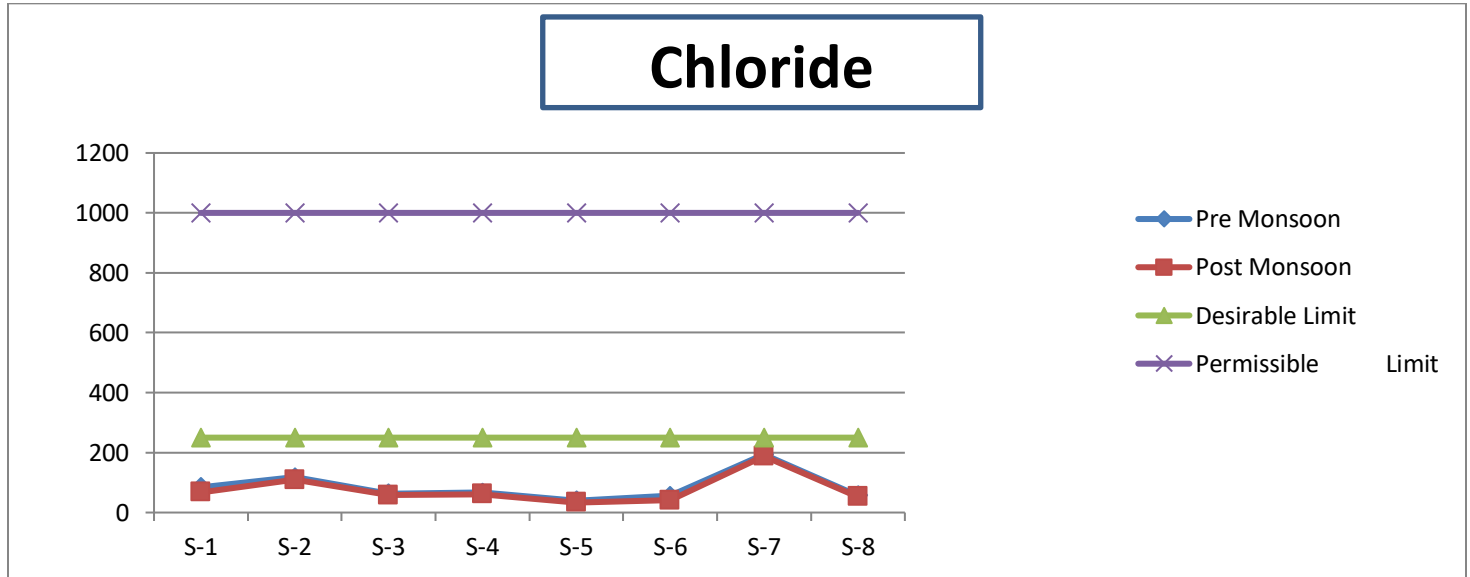
DO:-Dissolve oxygen is very important parameter of water quality and an index of physical and biological process going on water. The range value of DO in pre monsoon 4.33 to 7.5 and 4.91 to 7.02 in post monsoon. This show that the DO above the permissible limit is good for health.



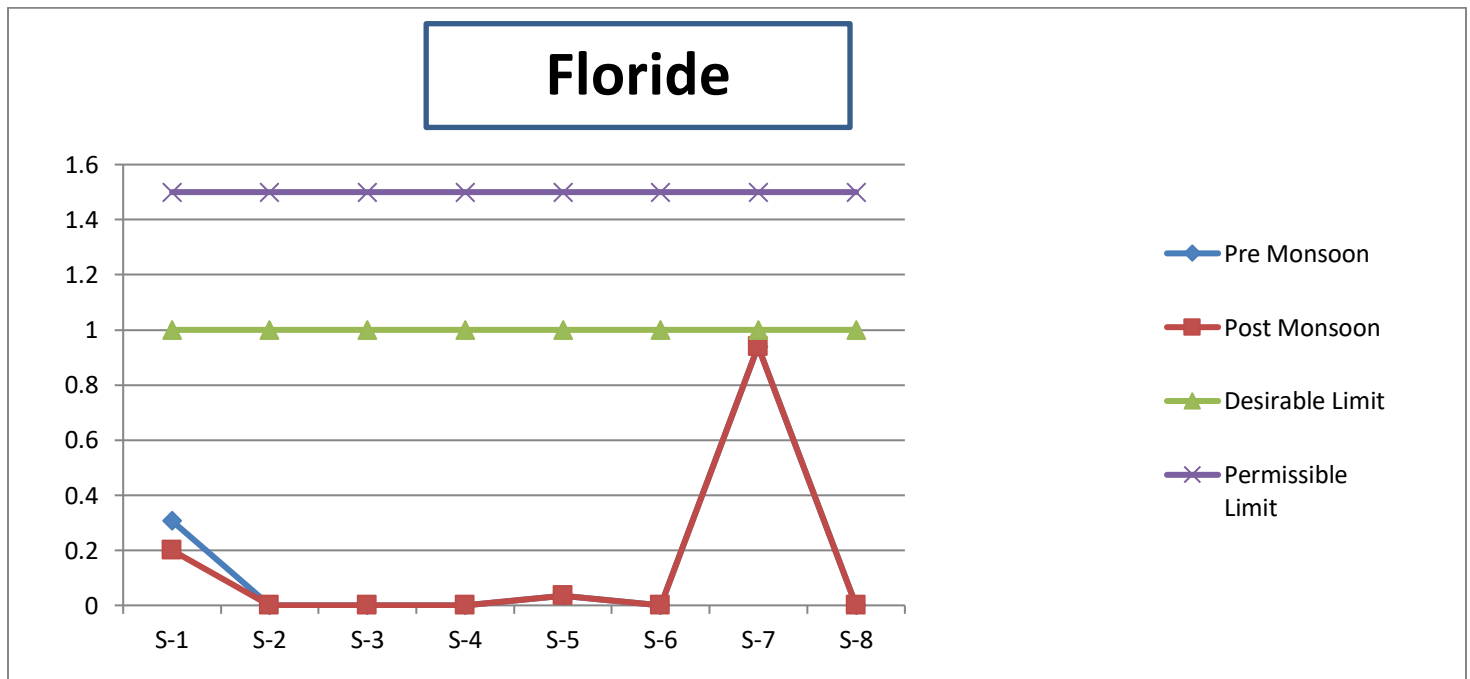
BOD:- The range value of BOD 1.23 to 2.20 in pre monsoon and 0.98 to 2.15 in post monsoon. The result indicates that the value of only S-7 was above the permissible limit.



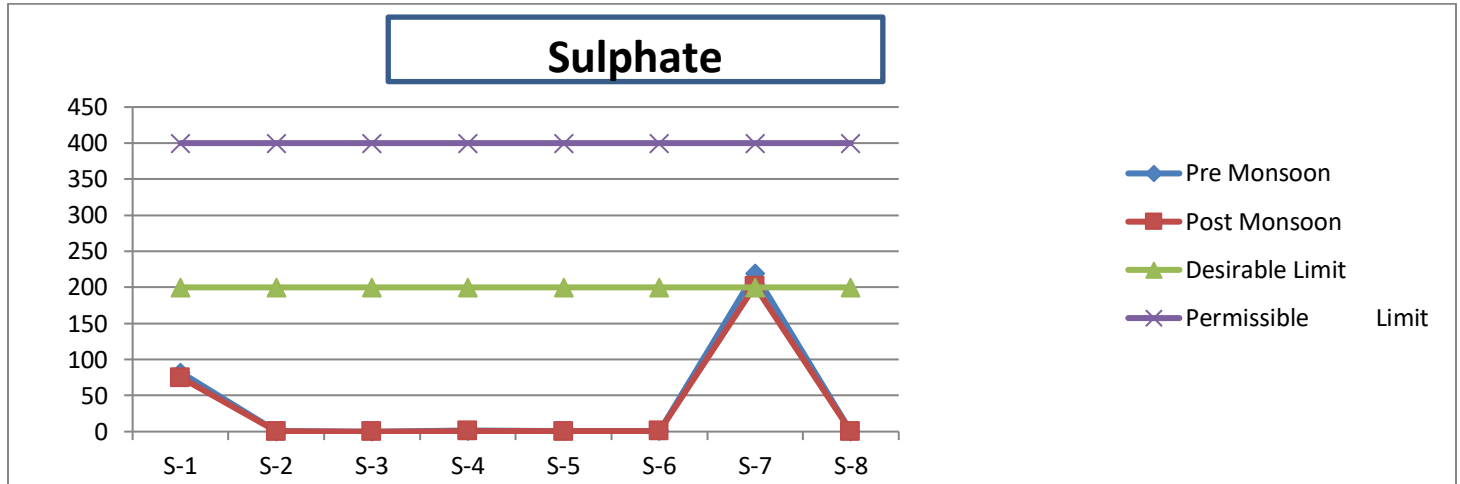
Chloride :-The high concentration of chloride is considered to be an indication of population due to high organic waste of animal origin. Chloride values obtained in pre monsoon 39.48 to 193.8 and 33.2 to 188.2 in post monsoon .In all samples chloride value below the desirable limit.



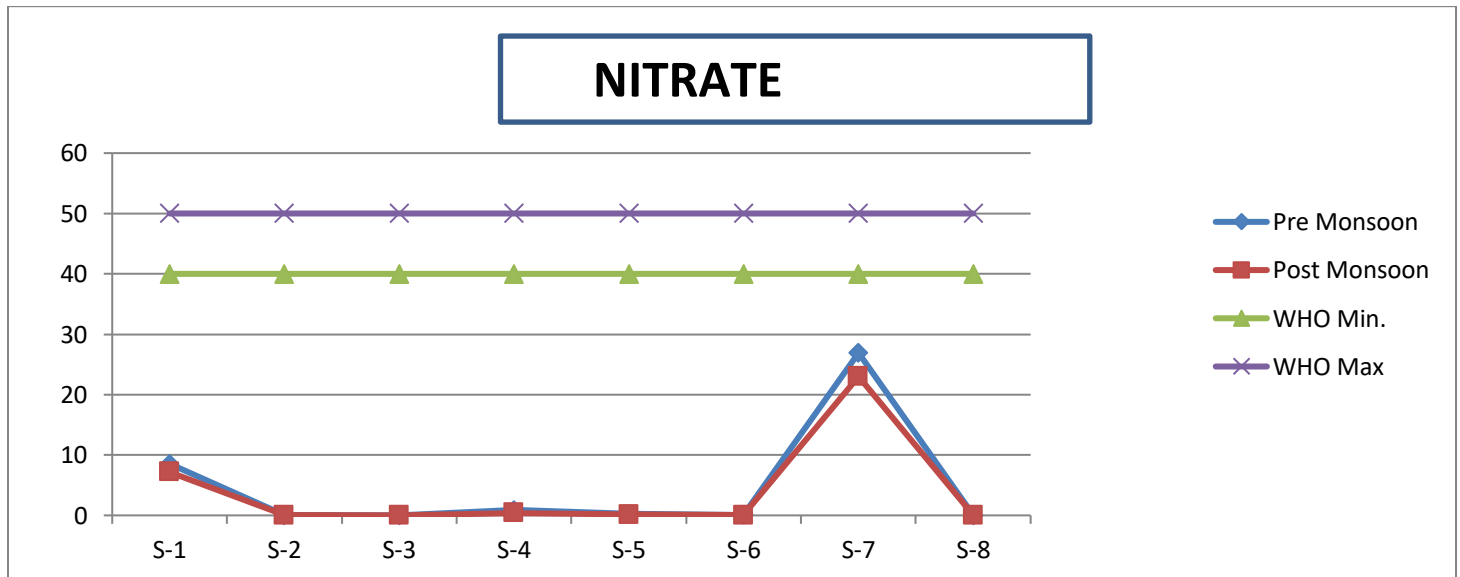
Fluoride:- Fluoride is present in S-1, S-5 and S-7 in range 0.035 to 0.94 in pre monsoon and 0.012 to 0.65 in post monsoon. The value of fluoride in sample S-2, S-3 ,S-4, S-6 and S-8 is zero.



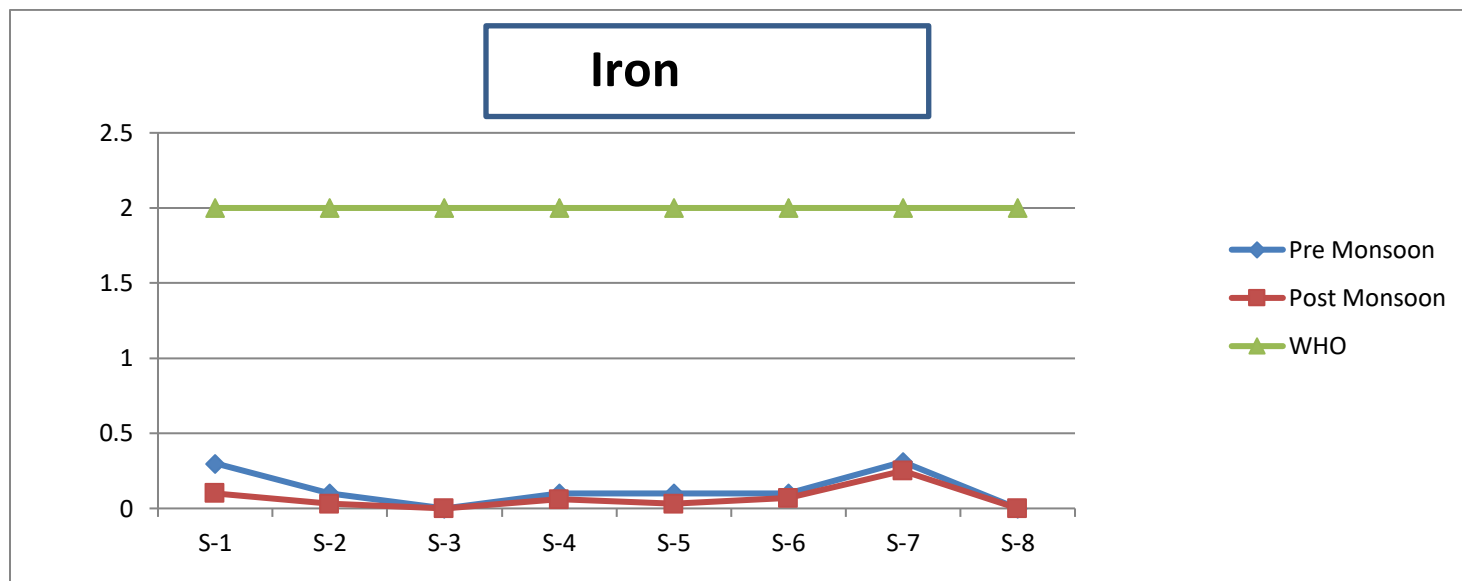
Sulphate:- sulphate is present in the range of 0.06 to 219.3 in pre monsoon and 0.02 to 202 in post monsoon. All sample are within the permissible limit.



Nitrate:- Nitrate is present in the range of 0.03 to 26.99 in pre monsoon and 0.01 to 23.00 in post monsoon. In S-3 (Khokhara) nitrate value is zero and Other all samples below the permissible limit.



Iron:- The value of iron is 0.1 to 0.31 in pre monsoon and 0.03 to 0.25 in post monsoon. S-3, S-8, iron value is zero. All values of iron within the permissible limit.



CONCLUSION:- We have taken pre monsoon and post monsoon monitoring of ground water in eight sampling spots S-1 to S-8 in Janjgir-champa district of Chhattisgarh. From the result of experiment it may be concluded that the ground water no crossed the maximum permissible limit recommend by WHO and as per IS-10500-2012 drinking water. In Pithampur (S-7) turbidity and BOD is higher than standard value. Chloride and fluoride in all samples are below the desirable limit.

In this present investigation it was found that water samples were not at the label of pollution. So this ground water satisfy the requirement for the use in various purposes.

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REFERENCES:-

1. Gorde S.P. and Jadhav M.V. "Assessment of water quality parameters": Journal of Engineering Research and Application, 3(6), 2029-2035(2013).
2. Zaman C. L. "A Nested case control study of Methemoglobinemia Risk factor in children of Transylvaniya, Romania" Env. Health perspt. Vol.110(B).2002.
3. Ghosh M.K. "Study of water quality index to Assess Physico-chemical parameters of Ground Water of Durg city", Chhattisgarh, India. The journal of Energy and Environmental Science. Photon 127, 240-247 . (2013).

4. Borah B.K. and H. P. Sarma hand R. Roy, National. Environmental Pollution Tech., 10(1).73, (2011).
5. Tiwari H. and S. Shani. International journal of Aquatic science ISSN: 2008-8019, Vol 12. Issue 03. 2021.
6. WHO, International standards for drinking water 3rd Ed. Geneva (1971).
7. Buragohain M., B. Bhuyan and H.P. Sharma, Environ, Monit. Assess 170:pp, 345,20098.ISI., 1993. Specification for drinking water IS: 10500, New Delhi.
8. Manual on water and Waste water analysis NEERI Publication, 1998.
9. ISI., 1993. Specification for drinking water IS: 10500, New Delhi.
10. World Health Organization (WHO) ,1993. Guideline for Drinking-water Quality (vol1).
2nd edition ., World Health Organization, Geneva, ISBN:10: 9241545143, PP: 36.
11. Welch Limnology 2nd Ed. Mc Graw Hill Book Co.New Yark. 1952.
12. APHA, "Standard method for examination of water and waste and waste water", American Public Health Association, Washington, D.C. 1989.