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## STUDIES OF FLUORIDE CONTENT IN GROUND WATER IN KUKSHI BLOCK (DHAR), MADHYA PRADESH, INDIA

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### ABSTRACT:

Water is one of the most and main component for the survival of any living being since life on earth was begun in the seas and it is one of the most unusual natural compounds found on our earth. Hand pump is the major source of drinking water in the small villages of Kukshi block of Dhar district. Hand pump water quality is degrading at a faster rate day by day therefore, regular monitoring is essential. The present study deals with the fluoride concentration at selected zone of Kukshi block of Dhar district of Madhya Pradesh. Different drinking water sources of Kukshi block were selected from different sampling station and were analyzed for fluoride concentration. The Fluoride concentration in East zone is high and in West zone the Fluoride concentration is low.

**KEY WORD:** *Ground Water quality, Kukshi block, Fluoride.*

### INTRODUCTION:

Water is an essential natural resource for sustaining life and environment that we have always thought to be available in abundance and free gift of nature. Though groundwater contributes only 0.6% of the total water resources on earth, it is the major and the preferred source of drinking water in rural as well as urban areas. The fluorides belong to the halogen group of minerals and are natural constituents of the environment. Fluorides are

mainly found in ground water when derived by the solvent action of water on the rocks and the soil of the earth's crust. Fluoride is the most electronegative of all chemical elements and is never encountered in nature in the elements from. It's seventeenth in the order of frequency of occurrence of the elements and represents about 0.060 to 0.09% of the earth's crust (Wedepohl, 1974) Fluoride is an essential element for life at low concentrations. In relation to drinking water it is generally believed that too little (<0.5mg/l) or too much (>1.5 mg/l) can affect bone and teeth structure (Edmunds and Smedley, 1996, 2003).

Kukshi region is situated in the South western part of Madhya Pradesh lying between 22°12' to 22°2'N Latitude and 74°45' to 74°75'E Longitude. Kukshi is famous tribal town of Dhar district and it is the biggest tehasil of Dhar district of Madhya Pradesh. It is a part of Nimar region of Madhya Pradesh. Topographically Kukshi is situated centrally in Northern part covered with Vindhyan scabs and in southern part with Satpura hill ranges. Satpura plateau covers two third part of the south-western part of Nimar (Sainkhediya and Ray 2012.)Major part of Kukshi occurs in Narmada valley. Narmada is the major river flowing in the area. Narmada river is provides a favourable ground for the varied ecological habits (Ray & Sainkhediya 2012).

#### **STUDY AREA:**

It is surrounded by the districts of Dhar to the north, Khargone (West Nimar) to the northeast, Barwani to the southeast, and Alirajpur and Jhabua to the west. Kukshi has a subtropical climate, which is made up of a hot, dry summer (April-June) followed by monsoon season (July-September), and a cool, dry winter. The average rainfall is about 45 mm. The temperature varies from around 10 °C in the winter to 45 °C in the summer. Kukshi is falls in the Maharashtra cotton belt. The main businesses in town are jewellery, cloth, steel utensils, cement factories, tile factories, torch accumulator and torch factories, cement pipes, electric poles and cement barricade factory, Bagh printing on clothes and shops.

The safe limit of fluoride in drinking water is 1.0 mg/L. (WHO 1996, 1970).The endemic fluorosis in India is largely of hydro geochemical origin. It has been observed that low calcium and high bicarbonate alkalinity favor high fluoride content in groundwater. In groundwater, the natural concentration of fluoride depends on the geological, chemical and physical characteristics of the aquifer, the porosity and acidity of the soil and rocks, temperature, the action of other chemicals and the depth of wells.

#### **MATERIALS AND METHOD:**

The present study was carried out in 25 villages of eastern zone, western zone, southern zone and northern zone of Kukshi block, in Dhar district of Madhya Pradesh. The study area is situated in the

sub-tropical region on the North it is bounded by Bagh block, on the east by Manawar block, on the south by Dahi block and on the west by Alirajpur district. It is located between latitude 20°-15' and longitude 72°-37' is has a sub-dry climate with a hot summer. Since there is no major Perennial River nears the area. Ground water is the major source of drinking water supply through the hand pumps, and Tube wells. Sampling was done for the period of 52 weeks from 2011-2012 at different sampling station of different zone of Kukshi block of Dhar district of Madhya Pradesh, India. Water samples were collected from four different zones viz. East zone, West zone, South zone and north zone of Kukshi block. Water sample were collected from different sources viz. Hand pumps and Tube-wells Water supply from randomly selected villages and stored in sterile glass bottles. Water samples were analyzed for fluoride by following the methods as described by APHA, AWWA, and WPCF 1995.

### **RESULTS AND DISCUSSION:**

In the present study fluoride concentration in eastern zone at Kukshi block is ranging between 2.50 to 13.80 mg/L (Table-1 and Fig.-1), in West zone 6.33 to 1.40 mg/L (Table-2 and Fig.-2), in northern zone 8.01 to 2.74 mg/L (Table-3 and Fig.-3) and in southern zone 6.02 to 2.24 mg/L (Table-4 and Fig.-4). In the Kukshi block Hand pump is the main source of drinking water. In the present study it was found that in eastern zone S-11 (Magardha) is highly fluoride affected area the concentration of fluoride is 13.80 mg/L and S-13 (Tuwati, Holipura) (Fig.1-A) is low concentration of fluoride is 2.50 mg/L. In western zone S-2 (Chikali, Balarpura) is high concentration of fluoride is 6.33 mg/L and S-12 Khedli (Patelpura) near primary school is low concentration of fluoride is 1.40 mg/L. In northern zone S-11 Kapsi (Chilwapura) near Aanganwadi Kendra is high concentration of fluoride is 8.01 mg/L and S-4 Kundara (Aadarsh ville) near S. S. Dharwa Home is low concentration of fluoride is 2.74 mg/L and In southern zone S-5 Kuddigpura (Junapura) is high concentration of fluoride is 6.02 mg/L and S-1 Kukshi (Block Colony school) is low concentration of fluoride is 2.24 mg/L (Fig.1-B).

### **CONCLUSION:**

Hand pump is major sources of Drinking water in villages of Kukshi block of Dhar district. In the present study it was found that some villages crossed the maximum permissible limit due to various anthropogenic activities. In general it is concluded that the Hand pump Water quality is not satisfactory.

### **ACKNOWLEDGEMENTS:**

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**Table-1: Fluoride test of Groundwater of eastern zone (In Kukshi - Block)**

<b>Sampling station</b>	<b>Source</b>	<b>Fluoride concentration in mg/L</b>
S <sub>1</sub>	HP	3.52
S <sub>2</sub>	TW	3.27
S <sub>3</sub>	HP	2.96
S <sub>4</sub>	HP	3.02
S <sub>5</sub>	HP	3.10
S <sub>6</sub>	HP	4.70
S <sub>7</sub>	HP	3.28
S <sub>8</sub>	HP	5.72
S <sub>9</sub>	HP	3.97
S <sub>10</sub>	HP	7.39
<b>S<sub>11</sub></b>	<b>HP</b>	<b>13.80</b>
S <sub>12</sub>	HP	2.71
<b>S<sub>13</sub></b>	<b>HP</b>	<b>2.50</b>
S <sub>14</sub>	HP	3.51
S <sub>15</sub>	HP	5.53

HP= Hand pump, TW= Tube well, S<sub>1</sub> =Anjanika malhar (Patelpura) near Malia Surta Home, S<sub>2</sub>=Anjanika malhar (Patelpura) near Malia Surta Home, S<sub>3</sub> =Anjanika malhar (Patelpura) near Primary School, S<sub>4</sub>= Kutedi (Rengriyapura) near primary School, S<sub>5</sub>=Dehri (main villa.) near Sagdish Sultane Home, S<sub>6</sub> = Longsari (Mujhaldapura) near Hari Singh Home, S<sub>7</sub>=Taki (Main villa.) near Water tank, S<sub>8</sub> = Undali (Patelpura) near between two village, S<sub>9</sub>= Magarda (Khadapura) near Kalam Home, S<sub>10</sub> =Magarda (Dawarpura) near Kalu Home, S<sub>11</sub>=Magarda (Patelpura) near Aaganbadi kendra. S<sub>12</sub>=Lunhera (Mankarpura) near home. S<sub>13</sub>=Thuwati (Holipura) near Dhumsingh Home. S<sub>14</sub>=Thuwati (Patelpura) near school S<sub>15</sub> =Khargoan (Moripura).

**Table- 2: Fluoride test of Groundwater in western zone (In Kukshi Block)**

Sampling station	Source	Fluoride concentration in mg/L
S <sub>1</sub>	HP	6.31
<b>S<sub>2</sub></b>	<b>HP</b>	<b>6.53</b>
S <sub>3</sub>	HP	2.17
S <sub>4</sub>	HP	2.33
S <sub>5</sub>	HP	5.92
S <sub>6</sub>	HP	6.13
S <sub>7</sub>	HP	5.69
S <sub>8</sub>	HP	5.12
S <sub>9</sub>	HP	5.34
S <sub>10</sub>	HP	5.82
<b>S<sub>11</sub></b>	<b>HP</b>	<b>1.42</b>
S <sub>12</sub>	HP	1.40
S <sub>13</sub>	HP	1.43

HP= Hand pump, S<sub>1</sub> = Chikali(Balarpura), S<sub>2</sub>= Chikali(Mavdipura), S<sub>3</sub>=Haldi(Bhukalipura) near mantri Home, S<sub>4</sub> = Haldi(Talabpura) near canal, S<sub>5</sub> = Girwaniya (Girwaniyapura) primary School -1, S<sub>6</sub> = Girwaniya(Girwaniyapura) primary School -2, S<sub>7</sub> =Girwaniya (Palasiyapura)near Aanganbadi, S<sub>8</sub>=Girwaniya(New basti), S<sub>9</sub> = Girwaniya (Emlipura) near Aanganbadi, S<sub>10</sub>= Girwaniya(Dawarpura) near E.G.S., S<sub>11</sub> = Talawadi(Patelpura) near primary school, S<sub>12</sub> = Khedli(Patelpura) near primary school, S<sub>13</sub> = Bamanbedi near Rajandra Home

**Table- 3: Fluoride test of Groundwater in northern zone (In Kukshi Block)**

Sampling station	Source	Fluoride Concentration in mg/L
S <sub>1</sub>	HP	3.20
S <sub>2</sub>	HP	3.12
S <sub>3</sub>	HP	4.06
<b>S<sub>4</sub></b>	<b>TW</b>	<b>2.74</b>
S <sub>5</sub>	HP	4.10
S <sub>6</sub>	HP	4.82
S <sub>7</sub>	HP	4.77
S <sub>8</sub>	HP	3.26
S <sub>9</sub>	HP	3.65
S <sub>10</sub>	HP	4.62
<b>S<sub>11</sub></b>	<b>HP</b>	<b>8.01</b>
S <sub>12</sub>	HP	4.69
S <sub>13</sub>	HP	4.14

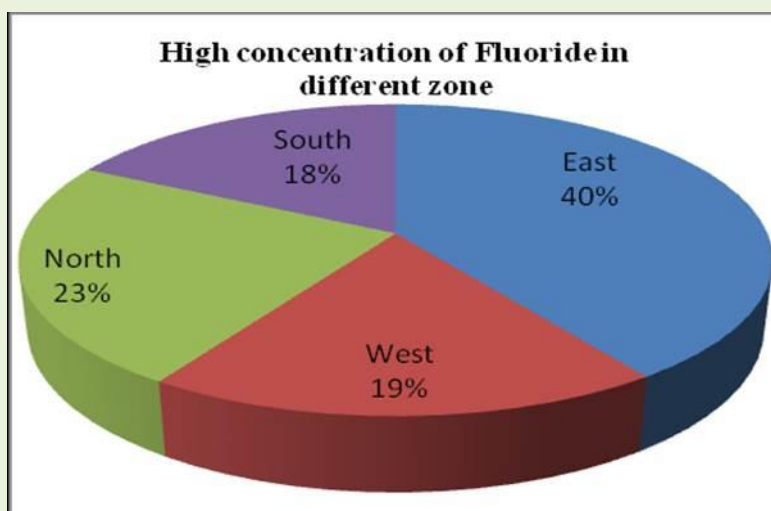
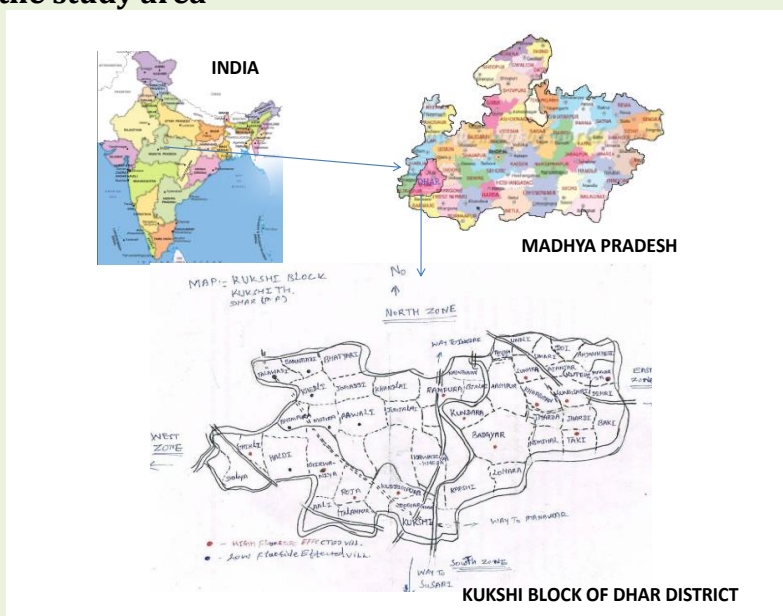
Were, HP= Hand pump, TW= Tube well S<sub>1</sub> = Rampura (Bichlapura) near E.G.S. S<sub>2</sub> = Rampura (Bichlapura) near E.G.S. S<sub>3</sub> = Kundara (Aadarsh ville.) near Indore Road, S<sub>4</sub> = Kundara (Aadarsh ville.) near S.S. Dharwa Home, S<sub>5</sub> = Kundara (Baydipura) Bhutiya Home, S<sub>6</sub> = Kundara (Patelpura) near mama kamdar, S<sub>7</sub> = Kundara (Patelpura) near Mehtab Home, S<sub>8</sub> = Badgyar (Main villa.) ner Ramesh Home, S<sub>9</sub> =Badgyar (Main villa.) ner Jagdish Home, S<sub>10</sub> = Kapsi (Chilwapura) near Indore Road, S<sub>11</sub> =Kapsi (Chilwapura) near Aanganwadi kendra, S<sub>12</sub> =Kapsi (Kapsipura) near School, S<sub>13</sub> = Kapsi (Kapsipura) near Sankar Home

**Table-4: Fluoride test of Groundwater in South Zone (In Kukshi Block)**

Sampling station	Source	Fluoride Concentration(mg/L)
S <sub>1</sub>	HP	2.24
S <sub>2</sub>	HP	3.84
S <sub>3</sub>	HP	5.76
S <sub>4</sub>	HP	5.84
S <sub>5</sub>	HP	6.02
S <sub>6</sub>	HP	4.06
S <sub>7</sub>	HP	4.18
S <sub>8</sub>	HP	3.21

HP=Hand pump,S<sub>1</sub>=Kukshi(Block Colony),S<sub>2</sub>=Kukshi Jawahar Colony near Shivmandir,S<sub>3</sub>=Kuddigpura (Mandbadiyapura) near Sitaram Home, S<sub>4</sub>=Kuddigpura (Junapura) near Sankar home S<sub>5</sub> = Kuddigpura (Junapura) near E.G.S., S<sub>6</sub> = Kuddigpura (Bawadiyaghatpura) 1 near Sohan Home, S<sub>7</sub>=Roja (Malpura) near Mohan Home, S<sub>8</sub> =Talanpur (New Basti-3)

**Map of the study area**



**Fig.1-A: High concentration of Fluoride in different zone in Kukshi block**

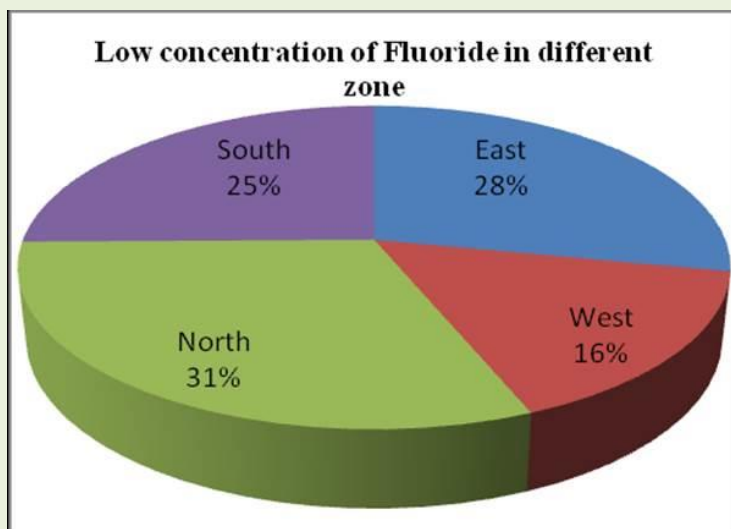


Fig.1-B: Low concentration of Fluoride in different zone in Kukshi block

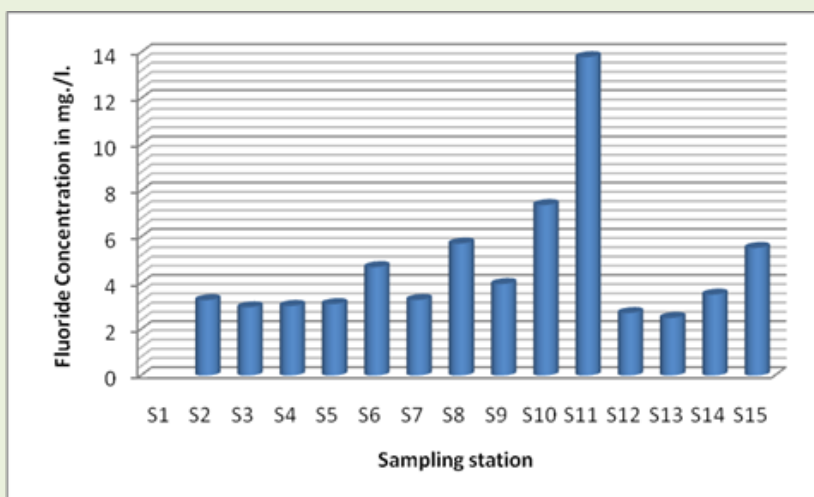


Fig.1: Fluoride concentration in mg/L in East Zone (In Kukshi - Block)

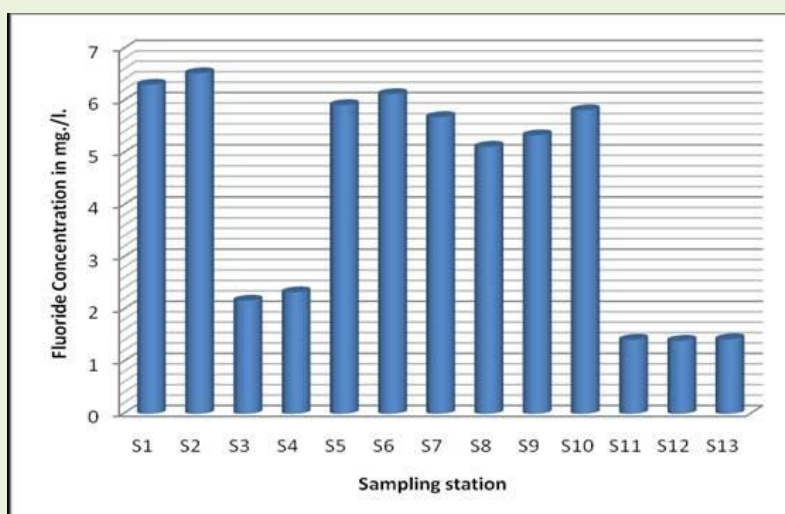


Fig.2: Fluoride concentration in mg/L in West Zone (In Kukshi Block)

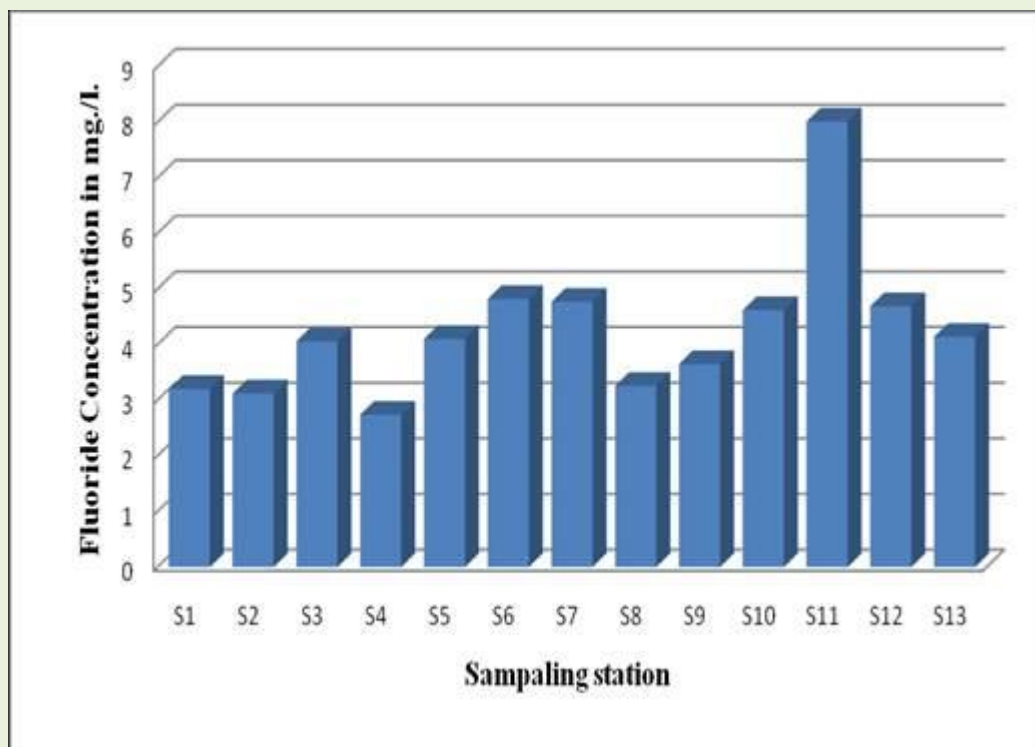


Fig.3: Fluoride concentration in mg/L in North Zone (In Kukshi Block)

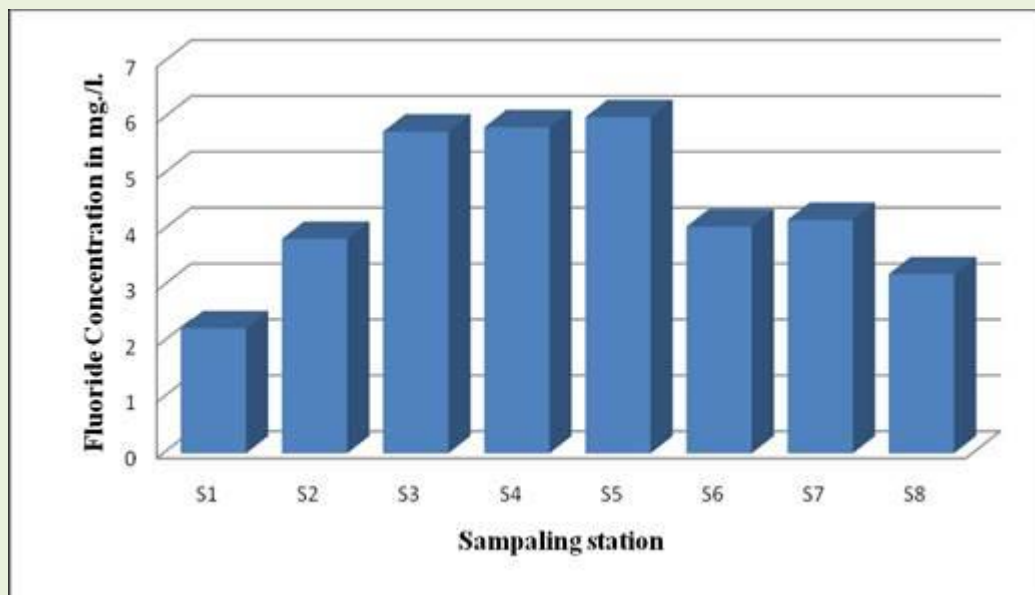


Fig.4: Fluoride concentration in mg/L in South Zone (In Kukshi Block)