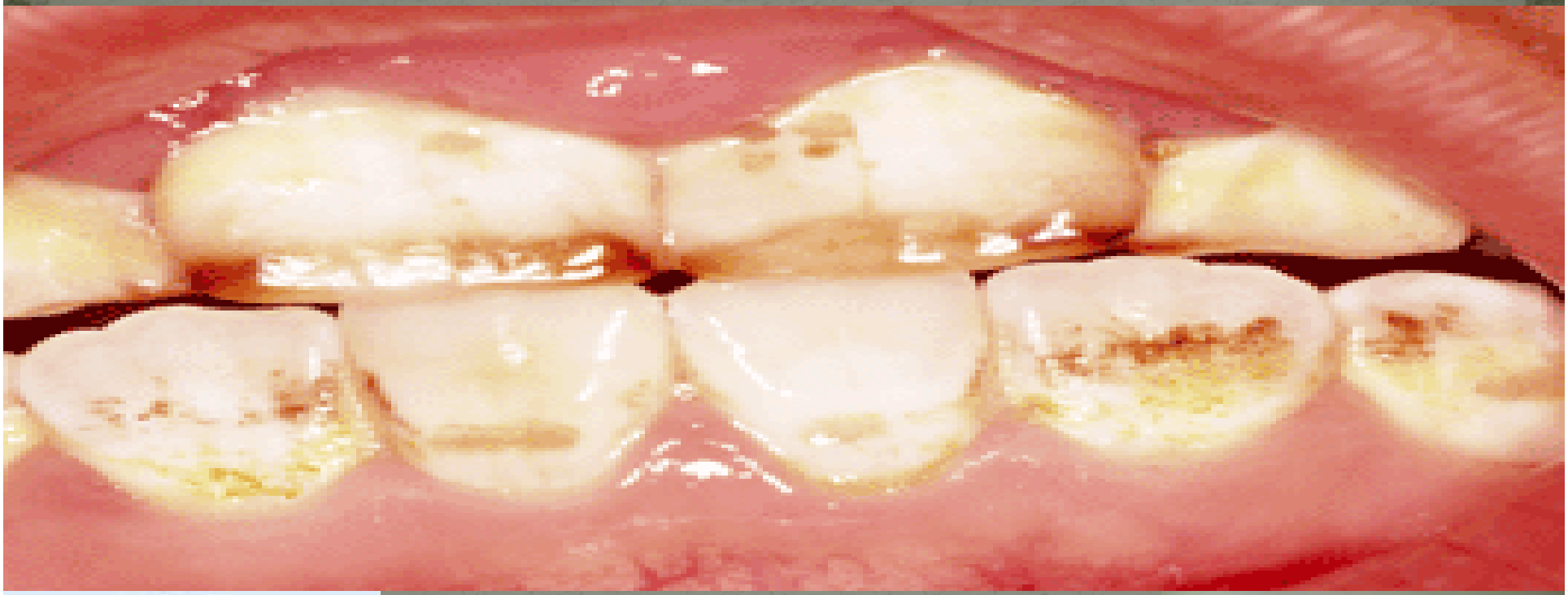
Effect of dental fluorosis on intelligence of tribal Children in barkagaon, hazaribag, Jharkhand, India



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Introduction:

- Earth is gifted with water, a primary, essential resource for all .
- Available drinking water on earth (about 1%) rendered unfit due to various factors including our injudicious activities.
- Fluoride is essential for calcification of bones and teeth.
- Excess (more than 1.5 mg/lit.) fluoride in drinking water may cause different ailments such as dental fluorosis consequently affecting intelligence .
- Excess fluoride in water is coming from geogenic activity.
- Keeping in view our study deals with the fluorosis and I.Q. among tribal dominated school children (06 to 14 yrs) in Barkagoan, Hazaribag, Jharkhand.

Mining Activities

Coal mining activities

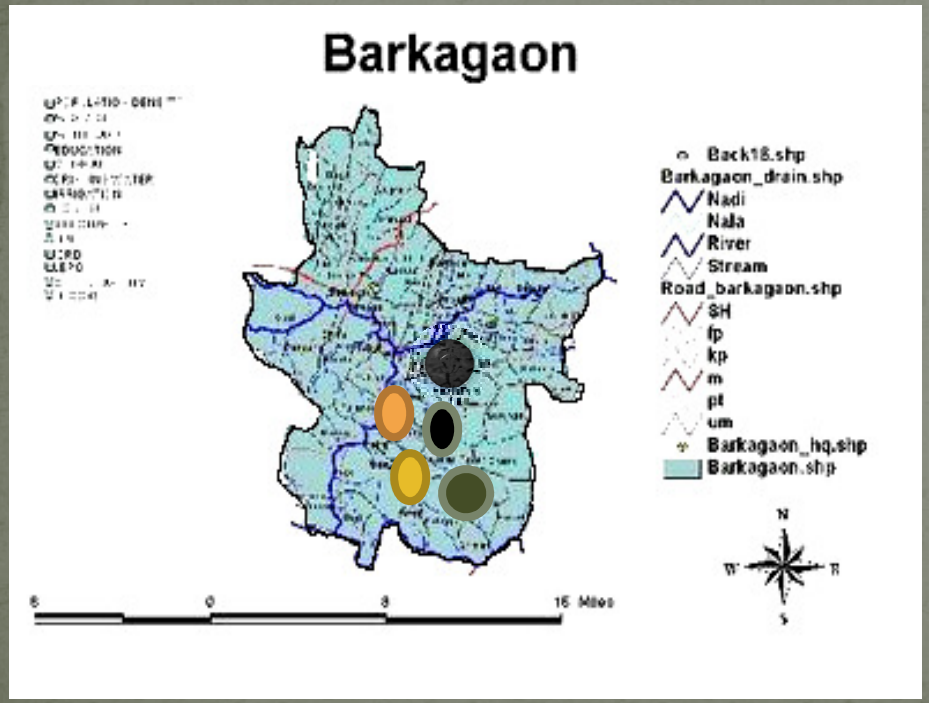
Health awareness camp

Illegal coal transportation

Children with affected teeth

Study Area:

- Five sampling stations are Potanga Basti, Jojotola, Murgatola, Garsulla Basti and Bihad Basti of Barkagoan as shown.



Potanga Basti

Jojotola

Murgatola

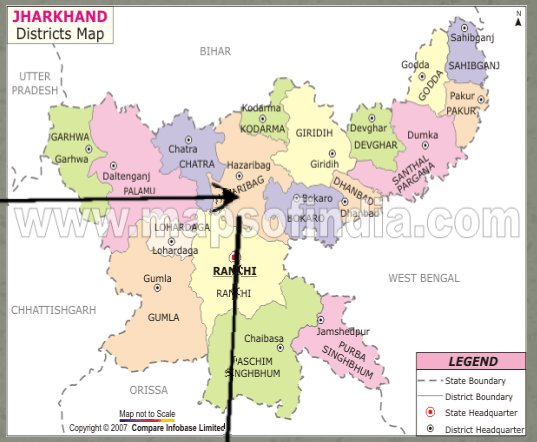
Garsulla Basti

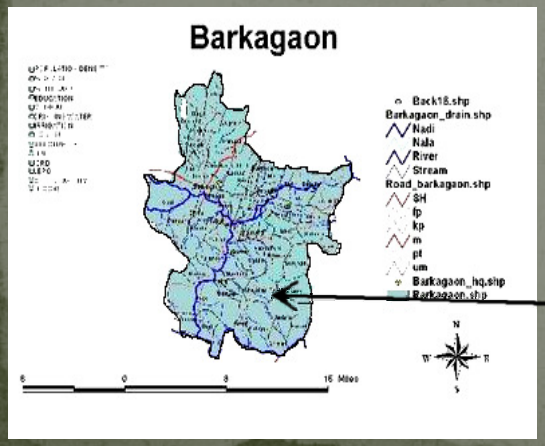
Bihad Basti

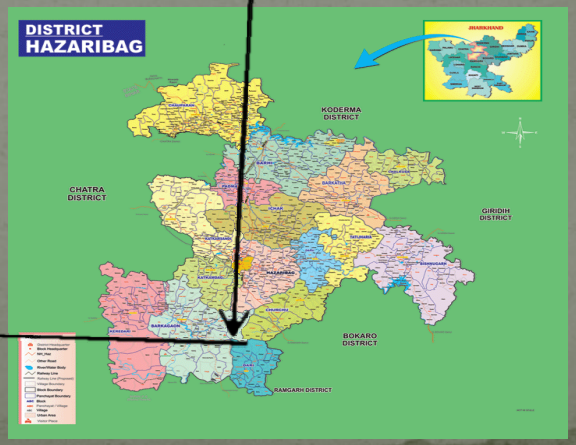
Fig-1: Showing the location of the Study Area

(23^0 52′ 5″ N latitude and 85^0 14′ 15″ E longitude)

(Not to scale)







Material and Method:

- Water samples from July 2011 to June 2013, analyzed for fluoride content as per protocol adopted after APHA, 2005.
- Samples were also tested in State Geological Laboratory, Hazaribag for confirmation.
- Characteristics of teeth among school children (06 to 14 yrs.) was assessed by Dean's Index(1934).
- Intelligence quotient (I.Q.) of school children is determined by Raven's Colored Progressive Matrices (RCPM, 1992),which is a non verbal multiple choice, for each test item, the child was asked to identify the missing part to complete the model, having 30 problems beginning with easy and ending with difficult one with time limit of 30 minutes.

Impact of fluoride in human system (Ghosh *et al.*, 2013)

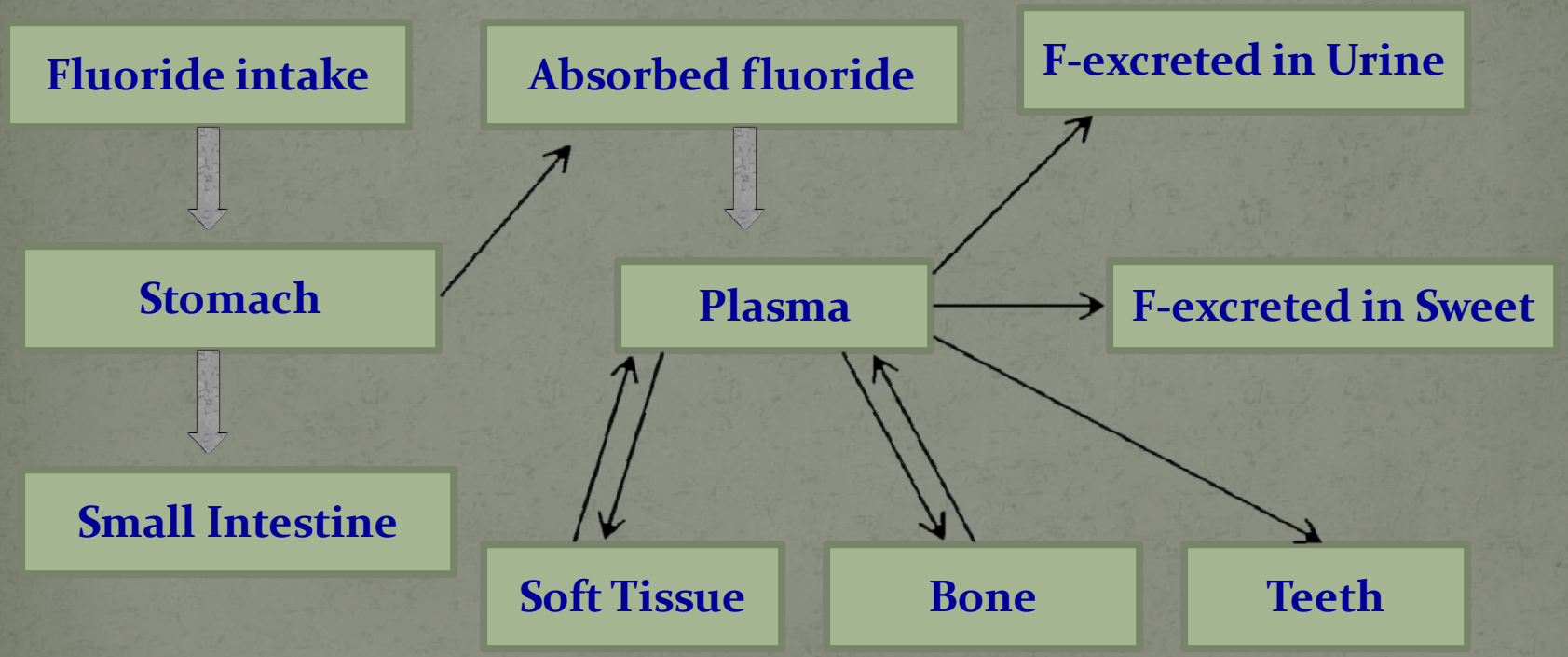


Table 1: Effect of fluoride concentration on Teeth

Sl. No.	Fluoride concentration in mg/L	Effect
01.	Less than 1.5	No effect
02.	1.5 to 3.0	Dental Fluorosis (discoloration, mottling and pitting of teeth)
03.	3.0 to 6.0	Mild skeletal fluorosis
04.	More than 6	Crippling skeletal fluorosis

Result:

Table-2: Seasonal variations of fluoride content in ground water of the study area

Season	Month	V I L L A G E S				
		*Mean+S.E. in mg/l	*Mean+S.E. in mg/l	*Mean+S.E. in mg/l	*Mean+S.E. in mg/l	*Mean+S.E. in mg/l
		Garsullabasti	Jojotola	Murgatola	Potangabasti	Bihadbasti
Rainy	July11 & 12	2.14±0.7	2.25±0.8	2.45±0.7	2.50±0.7	2.17±0.7
	Aug 11&12	1.80±0.7	1.90±0.6	1.75±0.8	1.95±0.8	1.65±0.8
	Sept 11&12	1.84±0.6	1.75±0.7	1.92 ±0.6	2.20±0.7	1.95±0.5
	Oct 11 & 12	2.17±0.6	1.93±0.6	2.66 ±0.6	2.10±0.7	2.25±0.7
	AV:Values	**1.99±0.8**	**1.95±0.7**	**2.19±0.6**	**2.18±0.7**	**1.98±0.7**
Winter	Nov 11&12	2.20±0.7	2.80±0.8	2.30±0.7	2.90±0.8	2.42±0.7
	Dec 11&12	1.98±0.7	2.90±0.8	2.76±0.8	3.50±0.8	2.65±0.7
	Jan 12&13	2.20±0.7	3.16±0.9	2.95±0.8	3.90±0.9	2.90±0.8
	Feb 12&13	2.42±0.7	3.30±0.9	3.51±0.9	3.39±0.9	3.35±0.9
	AV:Values	**2.20±0.7**	**3.04±0.9**	**2.88±0.8**	**3.42±0.9**	**2.57±0.7**
Summer	March12&13	2.55±0.7	3.40±0.9	3.42±0.8	3.60±0.9	3.54±0.8
	April 12&13	2.94±0.8	3.65±0.9	3.70±0.8	3.85±0.9	3.75±0.8
	May 12&13	3.02±0.7	3.35±0.8	2.75±0.7	3.25±0.7	3.30±0.7
	June 12&13	3.40±0.7	4.90±0.9	4.53±0.9	4.75±0.7	3.92± 0.7
	AV:Values	**2.98±0.7**	**3.82±0.9**	**3.85±0.9**	**3.86±0.8**	**3.60±0.8**

* 10 Samples

Table-3: Showing the percentage occurrence of fluoride - affected teeth of children as per Dean's Index

Sl. No.	Villages	Number of cases (06-14 yrs)	Dean's Index					
			Normal	Questiona-ble	Very mild	Mild	Modera-te	Severe
01.	Garsullabasti	145	16.67%	18.42%	21.05%	19.30%	11.40%	13.16%
02.	Jojotola	84	28.58%	11.90%	8.34%	25%	19.04%	7.14%
03.	Murgatola	88	30.69%	12.50%	10.22%	25%	14.78%	6.81%
04.	Potangabasti	155	18.18%	19.48%	7.79%	23.38%	20.78%	10.39%
05.	Bihadbasti	95	20.64%	11.11%	14.28%	28.58%	19.08%	6.35%
Total Percentage of F– affected teeth			22.78%	15.02%	12.91%	23.70%	16.44 %	9.15 %

Table-4: Showing the percentage occurrence of Intelligence Quotient of children as per Raven's Index

Sl. No.	Villages	Number of cases (06-14 yrs)	Raven's Index					
			Extremely Low I.Q.<70	Border Line I.Q. 70-79	Low Average I.Q. 80-89	Average I.Q.90-109	High average I.Q.110-119	Superior I.Q.>120
01.	Garsullabasti	145	22.52%	25.42%	21.67%	16.30%	7.83%	5.26%
02.	Jojotola	84	26.64%	24.90%	22.58%	15.32%	6.43%	4.13%
03.	Murgatola	88	28.22%	25.55%	19.69%	15.76%	5.92%	4.86%
04.	Potangabasti	155	29.79%	26.58%	19.68%	15.46%	4.86%	3.63%
05.	Bihadbasti	95	23.88%	25.81%	20.64%	18.78%	6.80%	4.09%
Total Percentage of I.Q.			**26.21**	**25.65**	**20.85**	**16.32**	**6.36**	**4.39**

Fluoride affected teeth of the study area.

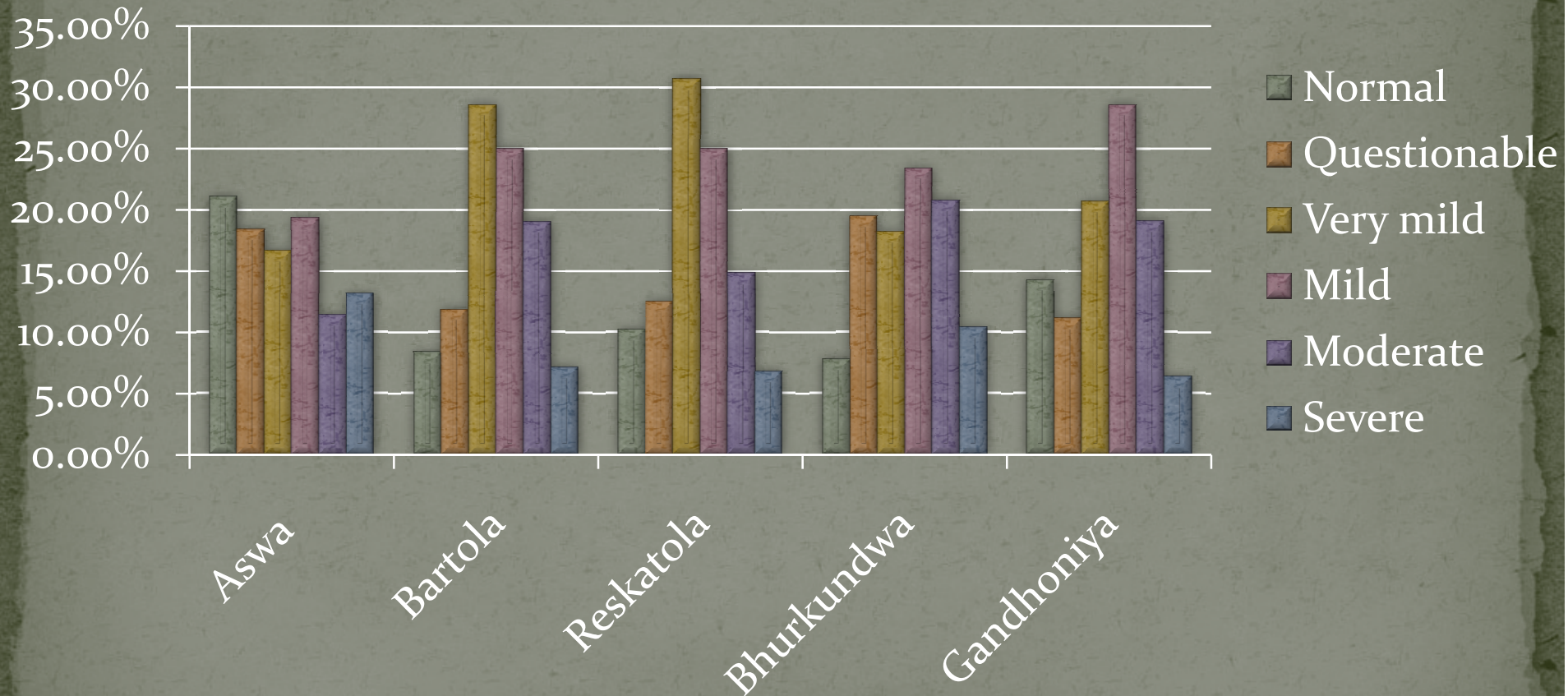
Severe

Moderate

Very Mild

Mild (Irregular)

Fig. 3: Showing the degree of fluorosis on children's teeth in Column



Discussion:

- ALL THE WATER SAMPLES SHOWED HIGHER CONCENTRATION OF FLUORIDE THROUGHOUT THE YEAR (RANGE 1.98 ± 0.5 TO 4.9 ± 0.8mg/lit.)
- THE HIGHER FLUORIDE CONCENTRATION IN THE STUDY AREA IS PROBABLY DUE TO EXCESS EXPLOSION AND MINERAL EXPLOITAION.
- STUDY ON 567 SCHOOL CHILDREN REVEALS THAT ABOUT 77% CHILDREN HAVING DENTAL FLUOROSIS.
- ALMOST 73% CHILDREN WERE LOW AVERAGE TO EXTREMELY LOW.
- BOTH THE RESULTS INDICATE THAT DENTAL FLUOROSIS AND I.Q. IS DIRECTLY RELATED TO FLUORIDE CONCENTRATION IN DRINKING WATER.

Conclusion:

- Water is life but quality drinking water is not sufficiently available in the study area. Most of the sources of drinking water are unsafe to use without some sort of treatment including defluoridation otherwise people will face a lot of health hazards.
- Naturally occurring Bethonite candle may be used in removing extra fluoride in drinking water (Gupta *et al.*, 2014).
- Unit of oral health and hygiene should be established in the area for proper assessment, guideline and monitoring of drinking water quality with the help of State and Central Govt., Health Department. Since the area is tribal dominated, special care should be taken for their proper survival.

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THANKS