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Assessment of ground water pollution due to fluoride content and water quality in and around Tanda Taluka of Rampur district, Uttar Pradesh, India

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ABSTRACT

Ground water samples of Tanda taluka of Rampur district have been collected either from the bore wells (from the part of municipal water supply) or from hand pumps (direct consumption) one analyzed for their physico- chemical properties. The results indicates that fluoride concentration is varies from 0.46-4.36 mg/L. Also in this Analysis the physico- chemical parameters such as pH, electrical conductivity, TH, TA, Na⁺, Cl⁻, TDS, SO₄²⁻, F⁻, K⁺, calcium and magnesium etc. were determine using standard procedures. Also in this paper due to increase permissible limits of fluoride in Tanda taluka a survey for dental and skeleton fluorosis is also done, which denotes mainly dental and Skelton fluorosis in the studied taluka. Thus an attempt was made to improve the ground water quality of Tanda taluka of district Rampur, U.P., India.

Keywords: Fluoride, Physico- Chemical analysis, Dental and Skeleton fluorosis, Ground water, Tanda takula (Rampur).

INTRODUCTION

Water pollution is an acute problem in all major areas and rivers in India [1-4]. Although three fourth part of earth is being surrounded by water but a little portion of it can be used for drinking purpose. In India 62.5 million people are suffering from disorder of the teeth or bones through fluorosis [5]. Seventeen States in India have been identified as endemic for fluorosis and Uttar

Pradesh is one of them. The content of fluoride in Rampur is also more than WHO and ICMR permissible limits [6]. Fluorosis is an endemic disease resulting from excess intake of fluoride either through drinking water, food or dentifrices at concentration of 2.00 ppm or above. Fluorosis of teeth has been reported to affect dental enamel. Chronic fluorine intoxication through drinking water containing above 10 ppm of fluorine results in pathological changes of bone leading to skeleton fluorosis [7]. Also pollution of water resources needs a serious and immediate attention through periodical check up of water quality. The purpose of this study to evaluate ground water quality of Tanda taluka of Rampur district, Uttar Pradesh, India.

EXPERIMENTAL SECTION

STUDY AREA - The Tanda taluka of Rampur district is 30 km far away from Rampur. The district Rampur is located between longitude 78.54E and 69.28 E, latitude 28.25 N and 29.10N . Rampur district is spread in the area of 2367 KM² falls in Moradabad division of Uttar Pradesh State with a population of approximately four million. (Figure 1 and 2)

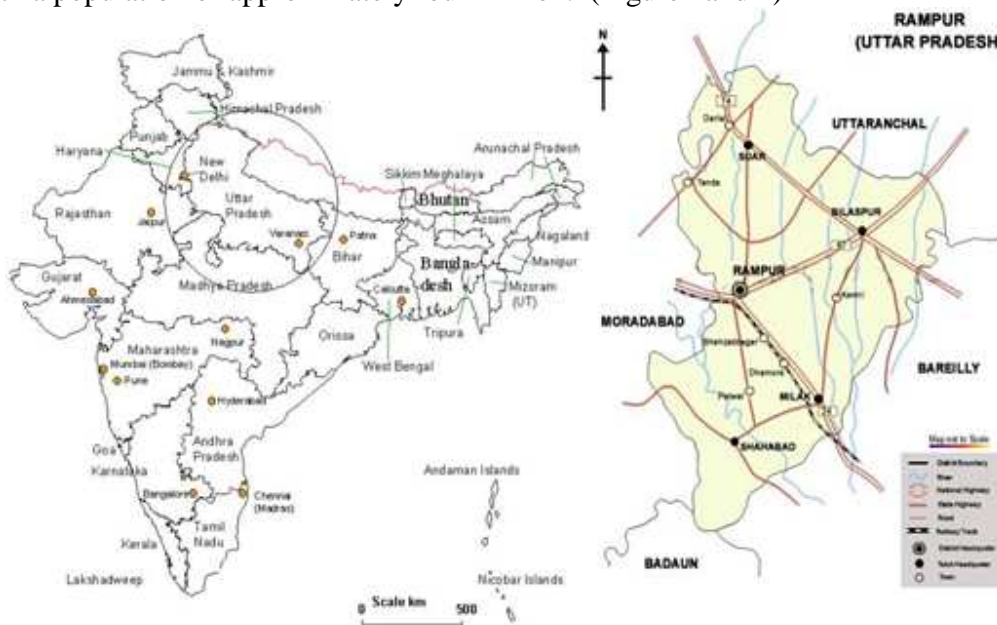


Fig.1-Location of Uttar Pradesh in India

Fig.2-Location of Rampur showing Tanda

It is around Udham Singh Major in North, Bareilly in East, Moradabad in West and Badaun in South situated on the NH 24 and 185 km from national capital. In Tanda taluka rural population is living and 85% ground water is used for drinking purpose by the rural population.

Water Sampling - A total of 100 samples from the twenty five villages of Tanda taluka of Rampur district were collected in polythene bottles (i.e., four samples from each village) which were cleaned with acid water, followed by rinsing twice with distilled water. The water samples are chemically analyzed. The analysis of water was done using procedure of standard methods.

Methodology -

Table 1 - Methods used for analysis of quality parameters for water samples [8]

Quality parameters	Methods used
pH	Eutech- Cybernetics pH meter
EC	Eutech- Cybernetics EC Scan meter
TDS	United State salinity lab. , 1954 [9]
Na ⁺ , K ⁺ , Cl ⁻	ELICO-220 Flame photometer
F ⁻	Spectrophotometrically using ELICO-52 UV Spectrophotometer
SO ₄ ²⁻	Naphalometrically using ELICO-52 Naphalometer
Cl ⁻	Argentometric Method
Ca ²⁺ /Mg ²⁺	EDTA Method/ Titrametric Method using H ₂ SO ₄

RESULTS AND DISCUSSION

Table 1 - Physico –chemical analysis of water quality in selected village's samples of Tanda taluka

S.No.	pH	EC	TDS	TH	TA	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	HCO ³⁻	Co ₃ ²⁻	Cl ⁻	So ₄ ²⁻	F ⁻
1	7.5	2.10	540	834	834	40	04	140	0	156	56	31	156	1.5
2	7.2	3.33	1250	1016	1031	42	18	170	8	393	93	170	188	2.02
3	7.3	1.18	840	176	772	16	22	512	4	256	57	172	102	2.60
4	7.5	1.75	1006	160	1016	28	18	602	6	902	137	203	806	4.36
5	7.2	2.03	930	156	823	33	27	440	4	768	81	349	165	0.75
6	8.19	3.98	1210	89	786	63	32	310	6	520	68	413	70	1.03
7	7.23	3.69	828	916	552	58	18	388	3	515	57	458	610	2.28
8	8.05	5.02	796	412	907	18	24	292	3	942	82	306	280	1.00
9	7.84	4.06	648	428	956	21	46	104	6	885	137	142	480	1.24
10	7.79	1.02	540	610	782	13	28	408	4	906	102	210	260	3.86
11	8.06	1.25	516	586	730	44	21	309	16	777	56	28	80	2.95
12	7.15	3.89	410	926	632	56	26	321	1	607	81	17	240	0.58
13	7.44	7.45	2106	1024	796	61	68	212	3	803	82	52	252	0.88
14	7.30	2.95	1620	223	746	57	61	288	3	815	37	99	810	1.17
15	8.16	2.00	1516	328	702	32	32	310	2	614	62	108	354	4.02
16	7.12	1.64	848	416	601	36	52	412	9	213	41	41	91	0.77
17	7.05	2.02	546	169	520	48	56	506	7	377	58	281	408	0.46
18	8.29	2.18	1524	154	617	91	24	119	6	403	87	145	112	1.48
19	7.25	5.06	816	1110	628	85	16	528	4	516	92	296	86	3.92
20	7.76	1.20	1410	948	816	31	31	203	3	623	106	99	186	2.31
21	7.86	3.45	1521	1158	643	42	47	383	3	794	54	188	437	3.02
22	7.90	1.78	1658	1146	712	42	52	168	7	301	42	272	187	2.48
23	8.12	2.70	1214	946	546	87	19	499	6	437	79	386	358	0.99
24	8.15	1.10	1608	853	673	27	21	506	3	147	83	401	481	1.75
25	8.26	6.12	660	1210	935	93	18	393	4	618	98	196	111	2.48

The finding of the present investigation are summarized in (Table 1) and also made comparison with WHO and India drinking water standards (Table 2).

Table 2- Comparison of ground water quality at different locations under study with drinking water standard (Indian / WHO)

Parameters	Indian Standards	WHO
pH	6.5-9.2	6.5-9.2
EC	6.5-9.2	6.59.2
TDS	1500	500
TH	600	500
TA	600	500
Ca ²⁺	200	75
Mg ²⁺	200	150
Na ²⁺	200	200
K ⁺	200	200
CO ₃ ²⁻	200	200
HCO ₃ ³⁻	200	200
Cl ⁻	1600	500
So ₄ ²⁻	400	500
F ⁻	1.5	1.5

Tanda taluka is hot and semi – arid, soil water and depth of ground water varies from 6-20, manually operated hand pumps can easily be installed in study taluka to pump out the ground water. The ground water has no colour, odour, turbidity. Taste of water was slightly brackish at most of the location. The pH value of all the samples shows in the range 7.2-8.29. Also there is large variation in EC was also found in present study. The calcium content in water, few locations found beyond the permissible limits. Alkalinity present in water is more than acceptable limits in maximum locations. Also sodium was higher. The main result indicates the fluoride content is also higher than permissible limit and resulting diseases faced by Tanda taluka people. It is evident from the analysis data, fluoride content is more. Fluoride content of 1mg/L in drinking water has no biological side effects (10). So in Tanda taluka drinking water consumed for a period of 5-10 years caused dental fluorosis. Health status of the people is varied in different villages because of severity of fluorosis.

Table 3- The clinical symptoms of fluorotic patients from Tanda taluka

Age in Years	No. of people Examined	No. of people with dental and skeleton fluorosis	Percentage (%)
8-16	100	28	28%
17-25	200	78	39%
25-50	400	173	43.25%

In this study, due to lack of luster were the most symptoms of dental fluorosis experienced by Tanda taluka followed by browning of teeth. The various grade of discoloration of teeth ranging

from chalky white to yellow or brown with pitting. The difference being attributed by temperature and it leads severity of the disease (11).

CONCLUSION

Most of the water samples collected from Tanda taluka does not meet water quality standards and any other quality parameters. Hence it is not suitable for drinking purpose. Also the people of that area are facing dental and skeleton problems also, mainly from dental and Skelton fluorosis. A hand pump attached filter based on Nalgonda Technology or activated alumina adsorption might be the solution of this problem.

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