P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-6* ISSUE-6* September-2021
E: ISSN NO.: 2455-0817 Remarking An Analisation

# The Chemistry of Drinking Water of Tube Wells, Ring Wells and PHE Supply Drinking Water in and Around the Area of Some Schools in The Hojai District Assam, India

Paper Submission:28/08/2021, Date of Acceptance: 09/09/2021, Date of Publication: 10/09/2021

**Satyajeet Kumar**
Head and Associate Professor,
Dept. of Chemistry,
Rabindranath Tagore University, Hojai,
Assam, India

**Abstract**

The ground water quality of drinking water of tube well, ring well and PHE of Hojai district ,Assam, has been studied with special reference to the presence of fluoride. The concentration of fluoride ion is determined by SPADNS colorimetric analysis .Most of Fluoride levels were within permissible limits, whereas a ten water samples has higher concentration of fluoride than permissible limit ( 1mg/l, WHO) Fluoride content have positive correlation with Na’ and K’ and negative correlation with $Mg^{2}$+,$Ca^{2}$+ and Total hardness(TH). Fluoride showed fairly good positive correlation with depth of sources. The main source of fluoride comes into contact with ground water from its source of origin, the rock minerals. The concentration of fluoride in groundwater basically depends on easily weathered fluoride bearing minerals, the accessibility of circulating water to fluoride bearing minerals, extent of fresh water exchange in an aquifer, evaporation and evapotranspiration, formation of ionic compound such as $CaSO_4$,$CaHCO_3$ etc and complexing of F with Al, Be, Ferric ions.

**Keywords:** Groundwater, fluoride, Hojai District.

**Aim of The Study**

The aim of the study is to test the quality of drinking water in and around schools area in Hojai District and alert the students not to drink polluted water. More over to provide safe and pure drinking water for the students.

**Introduction**

Water-the most abundant and wonderful natural resource is extremely essential for survival of all living organisms. There are many factors affecting the drinking water quality and cause of fresh as well as ground water pollution. Water is life. No life can service without water. Our health depends upon the quality of water we drink. Aquatic animals live in water and take oxygen and some nutrients from water. But pollution of water has created a serious problem in our environment. But the term water pollution we mean the contamination of water with undesirable substance which adversely affect the plant and animal world. The natural sources of water pollution are land erosion, decomposed bodies of plants and animals, fallen leaves and other organic materials. The man made sources of water pollution are industrial wastes, pesticides, fertilizers, domestic waste etc.

Increasing industrial activities, rapid progress in science and technology, human activities, use of various chemicals in agriculture etc are the factors threatening the very quality of the life sustaining aquatic system. Moreover, the geology of soil also determine the presence of chemical substance and their concentrations in water quality of water particularly that used for drinking is very much influence by these substance.

The main purpose of present study is to do chemical characterization of groundwater bodies in the area with special attention to fluoride contamination.

Fluoride ion concentration in India's ground water very widely ranging from 0.01mg/L to 48mg/L. The amount of Fluoride occurring naturally in groundwater is governed principally by climate, composition of host rock, and hydrogeology. Generally, the presence of Fluoride ion may be due to low-level basaltic volcanic activity.

Study area lies between 25$^{O}$40´and 26$^{O}$ 9´ North latitudes and 92$^{O}$45´and 93$^{O}$ 15´ East longitude .

**Review of Literature**

The Chemistry Of Drinking Water related topic is the most popular, important and burning topic in the country Earth as a whole, but fresh potable water is not always available at the right time or the right place for human or ecosystem use and water is undoubtedly the most precious natural resource vital to life. Furthermore, they opined that water is distributed in nature as surface and ground water in different forms and sources which are oceans, seas, rivers, streams, lakes, ponds, wells, boreholes and springs. Rivers are among the oldest water bodies in the world (Higler, 2012). He also noted that in most urban-rural communities in the developing countries especially the SubSaharan Africa, surface waters (rivers, streams, and lakes) have been the most available sources of water used for domestic purposes. The water from these sources is contaminated with domestic, agricultural, and industrial wastes and is likely to cause water related diseases (Ojekunle, 2012; Ayeni, 2014)

Water is a resource that has many uses, including recreation, transportation, hydroelectric power and domestic, industrial and commercial uses (Kumar, 2007). He also asserted that water also supports all forms of life and affects our health, lifestyle, and economic well- being. Although more than three quarters of the Earth's surface is made up of water, only 2.8 percent of the Earth's water is available for human consumption (Iskandar, 2010). At present, approximately one-third of the world's people live in countries with moderate to high water stress and the worldwide freshwater consumption increases six fold between the years 1900 and 1995 more than twice the rate of population growth, thus, many parts of the world are facing water scarcity problem due to limitation of water resources coinciding with growing population (United Nations Environmental Programme, UNEP, 2002). Filkersilasie (2011) opined that the role of the river is not primarily to carry industrial wastes but their ability to do so is hugely exploited. He also reported that there has been significant impairment of rivers with pollutants, rendering the water unsuitable for beneficial purposes.

Fluoride naturally occurs in the earth's crust. Various natural processes, including the weathering of bedrocks, most commonly igneous and sedimentary rocks in different aquifers, accelerate the concentration of fluoride in groundwater. Chemical interaction between the fluoride-bearing aquifer material and alkaline water facilitates the leaching of fluoride in groundwater (Adimalla, Venkatayogi, & Das, 2019). Varying levels of fluoride in groundwater in large parts of the Shanmuganadhi River Basin, Tamil Nadu, India, are excellent examples of the occurrence of fluoride due to geochemical processes. In this region, varying levels of fluoride concentrations in groundwater are attributed to the interaction between groundwater and fluoride-bearing minerals in granitic and gneissic rocks, such as apatite, hornblende, muscovite, biotite, and amphiboles (Aravinthasamy, Karunanidhi, Subramani, Srinivasamoorthy, & Anand, 2019).

Various studies documented the presence of elevated levels of fluoride in groundwater at various locations. In many instances, groundwater is a source of drinking water and may adversely affect human health due to exposure to elevated levels of fluoride. While the health benefits of fluoride justify the fluoridation of drinking water, elevated levels of fluoride can have an adverse health impact, including the development of skeletal and dental fluorosis. In many parts of the world, high levels of fluoride occur in the subsurface. For example, India alone has approximately 12 million of the 85 million tons of fluoride deposits on the earth's crust. Not surprisingly, in many parts of India, groundwater has elevated levels of fluoride. For example, an analysis of 28 groundwater samples collected, hand pumps (22 samples) and tube wells (6 samples) from Agra City, India, shows concentrations of fluoride in groundwater ranged from 0.90 to 4.12 mg/L, with an average concentration of 1.88 mg/L. Of the 28 groundwater samples analyzed, 64% had a concentration above the permissible limit of 1.5 mg/L. Only 32% of the samples were well within the WHO guidelines for drinking water, and 3.5% of the groundwater samples were below the 1.0 mg/L threshold. The authors attributed the presence of excessive fluoride levels to both underlying geological formations and anthropogenic sources. The health risk assessment showed that the chronic daily intake levels of exposure for infants, children, and adults were 0.69, 0.31, and 0.12 mg $kg^{-1}$ $d^{-1}$, respectively. These findings indicated that infants and children are at higher noncarcinogenic risk (dental fluorosis) (Yadav et al., 2019).

Excessive fluoride concentrations in drinking water were also reported from groundwater samples collected from the Siddipet Vagu area, India. Analysis of 51 groundwater samples obtained from this area shows that the concentration of fluoride ranged from 0.5 to 3.7 mg/L, with a mean concentration of 1.62 mg/L. Of these, 51% of the samples exceeded WHO drinking water standards (1.5 mg/L of fluoride) (Adimalla & Wu, 2019). Analysis of 128 groundwater samples from Markapur, Andhra Pradesh, India, exhibited similar fluoride levels. Fluoride concentrations in this area ranged from 0.4 to 5.8 mg/L, with a mean concentration of 1.98 mg/L. Of the total 128 samples analyzed, fluoride concentration levels in 54 samples exceeded the permissible limits (Adimalla et al., 2019).

Seasonal variation can affect the occurrence of fluoride in groundwater. Analysis of 61 groundwater samples (14 post monsoon and 16 pre monsoon season samples) indicates relatively lower fluoride concentration in post monsoon season (0.01–2.50 mg/L), compared to the concentrations observed in the pre monsoon season (0.01–3.30 mg/L) (Aravind Swamy et al., 2019). The authors reported that seasonality affects the geochemical mechanism responsible for fluoride contamination in groundwater and its health effects on the people of this region.

Dangerous levels of fluoride in groundwater have also been observed in other countries across the world. The distribution of groundwater fluoride in China's Loess area and the geochemical and anthropogenic factors affecting its concentration are also reported. Fluoride concentrations in this region's groundwater range from 0.54 to 1.95 mg/L; approximately 22.2% of groundwater samples exceeded the national drinking water guidelines, rendering groundwater in those areas unfit for human consumption. The occurrence of elevated levels of fluoride is observed primarily in the southeast part of this region, which aligns with the region's groundwater flow direction (Li, He, Li, & Xiang, 2019).

The hydrogeochemistry and isotopic analysis help us understand the distribution of fluoride in groundwater. Su, Wang, and Liu (2019) presented the spatial distribution of fluoride and the proposed potential mechanisms for the enrichment of fluoride in the western region of the Ordos Basin, northwest China. The authors collected 62 groundwater samples from the unconfined aquifer and 56 from the confined aquifer during the pre monsoon season. More than 77% of groundwater samples from the unconfined aquifer (fluoride concentration up to 13.30 mg/L) and approximately 66% from the confined aquifer (with a maximum fluoride concentration of 3.90 mg/L) exhibit higher levels of fluoride than the Chinese safe drinking limit (1.0 mg/L) (Su et al., 2019). The authors revealed that high-fluoride groundwater has distinctive hydrochemical characteristics, such as high pH and a relatively lower concentration of calcium bicarbonates compared to sodium bicarbonate concentration. Confined aquifer mixing with unconfined groundwater is an important mechanism that results in high fluoride concentration in the confined aquifer. The authors also suggested that physicochemical processes had a crucial role in driving fluoride enrichment and may be useful for studying fluoride occurrence in arid and semi-arid groundwater regions (Su et al., 2019).

Analysis of 88 groundwater samples collected from 22 different locations in Showt City, West Azerbaijan Province, Iran, showed unhealthy levels of fluoride in groundwater samples (Yousefi et al., 2019). Of these samples, 33.36% samples exceeded the WHO stipulated drinking water permissible concentration of less than 1.5 mg/L, with 54.55%, 31.8%, and 22.73% of samples having an adverse effect (Hazard Quotient >1) on children, teenager, and adults, respectively (Yousefi et al., 2019). Health risk assessment due to exposure to elevated levels of fluoride in groundwater in the fluoride endemic areas of Upper East Region, Ghana, suggests that of the 64 groundwater samples collected from this area, 27.27% and 15.38% groundwater wells in the Bongo (19 samples) and Kassena Nankana West District (55 samples), respectively, have elevated levels of fluoride with concentrations exceeding 1.5 mg/L, posing health hazards for young children (Ganyaglo et al., 2019).

A variety of remediation methods exist for the removal of fluoride from groundwater. Recently, a pilot study was conducted to establish a straightforward, economical, integrative approach for removing fluoride from groundwater in Tanzania's rural communities. In this area, fluoride levels in groundwater are very high, with concentrations of up to 60 mg/L. A long-term study spanning over 9 months was conducted to evaluate the removal of fluoride from groundwater using a small photovoltaic-powered nanofiltration (NF) pilot plant fitted with a single-membrane module containing Dow Water & Process Solutions' 4040 spiral wound membrane NF90. The finding showed more than 98% removal of fluoride using the membrane with less than 1 mg/L, which aligns with the WHO recommended standard (1.5 mg/L) (Bouhadjar et al., 2019). Removal of fluoride was also investigated using natural clay (kaolinite) as an adsorbent. Adsorption experiments show effective fluoride ion removal when the pH ranges between 4.5 and 6. The adsorption capacities under these conditions were 0.442 and 0.448 mg/g, respectively (Nabbou et al., 2019). The authors suggested that natural clay comprised of $SiO_2$ (53.83%) and $Al_2O_3$ (39.81%) could be an excellent adsorbent for removal of fluoride from groundwater in Tindouf (Algeria), where fluoride concentrations often exceed recommended drinking water standards here are a number of methods to analyze water quality data that vary depending on informational goals, the type of samples, and the size of the sampling area.

One of the most effective ways to communicate information on water quality trends is by use of the su here are a number of methods to analyze water quality data that vary depending on informational goals, the type of samples, and the size of the sampling area. One of the most effective ways to communicate information on water quality trends is by use of the suitable indices (Dwivedi & Pathak, 2007). Indices are based on the values of various physico-chemical and biological parameters in a water sample. Initially, WQI was developed by Horton (1965) in United States by selecting 10 most commonly used water quality variables like dissolved oxygen (DO), pH, coliforms, specific conductance, alkalinity and chloride etc. Ramakrishnaiah et al. (2009) used water quality index to assess groundwater quality of Tumkur Taluk, Karnataka State. 17 parameters such as pH, electrical conductivity, TDS, total hardness, bicarbonate, carbonate, chloride, sulphate, ph here are a number of methods to analyze water quality data that vary depending on informational goals, the type of samples, and the size of the sampling area. One of the most effective ways to communicate information on water quality trends is by use of the suitable indices (Dwivedi & Pathak, 2007). Indices are based on the values of various physico-chemical and biological parameters in a water sample.

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## Material and Method

In addition to fluoride concentration other parameter such as $p^{H,}$ TH, $Ca^{++}$ , $Mg^{++}$, $SO_4^{--}$, $Na^+$, $K^+$, $Cl^-$,$NO_3$ - N, $PO_4^{3}$- are determined (Feb-2018 to April-2019)by standard methods. F concentration was determined spectrophotometrically by the SPADNS colorimetric methods. Fluoride reacts with the coloured complex of zirconyl acid and SPANDS reagent [Sodium-2(p-sulphophenylazo)-1,8-dihydroxy -3,6-naphthalein disulphonate ] forming colorless $(ZrF_6)^{-2}$and releasing the dye. This reaction which can be followed conveniently by colorimetric measurement of the dye , is the basis of fluoride estimation. At first fluorides are separated from water samples by distillation in presence of cons $H_2SO_4$ and soft glass beads to obtain fluorosilicic acid .A little $Ag_2SO_4$is added to distilling flask to prevent volatilization of hydrogen chloride when samples have appreciable chloride content. The fluoride is then estimated by SPADNS method. The absorbance measurements were done at 570nn with the help of UV spectrophotometer (Hitachi, 3210). $F^-$ Concentration was read directly by operating the instrument in photometry mode calibrating against a standard and a blank.

The physical parameter namely $p^H$ was determined by using a digital $p^H$ meter (ELICO). UV spectrophotometer method was followed for quantitative determination of phosphate and nitrate-N , Quantity of sulphate was determined using a colorimeter. The amount of sodium and potassium were determined using a flame photometer (digital) .EDTA titrimetric method was used for calcium and magnesium (Total Hardness) estimation and argentometric method for chloride determination.

Water samples were collected in pre- cleaned plastic containers of 5L capacity and closed tightly. The samples were pretreated and proved property .A total of 30 ground water samples were collected for de other ions and parameters have been carried on twenty six representative samples with varying fluoride concentrations.

For comparative evolution, correlation co- sufficient was determined between various parameters (table(i) and tale (ii)).There is no industrial, like smelted plant power station, Fertilizer Corporation, etc.in the present study area with capabilities of producing fluorides contains in the ground water. So the main source of fluoride and there concentration in water is geological source.

**Results and Discussion**

The name of sampling stations and their sources are given below

1. Kaliba Tubewell (TW1 ),
2. Santiban Tube well (TW2),
3. Amtola Tube well (TW3),
4. Nandpur PHE Supply Water (S1),
5. Sankardev Nagar Tube well (TW4),
6. Panigoan, Kachali Tube well (TW5),
7. Amola Patty PHE Supply Water (S2),
8. T.P.Road Haibargaon Tube well (TW6 ),
9. R.M.Road Itachali PHE Supply Water (S3),
10. A.D.PROAD .Bengalipatty Tube well (TW7 ),
11. Dimuruguri Tube well ( TW8),
12. Teli Basti Tube well (TW9),
13. Radha Nagar Ring well (RW 1),
14. Jugijan Tube well (TW10),
15. Kaki Tube well (TW11),
16. Lanka town Tube well ( TW12),
17. Howraght Tube well TW13
18. Bhalukmari Tube well (TW14),
19. Dhalpukhuri Ring well (RW2)
20. Padumpukhuri Tube well (TW15),
21. Shikarigati Tube well (TW16),
22. Oamgaon Tube well (TW1 7),
23. Doboka Town Tube well (TW18),
24. Haongaon Tube well( TW1 9),
25. Barpukhuri Ring well RW3
26. Komorakata Tube well (TW20),
27. Haldihati Tube well (TW21),
28. Parokhowa Tube well (TW22 )
29. Nij Parokhowa PHE Supply Water (S4)
30. Akashiganga Tube well (TW23),

**Table (1) : Analytic Result Of Ground Water Samples of Hojai District**

(Values Are Expressed In Mg/L Except $P^h$.) Th=Total Hardness, T= Tubewell, Rw= Ring Well And S = Phe Supply Water

| Sample no | $P^H$ | TH | $Ca^{++}$ | $Mg^{++}$ | $SO_4^{--}$ | $F^-$ | $Na^+$ | $K^+$ | $C1^-$ | $NO^-_3$ | $PO_4^{3-}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TW1 | 7.21 | 46 | 32 | 20 | 46 | 0.48 | 11 | 09 | 32 | 2.2 | 0.521 |
| TW 2 | 7.12 | 48 | 40 | 28 | 55 | 0.24 | 8 | 16 | 28 | 1.8 | 0.548 |
| TW 3 | 7.32 | 60 | 16 | 27 | 19 | 0.52 | 6 | 4 | 47 | 1.2 | 0.584 |
| TW 4 | 7.04 | 50 | 18 | 20 | 34 | 0.64 | 13 | 6 | 49 | 0.6 | 0.422 |
| TW 5 | 7.38 | 474 | 80 | 60 | 140 | 1.20 | 30 | 22 | 45 | 0.3 | 0.642 |
| TW 6 | 7.52 | 88 | 120 | 80 | 128 | 0.48 | 12 | 36 | 48 | 1.4 | 0.408 |
| TW 7 | 7.42 | 48 | 60 | 70 | 22 | 0.72 | 14 | 20 | 40 | 2 | 0.422 |
| TW 8 | 7.22 | 68 | 72 | 48 | 30 | 0.08 | 13 | 18 | 46 | 0.28 | 0.448 |
| TW 9 | 7.02 | 60 | 80 | 29 | 18 | 0.06 | 2 | 2 | 32 | 0.16 | 0.548 |
| TW 10 | 7.44 | 28 | 42 | 21 | 38 | 3.0 | 14 | 12 | 37 | 2.3 | 0.922 |
| TW 11 | 7.08 | 36 | 46 | 32 | 30 | 9.0 | 12 | 18 | 29 | 1.8 | 0.668 |
| TW 12 | 7.11 | 26 | 56 | 38 | 27 | 0.02 | 38 | 8 | 40 | 2.2 | 0.322 |
| TW 13 | 7.12 | 40 | 72 | 62 | 45 | 0.16 | 13 | 16 | 35 | 1.2 | 0.462 |
| TW 14 | 7.00 | 26 | 35 | 30 | 40 | 5.0 | 52 | 20 | 40 | 0.88 | 0.488 |
| TW 15 | 7.06 | 46 | 31 | 21 | 36 | 4.0 | 24 | 20 | 52 | 1.9 | 0.622 |
| TW 16 | 7.08 | 42 | 28 | 26 | 19 | 0.40 | 8 | 4 | 47 | 0.68 | 0.582 |
| TW 17 | 7.2 | 40 | 34 | 30 | 217 | 1.00 | 40 | 12 | 46 | 1.2 | 0.721 |
| TW 18 | 7.03 | 56 | 39 | 60 | 300 | 10.0 | 9 | 28 | 45 | 1.7 | 0.720 |
| TW 19 | 6.92 | 36 | 90 | 72 | 27 | 0.08 | 80 | 6 | 60 | 1.6 | 0.411 |
| TW 20 | 7.08 | 48 | 112 | 96 | 37 | 7.0 | 19 | 14 | 106 | 1.1 | 0.488 |
| TW 21 | 7.06 | 24 | 22 | 24 | 29 | 15.0 | 42 | 22 | 45 | 0.93 | 0.28 |
| TW 22 | 7.21 | 46 | 32 | 20 | 46 | 20.0 | 11 | 09 | 32 | 2.2 | 0.521 |
| TW 23 | 7.21 | 46 | 32 | 20 | 46 | 13.0 | 11 | 09 | 32 | 2.2 | 0.521 |
| S1 | 7.21 | 46 | 32 | 20 | 46 | 0.48 | 11 | 09 | 32 | 2.2 | 0.521 |
| S2 | 7.00 | 30 | 28 | 12 | 30 | 1.30 | 9 | 12 | 39 | 1.2 | 0.608 |
| S3 | 7.00 | 30 | 28 | 12 | 30 | 15 | 9 | 12 | 39 | 1.2 | 0.608 |
| S4 | 6.95 | 67 | 48 | 61 | 18 | 0.09 | 23 | 2 | 20 | 0.82 | 0.672 |
| RW1 | 7.06 | 24 | 22 | 24 | 29 | 15.0 | 42 | 22 | 45 | 0.93 | 0.828 |
| RW2 | 7.22 | 32 | 41 | 29 | 80 | 0.96 | 17 | 11 | 38 | 0.92 | 0.261 |
| RW3 | 7.06 | 29 | 46 | 17 | 66 | 0.08 | 11 | 3 | 22 | 0.08 | 0.422 |

**Table 2: Correlation Coefficients of Hojai District Ground Water Samples**

| Parameters | $P^H$ | TH | $Ca^{++}$ | $Mg^{++}$ | $SO^{--}_4$ | $F^-$ | $Na^+$ | $K^+$ | $Cl^-$ | $No_3^-$ | $PO_4^{---}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $P^H$ | 1 | | | | | | | | | | |
| TH | -033 | 1 | | | | | | | | | |
| $Ca^{++}$ | .268 | .167 | 1 | | | | | | | | |
| $Mg^{++}$ | .203 | .077 | .822 | 1 | | | | | | | |
| $SO^{--}_4$ | .079 | .106 | .077 | .202 | 1 | | | | | | |
| $F^-$ | .028 | -354 | -.448 | -.377 | .345 | 1 | | | | | |
| $Na^+$ | -341 | .032 | .120 | .188 | .015 | .305 | 1 | | | | |
| $K^+$ | .400 | .206 | .275 | .341 | .406 | .445 | .021 | 1 | | | |
| $Cl^-$ | -013 | .078 | .387 | .472 | .034 | .096 | .237 | .181 | 1 | | |
| $No_3^-$ | .248 | -190 | -.132 | -.005 | .007 | .091 | .096 | .254 | 0.03 4 | 1 | |
| $PO_4^{---}$ | -087 | .205 | -.102 | -.011 | .356 | .548 | -332 | -053 | -.114 | .09 1 | 1 |

The value of $PO_4^{3-}$ was found to be highest for TW10 and 2nd highest for RW1 sample whereas all sources of water studied in the work were found to contain phosphate at higher concentration levels then the limit of WHO(0.1mg/l). and thus not to be absolutely fit for use as drinking water sources. Phosphate, if consumed in excess, may produce phosgene gas in the gastrointestinal tract on reaction with gastric juice which can lead even to death of consumers (Dhembare at al., 1998).

All sulphate measurement study except samples no TW 18 record in the present were found to lie within the guideline levels of WHO( 250 mg/L). sulphate may be present in natural water in several thousand milligrams per liters. Excessive sulphate contains of drinking water may cause catheric effect (De, 1989). It may also cause corrosion of metals at high concentrations, specally at lower alkaline water. At high concentration levels sulphite may induce diarrhea. Moreover, laxative effect may occuer at lower concentrations if Mg is present in water at equivalent concentrations ( Dhembare et al., 1998: Srinivbas el al., 2000)

The range of F concentrations of present ground water samples very from 0.2 to 20 mg/l. the positive correlation of $p^H$ with F suggested that $p^H$ is important when f is determined in ground water. From previous observations by other elevated F in the ground water generally associated with low value of $Ca^{++}$. The positive correlation of F with $Na^{+}$and negative correlation with $SO_4$- suggests that higher value of F was associated with high $Na^+$ and low $SO_4$-. Fluoride showed fairly good positive correlation with depth of sources when plotted separately ...for different locations.

$F^-$ value range is 3mg /L to 20 /L of groundwater samples are found in the following regions.
1 Jugijan (TW10),
2.Kaki TW1,1
3. Bhalukmari (TW14),
4 Padumpukhuri (TW15),
5. Doboka Town (TW18),
6. Komorakata (TW20),
7 Haldihati (TW21)
8. Parokhowa (TW22),
9 Nij Parokhowa (S3),
10. Akashiganga (TW23)

Of Hojai Sub- division, Out thirty sample , twenty samples have F concentrations were not exceptionally high. Although there is no industrial activities at Hojai Sub—Division with capabilities of producing F contains in ground water, the main source of this F contamination in groundwater at fluoride effected area may be due to the presence of intertrappean sedimentary become soluble in entrapped water by favorable physic-chemical conditions. The F contains in groundwater basically depend on the contact with the F bearing minerals. The three major source of F in india are fluorspars, rock phosphates and phosphorites. The F contains in groundwater varies from place to place due to differences in geographical chemical and Physical characteristics of water bearing aquifers, the porosity of rocks, the $P^H$.and temperature water. When F containing minerals in the rocks and soils come into contact with the ground water, they release F into water by the process of hydrolysis. Fluorides are ubiquitous in nature and present in rock, soil, water, plants, foods and even air.

Dental carries is decay of tooth. Dental carries is a bacterially based disease. When it progresses, acid produced by bacterial action on dietary fermentable carbohydrates diffuses into the tooth and dissolves the carbonated hydroxyapatite mineral—a process called demineralization. Pathological factors including acidogenic bacteria (mutants streptococci and lactobacilli), Salivary dysfunction, and dietary carbohydrates are related to caries progression, protective factors—which include salivary calcium, phosphate and proteins, salivary flow, fluoride in saliva, and antibacterial components or agents—can balance, prevent or reverse dental caries. Caries progression or reversal is determined by the balance between protective and pathological factors , The results of the initial survey in present study area indicates that about 80% of population was affected by the dental carries

Dental fluorosis occurs because of the excessive intake of fluoride either through fluoride in the water supply , naturally occurring or added to it ; or through other sources. The damage in tooth development occurs between usually from birth to approximately 6 – 8 years of age, from the overexposure to fluoride. Teeth are generally composed of hydroxyapatite and carbonated hydroxyapatite; when fluoride is present, fluorapatite is created. Excessive fluoride can cause yellowing of teeth, white spots, and pitting or mottling of enamel .Fluorosis can not occur once the tooth has erupted into the oral cavity. At this point , fluorapatite is beneficial because it is more resistant to dissolution by acids ( demineralization ).

Almost all the people are suffering from dental fluorosis and skeleton fluorosis in present fluoride effected study area. So precaution should be taken by the people of area Jugijan , Kaki . Bhalukmari , Padumpukhuri , Doboka Town , Komorakata , Haldihati ,Parokhowa ,

Nij Parokhowa Akashiganga region where fluoride level was found beyond permissible limit.

Skeletal fluorosis is a bone disease exclusively caused by excessive consumption of fluoride. Mild cases cause no symptoms or problems. In advanced cases,skeletal fluorosis causes pain and damage to bones and joints. Advanced cases usually involve about ten times the normal amount of fluoride. In India, the most common cause of fluorosis is fluoride-laden water derived from borewell dug deep intothe earth while fluorosis is most severe and widespread in the two largest countries –India and china –UNICEF estimates that “Fluorosis is endemic in at least 25 countries across the globe. The total number of people affected is not known , but a conservatives estimate would number in the tens of millions “ Common causes of fluorosis include inhalation of fluoride dusts / fumes by workers in industry, use of coal as an indoor fuel source ( a common practice in China ), and consumption of fluoride from drinking water . In China the World Health Organization recently estimated that 2.7 million people have the crippling form of skeleton fluorosis, while in India 17 of its 32 states have identified as endemic areas, with an estimated 66 millions people at risk and 6 million people seriously affected. According to scientific surveys skeletal fluorosis in India and China occurs when the fluoride concentration in water exceeds 1 ppm and has been found to occur in communities with only 0.7 ppm ( source : Singh, 1961; Singh 1963; Jolly 1970; Siddiqui 1970; Susheela 1993; Choubisa 1997; Xu 1997; Bo 2003) . The Chinese government now considers any water supply containing over 1 ppm fluoride a risk for skeletal fluorosis (Ba 2003). In United States an average of 1 ppm fluoride is purposely added to water supplies for water fluoridation while the maximum contaminant level ( as established by the US Environmental Protection Agency ) is 4 ppm.

Limeback’s concern is seconded by an increasing number of scientist studying the fluorosis problem in India and China . The emerging consensus in that part of the world is that fluoride – in addition to damaging the bones – may also demage the brain, the kidneys, the reproductive system and other organs as well.

It has been recognized for over five decades that fluoride may have both beneficial and potentially harmful effects on dental health. While the prevalence of dental carries is inversely related to range of concentration of fluoride in drinking water consumed the prevalence of dental fluorosis has been shown to be positively related to fluoride in take from many source (Fejerskov et al., 1988,1996). Public health programmes seeking to maximize the beneficial effects of fluoride on dental health through the introduction of fluoridated drinking-water have, at the same time, strived to minimize its adverse fluorotic effects on teeth. Based upon the studies conducted by Dean and colleagues five decades ago, the “optimum” level of fluoride in drinking water associated with the maximum levels of dentals caries protection and minimum level of dental fluorosis, was considered to be approximately 1 mg / l. The effect of fluoride on dental health were examined by WHO experts committee (WHO, 1994).

F causes dental fluorosis if present in excess of 1.5mg/ l in drinking water and skeletal fluorosis beyond 3mg/ l if such water is consumed for about 8- 10 years ( Nawlakhe and Buluse, 1989.)

In the present study area although F contents in ground water samples above the guide line value. 80 % of total population was suffered from dental and skeletal fluorosis since last twenty years in the fluoride affected area .The percentage of affected people by dental and skeletal fluorosis in the present study area is very high precaution should be taken by the people where fluoride level was found beyond permissible limit.

The different method so far tried for the removal of excess fluoride from ground water can be broadly classified into four categories, namely adsorption method , ion exchange method , precipitation method and miscellaneous methods ( Kilder and Bhargava , 1988, MRD 1993) . Out of the above the precipitation method .For this there should be 40 L plastic bucket and there should be a tap above 8 inches from the bottom of the bucket . 100 mg alum and 5 – 7 mg lime is mixed with per litre of water. Stirring is done for 10 – 15 min. and left for 1 hr . Precipitation of fluoride takes place and people get ware free from fluoride by this process.

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