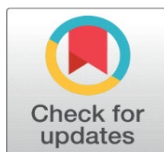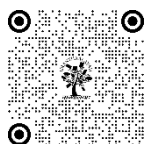# EVALUATING THE GROUNDWATER QUALITY IN THE SATNA DISTRICT'S RAM NAGAR, RAGHURAJ NAGAR, AND RAMPUR BAGHELAN TAHSILS FOR BOTH DRINKING AND IRRIGATION PURPOSES IN MADHYA PRADESH

Manish Kushwaha[1] ✉ , Dr. R.L.S. Sikarwar[2]

[1] Research scholar, Department of Environmental science, AKS University, Satna.
[2] Professor, Department of Environmental Science, AKS University, Satna

Corresponding Author
Manish Kushwaha,
manishkushwaha2@gmail.com

ABSTRACT

This study also shows seasonal variations in the quality of the water and a little increase in a few chosen metrics when pre- and post-monsoon data were compared. It suggests that in the ensuing years, a few parameters might surpass the maximum amount of contamination. In present study underground water quality of some selected region at Satna district on the basis of selected parameters like PH, Temperature, Electrical Conductivity, Total hardness, TDS, BOD, NO3-, SO4-2, PO4-3, Cl-, F-, HCO3-, Mg++, K+, Alkalinity, E. coli and Alge. It was observed that underground water quality in selected area is not bad for drinking, domestic and agriculture purposes. Subsurface water quality in a few chosen regions of Satna district is currently being studied. Selected metrics, including temperature, electrical conductivity, total hardness, TDS, BOD, NO3-, SO4-2, PO4-3, Cl-, F-, HCO3-, Mg++, K+, alkalinity, E. coli, and algae, are taken into account. It was found that the subsurface water quality in a chosen location is suitable for residential use, drinking, and agricultural uses. This study also express seasonal variation of water quality and slight increment in some selected parameters were observed when data of pre mansoon and post mansoon compared. It indicates that some parameter may cross maximum contamination level in next upcoming years. This study also shows seasonal variations in the quality of the water and a little increase in a few chosen metrics when pre- and post-monsoon data were compared. It suggests that in the ensuing years, a few parameters might surpass the maximum amount of contamination.

Keywords: Underground water, electrical conductivity, total hardness, Alkalinity.

1. INTRODUCTION

I discovered that potable water in the tehsil Ramnagar, Rampur Baglan of Satna district and Raghurajnagar has several decaying compounds that are harmful to both human and animal life, or that irrigation issues are widespread there. Since it has no substitute, water is referred to as "life". It has been acknowledged that water is the essence of life. Every living thing, including people, animals, and plants, depends on it to survive. 60–95 percent of its bodies are submerged in water. Water performs important role in the universe's biological activities. Water is necessary for biological activities, and while one can exist without food for nearly two months, one cannot survive without it for three to four days. Water supply and culture are almost synonymous, as per the history of human civilization. Due to climatic changes, various towns and societies have vanished due to water shortages. The first civilization arose near river valleys because water was the only resource available to meet human needs the history of human civilization suggests that water availability

and culture are almost synonymous. Water shortages brought forth by climate change have caused the disappearance of several communities and societies.

Water is known as "life" since it has no alternative. Water has been recognised as the very core of life. All living organisms, including plants, animals, and individuals, use it for existence. Water covers 60-95 percent of its bodies of all plants, insects, livestock, and humans. Sweat, excreta, urine, and vapour are all ways that water is produced. As a result, all living things need a large amount of water on a regular basis. Moreover, a large amount of water is needed for body growth and nutrition. As a result, thinking about life without water is ridiculous. However, like any other natural resource, our water supply resources are limited and it will be drained within a century. An essential part of the biological activity in the universe is played by water. While one may live without food for almost two months, one cannot survive without it for more than three to four days. Water is essential for biological activity.

I found myself in tehsil Ramnagar, Rampur Raglan and Raghurajnagar of Satna district that potable water contains a number of decomposing substances which are detrimental to human life and animal life, or that it is facing a lot of problems in irrigation.

Ground water is major source of drinking, domestic and industrial purposes not only in Satna district of Madya Pradesh but also in all most of popular industrial state of India [10]. Most of the area of Satna district is still untouched for evaluation of water quality. In present study some are were selected for study purpose and evaluated water quality on selected parameters in pre mansoon, monsoon, and post monsoon season. It was observed that water quality in this selected area is not very bad for drinking and domestic purposes. For industrial purpose treatment is necessary as per requirement of industry. Since water was the sole resource accessible to support human requirements, the first civilization developed around river valleys.

2. MATERIALS AND METHODS
SELECTION OF SAMPLE SITES
On the basis of literature survey following sample sites in Satna region was selected for this study. Only those selected places were chosen where no such type of study has ever been till date. Samples were collected during monsoon, pre-monsoon and post monsoon in every year from 2019 to 2020.The Satna region' like Ramnagar, Rampur Baghelan and Raghurajnagar sample sites were chosen for this study based on a review of the literature. Only those locations that have never before seen this kind of research were chosen. Every year between 2019 and 2020, samples were taken during the monsoon, pre-monsoon, and post-monsoon.

ANALYSIS OF WATER SAMPLES
Water samples were subjected to conventional techniques as outlined in APHA (1995) for analysis based on selected parameters, including PH, temperature, electrical conductivity, total hardness, TDS, BOD,NO3-, SO4-2, PO4-3, Cl-, F-, HCO3-, Mg++, K+, alkalinity, E. coli, and algae. Pre-, man-, and post-monsoon water sample collection was conducted in 2020 using pre-selected sampling sites and 250 ml polypropylene bottles in Satna district's Ramnagar, Rampur Baghelan and Raghurajnagar Tehsil.

Collection of water samples was done from selected sampling sites in 250 ml polypropylene bottle in pre mansoon, mansoon and post mansoon of year 2020. Water samples were analyzed on the basis of selected parameters viz. PH, Temperature, Electrical Conductivity, Total hardness, TDS, BOD, NO3-, SO4-2, PO4-3, Cl-, F-, HCO3-, Mg++, K+, Alkalinity, E. coli. and Alge by following standard methods as prescribed in APHA (1995).

S.N.	Selected Area and Sample sites		Type of water source	Use	Code
1	Amarpatan	Govt. H.S. School	Bore well	Public	AP1
		P.H. C.	Bore well	Public	AP2
		Tahsil HQ	Hand pipe	Public	AP3
2	Ramnagar	Govt. H.S. School	Bore well	Public	RN1
		P.H. C.	Bore well	Public	RN2
		Tahsil HQ	Bore well	Public	RN3
3	Nagod	Govt. H.S. School	Hand pipe	Public	ND1

#	Area	Site	Source	Type	Code
		P.H. C.	Bore well	Public	ND2
		Tahsil HQ	Bore well	Public	ND3
4	Raghuraj Nagar	Govt. H.S. School	Bore well	Public	RJ1
		P.H. C.	Bore well	Public	RJ2
		Tahsil HQ	Bore well	Public	RJ3
5	Sohawal	Govt. H.S. School	Bore well	Public	SL1
		P.H. C.	Hand pipe	Public	SL2
		Tahsil HQ	Bore well	Public	SL3
6	Rampur Baghelan	Govt. H.S. School	Bore well	Public	RB1
		P.H. C.	Bore well	Public	RB2
		Tahsil HQ	Bore well	Public	RB3
7	Unchehara	Govt. H.S. School	Bore well	Public	UA1
		P.H. C.	Bore well	Public	UA2
		Tahsil HQ	Bore well	Public	UA3
8	Maihar	Govt. H.S. School	Bore well	Public	MH1
		P.H. C.	Bore well	Public	MH2
		Tahsil HQ	Bore well	Public	MH3

Table: 1 list of Selected Area and Sample site and types of water source.

3. RESULT AND DISCUSSION

The results obtained for selected parameters are given in table2, 3, 4. For pre mansoon, and post mansoon. It was observed that PH was under limit at every sampling site and exhibited variation between 6.5 – 7.8 PH values. In monsoon highest PH was recorded while minimum value obtained in pre and post monsoon at specific sites. Electrical conductivities as well as TDS were increased in monsoon comparable to pre and post monsoon results. Alkalinity, hardness, NO_3^-, SO_4^{-2}, PO_4^{-3} were under maximum contamination level in each season but most of parameter expressed higher values in rainy season. Bicarbonate, fluoride, chloride, magnesium, potassium, alkalinity exhibited variation in results and their higher concentration in rainy season due to dissolution of minerals from soil in slight acidic rain water. Concentration of fluoride in each season expressed reason for lack of fluorosis disease in the people of concern area. Alge were not detected at any sampling sites wile E. Coli were detected with acceptable most probable number (MPN).

ANALYSIS OF WATER SAMPLES: Water samples were analyzed on the basis of following parameters:

Sample Site Code	April 2020 (Pre mansoon)																
	Parameters																
	PH	EC MicroS/cm	TH Ppm	TDS Ppm	BOD 5day	TEMP °C	NO3- Mg/L	ALKAL-INTY ppm	K+ ppm	PO4-3 ppm	Cl ppm	SO4 ppm	F Mg/L	HCO3	Mg	E.coli MPN/100	Alge
AP1	6.8	876	221	643	3.4	30.2	2.45	167	45	1.45	38	154	1	126	67	1	ND
AP2	6.9	855	217	638	3.2	29.1	4.65	178	43	2.65	36	142	0.9	135	62	1	ND
AP3	6.9	870	222	645	3.6	31	2.41	173	48	1.56	32	142	1.1	132	71	1.1	ND
RN1	7.1	869	215	643	3.2	29.5	4.94	164	45	2.81	37	143	1	142	69	0.9	ND
RN2	6.7	856	219	639	3	30.1	4.82	163	46	2.54	39	141	1	134	70	0.9	ND
RN3	6.5	832	222	634	3.1	29.8	3.34	152	45	2.32	36	151	1.1	140	68	1	ND
ND1	6.7	845	265	630	3.2	30.8	4.61	165	44	2.45	35	142	1	133	66	0.8	ND
ND2	7	838	250	632	3.1	30.3	4.5	156	44	2.65	32	146	1.1	132	69	1	ND
ND3	6.9	851	249	644	3	30.4	4.74	172	46	2.7	37	138	1	139	65	1	ND
RJ1	7.1	846	240	634	3.2	30.7	2.21	174	43	1.74	36	132	1.1	141	66	1.2	ND

Evaluating the groundwater quality in the Satna district's Ram Nagar, Raghuraj Nagar, and Rampur Baghelan tahsils for both drinking and irrigation purposes in Madhya Pradesh

	PH	EC	TH	TDS	BOD	TEMP	NO3	ALK	K+	PO4	Cl	SO4	F	HCO3	Mg	E.coli	Alge
RJ2	6.5	843	248	652	3.1	29.4	4.91	160	44	2.65	36	144	1	142	70	1	ND
RJ3	7	836	244	648	3	30.1	4.27	174	46	2.78	34	137	1	132	69	0.8	ND
SL1	6.9	839	241	637	2.9	31	4.12	165	49	2.06	35	132	1.1	140	68	1	ND
SL2	6.9	835	252	632	2.6	30.6	4.62	154	50	2.31	40	131	0.9	133	71	1	ND
SL3	6.8	846	250	641	2.7	29.8	4.4	171	45	2.2	39	132	0.8	141	69	1.1	ND
RB1	6.1	848	248	649	3.2	31.1	4.18	174	42	2.09	41	142	1	130	68	1.2	ND
RB2	6.3	839	240	644	3.6	30.5	4.62	152	43	2.31	36	146	1	141	66	1.3	ND
RB3	6.7	821	252	643	3.8	31.3	2.23	173	46	1.11	38	142	1.2	133	67	1.1	ND
UA1	6.4	849	249	641	2.9	32.6	4.55	154	45	2.27	34	132	1.2	135	69	1.1	ND
UA2	6.8	848	246	638	2..8	31.4	4.94	169	45	2.47	36	131	1.1	142	68	0.8	ND
UA3	7.2	843	245	636	3.2	30.8	2.14	162	44	1.07	37	137	0.8	142	70	0.9	ND
MH1	6.6	865	251	639	3.3	31.2	3.01	156	49	1.5	39	139	1	137	68	1.1	ND
MH2	6.8	866	250	645	3.4	30.6	4.92	163	51	2.46	38	146	0.9	132	68	1.2	ND
MH3	6.6	859	247	641	3.7	30.3	4.45	157	49	2.42	39	138	0.9	140	67	1.2	ND

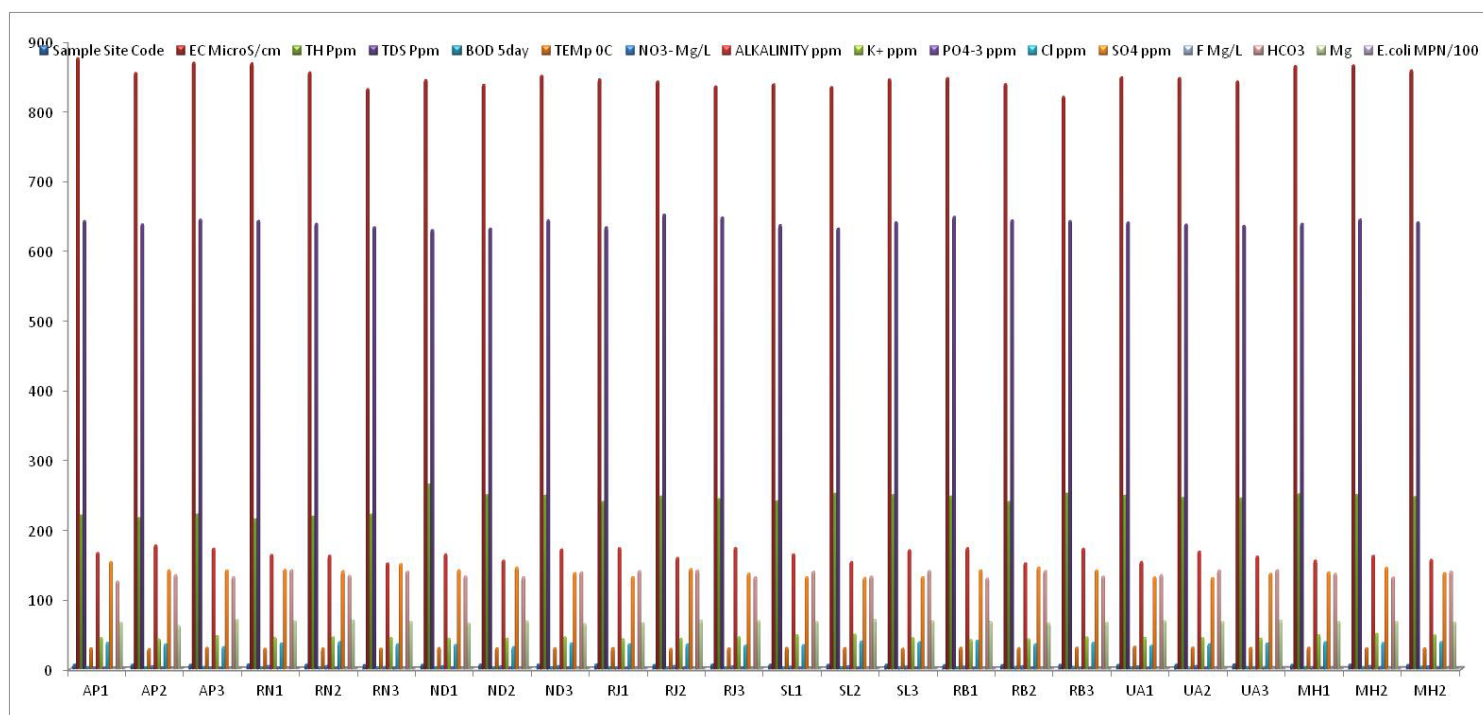**Table: 2 list of Aprils 2020 (Pre mansoon) water quality analysis.**

Fig. Bar chart of April 2020 (Pre mansoon) water quality analysis.

ANALYSIS OF WATER SAMPLES: Water samples were analyzed on the basis of following parameters

Sample Site Code	July 2020 (Mansoon)																
	Parameters																
	PH	EC MicroS/cm	TH Ppm	TDS Ppm	BOD 5day	TEMP ⁰C	NO3- Mg/L	ALKALINITY ppm	K+ ppm	PO4-3 ppm	Cl ppm	SO4 ppm	F Mg/L	HCO3	Mg	E.coli MPN/100	Alge

ShodhKosh: Journal of Visual and Performing Arts 1114

AP1	6.7	859	225	652	3.7	30.7	4.91	165	48	2.46	36	170	1.1	147	70	1	ND
AP2	6.9	858	236	648	3.1	30.8	4.62	172	49	2.55	39	132	0.9	138	69	1.1	ND
AP3	6.8	865	237	646	3.6	31.5	4.83	159	46	2.05	39	129	1	144	68	1	ND
RN1	7.8	867	238	644	3.4	29.9	4.74	163	45	2.46	38	133	1.1	148	69	ND	ND
RN2	7.1	866	222	638	3.9	30.6	4.92	162	46	2.16	45	135	1	130	71	ND	ND
RN3	6.4	869	226	640	3.3	30.7	5.1	173	48	2.15	44	131	0.9	132	66	1	ND
ND1	6.9	871	245	639	3.8	30.9	4.01	164	43	2.31	39	124	1.1	148	68	0.9	ND
ND2	7.9	855	252	638	3.6	30.6	4.92	175	41	2.46	36	136	1	133	70	1	ND
ND3	6.7	859	238	641	3.3	30.4	4.32	168	42	2.05	34	130	1	150	68	1.1	ND
RJ1	7.7	867	240	639	3.9	30.2	4.23	172	48	2.45	39	129	0.9	138	63	0.9	ND
RJ2	6.9	864	247	649	3.2	29.6	4.62	173	49	2.17	31	128	1.1	147	70	ND	ND
RJ3	6.8	858	248	648	2.9	30.8	4.92	164	47	2.12	38	137	1	133	67	0.9	ND
SL1	6.8	869	246	639	3.9	31.9	4.11	163	50	2.31	37	136	1	136	66	1.1	ND
SL2	7	870	250	644	2.9	30.6	4.9	172	49	2.16	39	124	1.1	141	69	ND	ND
SL3	6.9	869	249	648	2.8	31.2	4.35	164	47	2.12	41	129	0.9	148	71	1	ND
RB1	6.8	859	246	646	3	30.9	4.25	168	49	2.31	38	136	1.1	138	70	0.9	ND
RB2	6.9	858	251	642	3.3	30.6	4.62	171	47	1.07	31	138	0.8	141	69	1.1	ND
RB3	6.5	868	249	641	3.7	31.2	4.33	170	47	2.12	36	132	1.1	140	68	1	ND
UA1	6.9	855	248	649	3.9	32.3	4.24	160	44	2.1	34	133	0.9	150	68	ND	ND
UA2	6.9	859	246	648	2.8	29.9	4.62	162	49	2.46	40	139	1	141	69	ND	ND
UA3	7	868	249	639	3	30.7	2.14	163	48	2.55	39	135	0.9	139	71	1	ND
MH1	6.9	869	250	636	3.1	31.3	4.24	168	43	2.05	37	134	1.1	136	66	ND	ND
MH2	6.4	867	249	640	3.9	30.9	4.21	172	49	2.46	38	137	1	133	67	1.1	ND
MH2	6.9	870	248	648	3.3	30.8	4.65	166	51	2.3	37	120	1	145	69	1.1	ND

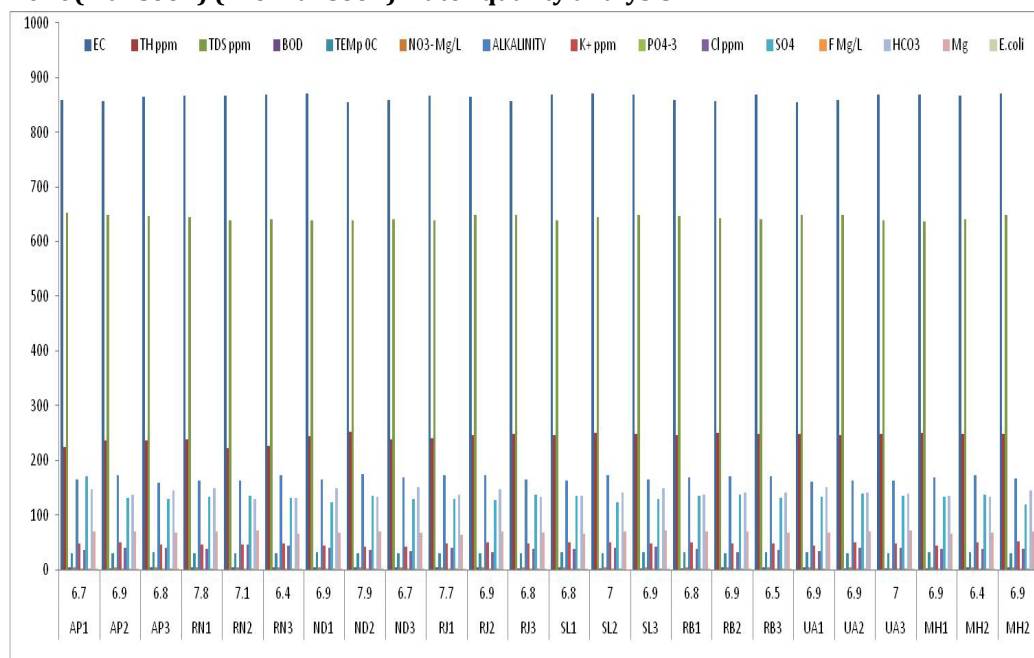**Table:3 list of July 2020(mansoon) (Pre mansoon) water quality analysis.**

Fig. Bar chart of July 2020 (mansoon) (Pre mansoon) water quality analysis.

ANALYSIS OF WATER SAMPLES: Water samples were analyzed on the basis of following parameters:

Sample Site Code	PH	EC MicroS/cm	TH Ppm	TDS Ppm	BOD 5day	TEMP ºC	NO3- Mg/L	ALKALINITY ppm	K+ ppm	PO4-3 ppm	Cl ppm	SO4 ppm	F Mg/L	HCO 3	Mg	E.coli MPN/100	Alge
AP1	6.7	869	220	646	3.2	30	4.84	175	46	2.42	39	164	1.1	144	67	1.1	ND
AP2	6	860	217	639	3.1	29.9	4.57	190	41	2.28	37	87	0.9	145	63	0.9	ND
AP3	6.7	871	215	646	3.6	31.2	4.92	185	42	2.46	37	123	1	138	70	1	ND
RN1	7	868	218	643	3.4	29.4	2.84	182	45	1.42	38	114	1.1	132	68	ND	ND
RN2	6.5	865	217	640	3.8	30.6	4.12	186	48	2.06	35	101	0.9	148	69	1	ND
RN3	6.3	840	219	639	3.3	29.8	4.22	192	44	2.11	32	119	1.1	136	67	ND	ND
ND1	7.1	842	246	637	3.9	29.7	2.03	174	43	1.01	39	119	1.1	142	65	0.9	ND
ND2	6.9	842	248	636	3	30	3.19	179	40	1.59	38	107	1	149	69	1	ND
ND3	6.7	856	247	640	3.3	30.1	4.82	174	50	2.41	36	118	0.9	139	68	0.9	ND
RJ1	7	843	239	639	3.8	30.9	4.85	182	48	2.42	37	120	0.8	141	65	1.1	ND
RJ2	6.4	842	244	649	4	29	3.75	176	49	1.87	40	115	1.1	138	68	1	ND
RJ3	6.9	839	243	651	3.9	30.6	2.45	200	47	1.22	39	101	1	146	71	0.9	ND
SL1	7.1	837	239	652	2.8	31.8	3.21	188	45	1.6	38	123	0.8	140	66	0.8	ND
SL2	6	840	248	639	2.8	30.9	4.82	174	48	2.41	40	129	0.9	126	70	ND	ND
SL3	6.1	848	250	643	3	29.3	4.91	189	45	2.45	37	109	1	143	67	1	ND
RB1	5.9	851	249	648	3.1	31.5	3.71	193	49	1.85	40	97	1.1	149	71	1.1	ND
RB2	6.2	842	246	646	3.9	30.6	4.51	198	48	2.25	41	91	0.9	147	68	1.2	ND
RB3	6.6	835	250	644	3.8	31.9	4.72	185	44	2.36	37	107	1.1	141	69	ND	ND
UA1	6.3	851	250	650	2.7	30.6	4.12	201	50	2.06	36	113	1	139	67	0.8	ND
UA2	5.7	844	243	642	3	30.7	4.91	176	49	2.45	38	109	1	140	68	0.9	ND
UA3	6.8	846	242	639	3.1	31.5	3.01	174	51	1.5	39	111	0.9	151	69	ND	ND
MH1	6.6	861	248	638	3.5	31.9	4.12	199	48	2.06	37	97	1	143	67	1	ND
MH2	6.7	862	249	646	3.6	29.6	4.82	189	50	2.41	38	119	0.9	132	66	1.1	ND
MH3	6.5	859	246	643	3.9	30.4	4.73	199	47	2.36	40	92	0.8	147	70	ND	ND

Table:4 list of Novembers 2020 (Post Mansoon) water quality analysis.
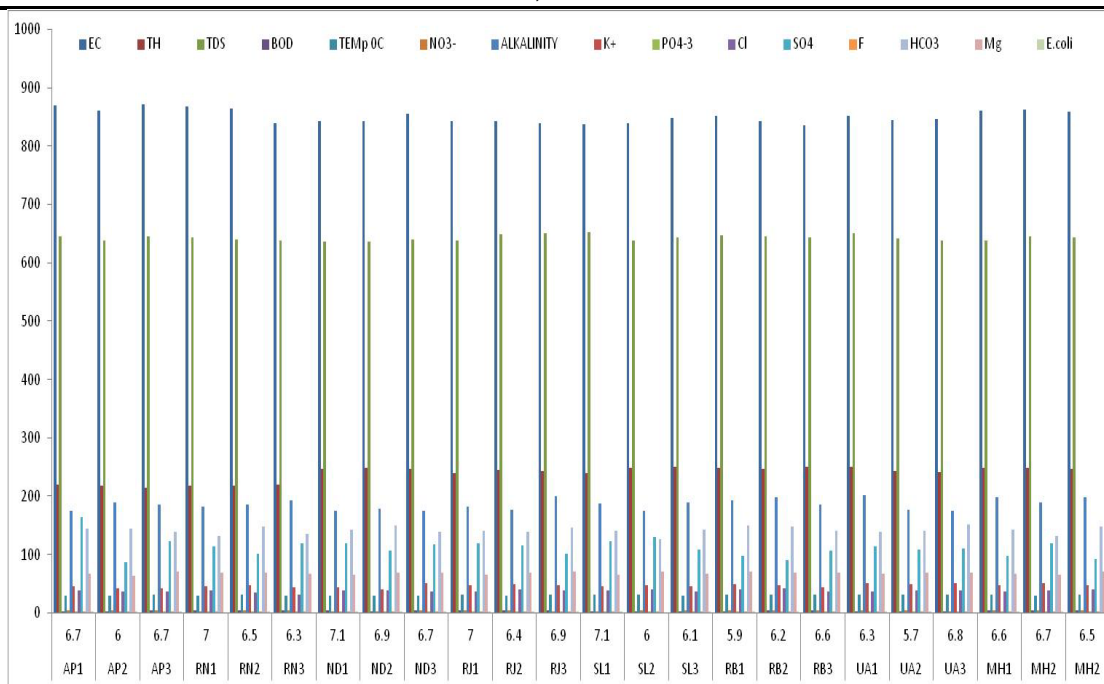
Fig. Bar chart of November 2020 (Post Mansoon)water quality analysis.

4. CONCLUSION

I took a sample of water from different places and tehsils, and I checked the acidity, lopsidedness, and intensity of each sample for five days straight in the pollution control board. I collected a sample of water from various locations and tehsils, and I tested the water in the pollution control board for five days straight in each sample to determine the water's acidity, lopsidedness, and intensity. Without talking about rain and water, we would be dealing with subterranean water problems today; without rain, the water wouldn't be safe to drink. The results for the selected parameters are shown in Tables 2, 3, and 4. in the run-up to, during, and after the monsoon. We would be dealing with subterranean water problems today if we did not discuss rain and water; otherwise, the water would not be drinkable. Tables 2, 3, and 4 present the findings for the chosen parameters. for the pre-, during-, and post-monsoon periods. At all sampling sites, the PH was found to be within permissible limits and to vary between 6.5 and 7.7. The maximum PH was measured during the monsoon, whereas the lowest value was found before and after TDS, BOD, NO3-, SO4-2, PO4-3, Cl-, F-, HCO3-, Mg++, K+, Alkalinity, E. Coli, and Alge. The number of farmers in the Amarapattan tehsil of the Satna district was determined, and it was noted that any water used in this tehsil for irrigation or agricultural promotion is not completely purified by river wells through boreholes, or that when we irrigate, we should take into consideration things like parameter, STTS TDS bode, and other things that can be irrigated in Krishna primarily in a few Satna areas. The community's farmers use distinctly varied agricultural techniques, much of which may be attributed to the irrigation phase. Farmers and vegetable growers in the area attempt to replicate the irrigation water they provide, however due to the number of farmers in Satna district's Ramnagar, Rampur Baghelan Tehsil.

The PH was observed to fluctuate between 6.5 and 7.7 at all sampling sites, falling within allowable limits. The monsoon produced the highest measured PH, while TDS, BOD, NO3-, SO4-2, PO4-3, Cl-, F-, HCO3-, Mg++, and K+ were found to have the lowest values before and after.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

REFERENCES

Alauddin, Shafqat & Yadav, Shailendra & Firdaus, Tamheed. (2012). Study the effect of Liquid Hospital Waste (LHW) on the growth of Bacterial Population in Municipal Sewer System. Parisheelan, Vol. VI(III), 2010 , 81-84.

2-De, A. K. (2007). Environmental education. New Age International.

3-Contamination of Groundwater. Available on, "https://www.usgs.gov/special-topic/water-science-school/science/contamination-groundwater?qt-science_center_objects=0#qt science_center_objects".Groundwater contamination source.Available on, "http://www.uwsp.edu/water/portage/undrstnd/gwcontam.htm".

4-Praveen, P. K., Ganguly, S., Wakchaure, R., Para, P. A., Mahajan, T., Qadri, K., & Dalai, N. (2016). Water-borne diseases and its effect on domestic animals and human health: A Review. Int. J. Adv. Res. Technol. 2016b, 6, 242-245.

5-Population Census 2011. Available on, "https://www.census2011.co.in/". http://cgwb.gov.in/district_profile/MP/Rewa.pdf.

6-Raju, N. J. (2007). Hydrogeochemical parameters for assessment of groundwater quality in the upper Gunjanaeru River basin, Cuddapah District, Andhra Pradesh, South India. Environmental Geology, 52(6), 1067-1074.

7-Alauddin, Shafqat & Yadav, Shailendra & Firdaus, Tamheed. (2012). Spectrophotometric study of Iron, Nitrate and Phosphate in the water of river Tons at Mau (MaunathBhanjan). International Journal of ScientificResearch.1.84.85.10.15373/22778179/DEC2012/33.

8- Alauddin, Shafqat & Kumar, Amresh & Yadav, Shailendra & Firdaus, Tamheed. (2012). Spectrophotometric Study of Iron, Nitrate and Phosphate in the River Gomti of Jaunpur City. International Journal of Scientific Research. 1.79.10.15373/22778179/NOV2012/3.

9- WHO(2004), International standards for drinking water, 3 rd Edition ,WHO, Geneva.

Yadav, Shailendra et al (2018) Analysis of fluoride concentration in the water of borewells of Satna city, M.P., India.International Journal of Engineering, Science and Mathematics, Vol.7(6), 2018,42-46.

APHA, (1995), Standard methods for the examination of water and waste water, 16th Edition, American Public Health Association, Washington DC.