

Learning from Jhabua Fluorosis on Water, Nutrition and Health

The work of INREM Foundation in recovery of
Children from Fluorosis



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FLUORIDE KNOWLEDGE AND ACTION NETWORK

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INREM Foundation

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Background

Fluorosis affects millions of people in India. It caused mostly by consumption of high Fluoride in drinking water. In India, the disease Fluorosis was identified in the 1930s and mostly been recognized in its severe forms by severe crippling and deformities that it caused to people. The highly affected places of Nalgonda (now in Telangana), Prakasam (AP), and later in other states highlighted the seriousness of the issue to policy-makers and other society. However, starting from the late 1980s and early 1990s, doctors such as Dr Tapas Chakma and Dr Teotia starting pointing out a strange aside of Skeletal Fluorosis, which was the impact it had on children^{1,2}. Soon observations started coming across India on stunting and extreme forms of Rickets in fluoride affected areas, which coupled with high malnutrition in those places, were suspected to cause very early and serious forms of Juvenile Fluorosis in children of these places³. Many of these places were tribal pockets of central India, and Jhabua was one of them.

What was found in Jhabua

By 2010, INREM Foundation was in its initial stages of developing a relatively comprehensive approach to tackle Fluorosis with support from Tata Trusts⁴. This was helped by the experience of not only doctors such as Dr Chakma, but other pioneers such as Dr A K Susheela, Dr Raja Reddy, and scientists such as Dr Leela Iyengar and Ms Suneetha Sapur. Together, they deduced that a range of problems were attacking Fluorosis affected people, and maybe it was felt possible to address and give relief to some of these symptoms, starting from relief in gastric symptoms, increase in blood Hemoglobin, relief from pain, to more serious forms of relief such as arresting childhood stunting and deformity⁵. These were hints but not well tested on field till then, and Dr Reddy was of the firm opinion, after an initial look at Jhabua's Fluorosis affected children in January 2011 that many of them could be sufficiently "recovered" based on his experience with such patients⁶. Larger acceptance of safe water and nutrition based approach had already been published by NEERI by then through the work of Dr Chakma and scientists such as Dr Pawan Labhasetwar and UNICEF⁷.

What Jhabua provided for was an "open lab" for INREM, with good ethical practices (see Appendix A for Ethics principles followed). Also Jhabua offered a challenge, especially in villages such as Jasoda Khunji and Miyati where almost nothing was tried earlier, and therefore the community was in a state of Tabula Rasa, or complete ignorance of what caused their problems, and how to approach it. In some ways, such a situation is helpful, as it later transpired.

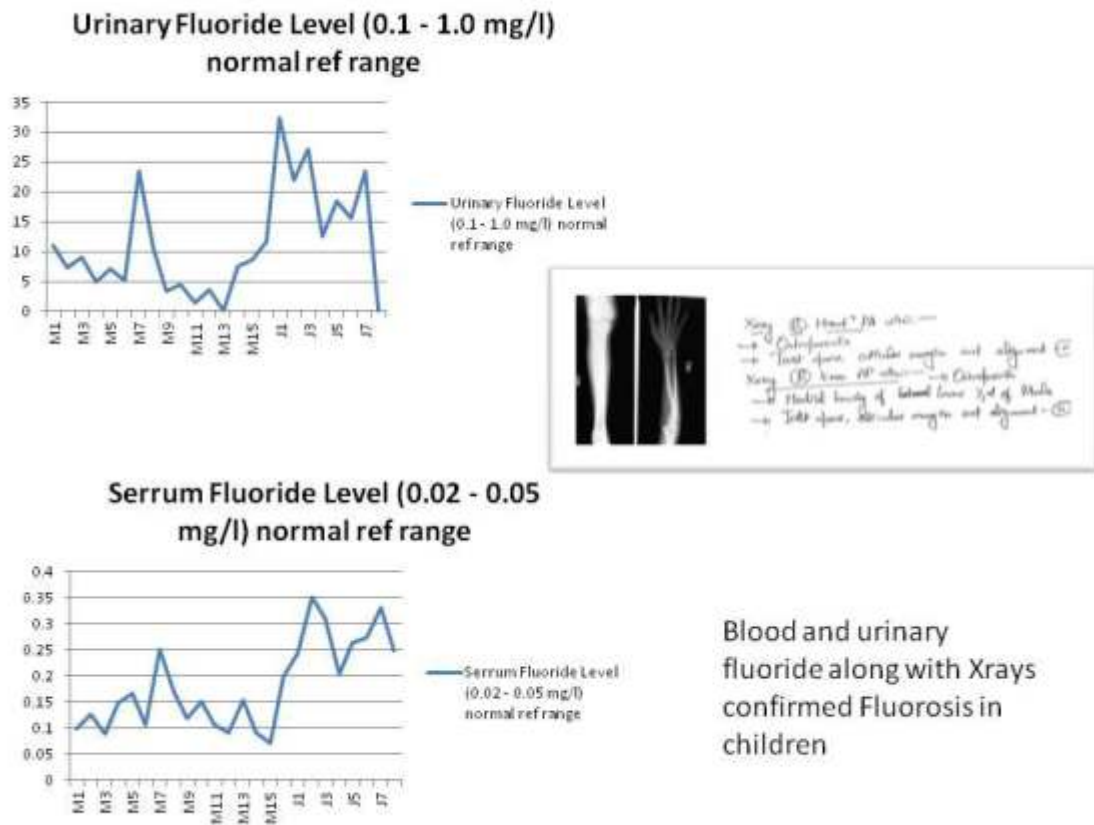


Figure 1: Initial medical Diagnosis of children affected with Fluorosis

Diagnosis supported by Dr Reddy and Dr Susheela for 23 children in these two villages of Jasoda Khunji and Miyati showed in early 2011 (see Figure 1 for initial test results), very high levels of blood serum and urinary Fluoride, and at the same time, severe bone deformities and osteoporosis conditions typical of Fluorosis patients. People were drinking high Fluoride water up to 8 mg/l, though fluoride was found very less in food to cause Fluorosis (see Figure 2 for water and food results) and intake calculations based on a Quantitative Chemical Risk Assessment (QCRA) and Appendix B for a summary for initial diagnosis. On the other hand, it was found that Calcium consumption was very poor, up to 200-250 mg/day only, which is much lesser than the required 800 mg/day recommended daily intake (see Appendix C for calculations on calcium intake). These observations and especially, the important facts that only deeper handpump water had high fluoride, as compared to low Fluoride in shallow wells (see Figure 2), offered some hope and hints to INREM and the supporting scientists

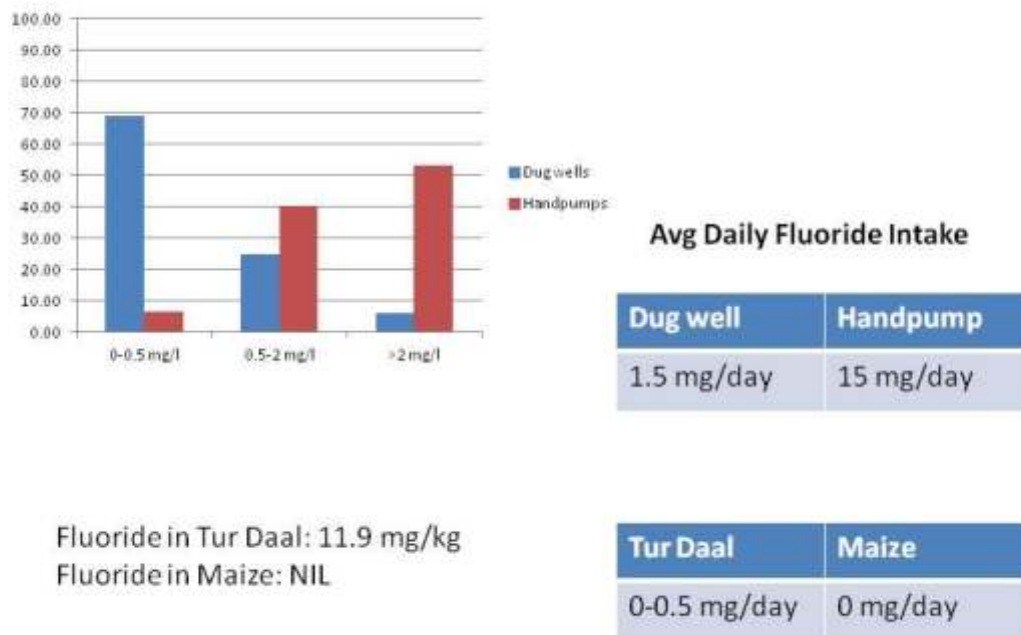


Figure 2: Fluoride found in different sources of Water and Food

The scientific basis for action

Right from the beginning of Fluorosis detection in 1930s, hints that addressing people’s symptoms through a combined action of water and food was suspected⁸. In fact, it has often been pointed out renal problems increase Fluorosis affliction, therefore, better renal health is essential to countering the disease. Further, good nutrition was often seen as means to lesser affliction from some forms of Fluorosis. Published research on Fluorosis affliction shows a strong linkage between Fluoride intake and bone afflictions, increasing with Calcium deficiency⁹. Also, due to the affinity between Fluoride and Calcium, an implicit Calcium deficiency develops in patients of up to 40 mg of calcium requirement for each ingested mg of fluoride¹⁰. Secondly, as reported by several authors, Vitamin C plays a key role in developing better resistance to consumed Fluoride in the body¹¹. Several other observations also helped, for example, that Magnesium could help in both Fluoride detoxification, as well as Calcium binding¹². Also, alongside, since these children, were highly Calcium deficient, they might require a treatment similar to that of high Rickets conditions caused by Vitamin D deficiency, as reported by Teotia¹³. With all this a protocol for action was formed in terms of nutritional supplementation by mid of 2011 in Jhabua by INREM Foundation, of appropriate Calcium supported by Magnesium, Vitamin D and Zinc, along with Vitamin C. The source of Amla high in Vitamin C was chosen, with initially dried sweet and salted Amla, and later, in a tablet form. See Appendix D for the nutritional supplementation protocol and nutritional content

of delivered Amla and other food items such as Til Chikki or Sesame with Jaggery, which is high in Calcium and Magnesium.

Stopping fluoride from entering the body required two types of approaches. Where safer source of fluoride were found close by, those were recommended, for example from shallow water sources such as dug wells, and where they were not found, a household fluoride removal unit was developed using Dr Iyengar's work from IIT Kanpur in partnership with UNICEF since late 1980s and previous experience across India on design of such filters and failures of these efforts¹⁴. What was realized was that good design was essential, along with close adaptation of such technology to people's lives, and constant maintenance.

All these scientific basis for action led a programme of action centered around Safe water and Better nutrition to save these children in Jhabua^{15, 16}.



Figure 3: Generation of Water Filters using for Fluorosis mitigation in Jhabua from 2010 till 2016

Community action and Behavioural change

Realizing that complete adoption of suggested practices of both Safe water and Good nutrition was essential to the success of the programme, a very closely knit communication programme was developed to bring the community towards better acceptance of their problem, and acting on it positively. Highlights of this first phase of 1.5 years of programme from May 2011 till October 2012, were as follows:

- a) Weekly visits to each family, to closely understand their problems and perceptions on Fluorosis and how change in practices were being followed or not
- b) Understanding problems in change practices such as consuming water from safer source, or using household filter, or consuming nutritional supplements, or suggested food, and solving problems in a participatory manner. See Table 1 for examples on participatory problem identification and solving for each of these change practices.
- c) Closely following each case for any signs of improvement in symptoms, and using these as cues for their own continuity of change practices and communicating the same to other families as a good practice.

Change practice	Examples of Problems faced	Modification evolved
Consuming water from Safer dug well water source	Open Waste falling into well, proper well covers are very expensive	Simple Bamboo and Green net based covers for protection
Using Fluoride removal filter	Slow rate of Water entering into filter	Upper Vessel to fill in and let water slowly drop into the chamber. See Figure 3 for the generations of models
Consuming dried Amla	Black colour in Daal, not suitable to all	Amla tablets used by patient as a medicine
Consuming Pharma nutrition supplements	Large piece difficult to take, especially for children	Small pieces for children and in different times
Consuming nutritious food	Bitter taste of Cassia Tora	Taste improvement in both sweet and salted forms with Gur, dried Ginger; and with Dhania, Salt for Masala

Table 1 : Change practices, problems faced by people and the modifications which evolved

Some of the programmatic changes which came about due to this process of close interaction and feedback from affected community were:

- i) Design of filter and modification to final form filter: Starting from a Earthen pot to a Plastic one, from a fixed size to around 10 different sizes, from a monolith design to a modular one, from just having Activated Alumina, to including Activated Carbon for making water more palatable and safe, there have been several generations of the Domestic filter being used with people in Jhabua over a period of 6 years. All of these have been guided by concerns expressed by the users and as a result steps have been taken for improvement. Many Clay pots used to get broken, hence the change to plastic. Alumina taste was a problem for people, hence the addition of Activated Carbon, brought in by scientists of Tata Innovation Labs. A local potter, Ramchandra Prajapati was a critical link during this entire process of model testing and improvement.

- ii) Realizing that a “tablet” mindset is present in people, especially when there is less faith in outcome of practices such as dietary and food change habits that could bring results in the long run new product was developed. Dried and salted Amla was found to be lagging in acceptance initially, and this pushed innovation towards an Amla tablet containing around 7mg Vitamin C per 750 mg tablet. This found high acceptance among affected children as shown by our weekly monitoring data of consumption.
- iii) Promoting for Safe water sources among the community, through simple field testing of water sources proved to be a very strong communication agent. The pink-yellow colour differentiator between safe and unsafe Fluoride got translated as “Lal-Pila” locally, for different water sources, ultimately proving beneficial to better acceptance of safe dug well water by Miyati village people in early 2012.
- iv) Since constant maintenance was essential for functioning of fluoride removal filters, it was realized that a modular design needs to be in place. This later became the basis for further development of the filter into three stages of bacterial disinfection, fluoride removal and taste improvement.
- v) Cassia Tora that was promoted by Dr Chakma as a green leafy vegetable having high Calcium was found to contain high Magnesium and Vitamin C too, (Appendix E) for nutrition contents. In terms of feedback from community, it was found that the taste of Cassia Tora is slowly retreating amongst people. Apart from that Cassia Tora is consumed only a few times, if at all, during monsoon. This lead INREM to follow a process of drying Cassia Tora and convert it into a powder that could be consumed all year long.
- vi) The regime which was developed following this above feedback with people then came into forming this comprehensive approach as shown in this Table 2 and in pictures in Figure 5.



Figure 4: INREM’s set of Water and Nutrition Products for Recovering from Fluorosis

	Safe Water		Nutrition	
	Availability of Safe sources	Non availability of Safe sources	Direct pharmaceutical supplementation for severely affected people	Food based supplementation
Background work	Testing of water sources for fluoride with field kit and a sample in lab		Food listing of people across seasons and an idea of their acceptance of nutritional interventions	
Intervention required	Rejuvenation, promotion, protection and access to Safe water sources	Providing household purification filter with some contribution from family	A Regime of nutritional pharma-supplementation based on Appendix D for children, adults and based on affliction	Til Chikki in winter, Cassia tora powder for adults at 5 mg powder per day, and promotion of other nutrient rich food such as Soya, dried Amla and Amla tablet
Regular maintenance and monitoring	Cleaning and covering of safe sources and ensuring their use	Monthly checks of filter and replacement of material used when found unsafe	Ensuring consumption of supplements and in cases of individual problems such as size of tablet, any side effects etc, finding ways to address them	Conducting communication campaigns to promote availability and consumption of nutrient rich food from field and purchase from markets

Table 2: Fluorosis Mitigation Approach followed by INREM from 2010 till 2012

Early Impacts and Proof of Concept

By closely following each of the children under this Fluorosis mitigation programme very closely, observations were being made by all local stakeholders such as parents, teachers, other children, and most importantly, their siblings and children themselves. Following these observations, initial reporting of pain relief, increased vigour, attention, speech, and general signs of vitality were made. More importantly, key observations starting pouring out in the following cases with visual evidences:

- a) Kailash of Miyati – Kailash was in 2010 observed with a strange form of skeletal Fluorosis, especially affecting his feet ie there was sword like front pointing of tebia bone. This not only was physically debilitating, but also something that was affecting this 9-year old boy in all other faculties of life, in school, at home and others. Gradual following of mitigation practices starting from usage of household filter, and tablets, and later going on to using dug well water, and better food, Kailash shows not just a physical recovery, but he was seen riding bicycle,

growing and selling vegetable by walking 7 kms to nearby town Thandla, and later, often migrating to Gujarat, and very recently getting engaged to be married. His recovery apart from other observations, lend much credit to the mitigation efforts. Til Chikki in winter, Cassia tora powder for adults at 5 mg powder per day, and promotion of other nutrient rich food such as Soya, dried Amla and Amla tablet Conducting communication campaigns to promote availability and consumption of nutrient rich food from field and purchase from markets

- b) Nilesh of Jasoda – Nilesh in 2010, was a severe case of childhood stunting affected by Skeletal Fluorosis. As can be seen in the Aarambh film (vimeo.com/110122874), he walked in a rounded manner then and even normal sitting was a difficulty. One could spot him from far away among all children of the school sitting on a small stone for support while others played. Drastic changes could however be seen in Nilesh from October of 2011 onwards. While some ability to walk, and run emerged, alongside, one could start physically observe changes on bone deformity. By end of 2012, most of the severe bone conditions had recovered, and recent pictures (see Figure 6) tell a story of very different person. He even does not like to believe his old photos!
- c) Bhur sinh of Miyati – Born to mother Kalibai, who herself was highly affected with skeletal Fluorosis during pregnancy, Bhur sinh, was affected with a severe form of deformity of both hands and feet. Worse, this affected him psychologically, and he was another case of neglected student at school, or at playground. The first sign of recovery in his case was by his teacher of him playing football and jumping over the school wall. Later, he moved out of the village for higher studies and he is being observed towards better health now and got married in December 2015.



Figure 5: Adaptation by Community of Safe water filters for their needs

These observations starting from early 2012, were followed by a second round of clinical observations which authenticated the observations. The above figure of visual recovery and the following X-rays which added evidence to the observations being made from ground. This motivated to further document and record visual evidences of certain children such as Nilesh of Jasoda, which was later documented into a short film, Aarambh (link above). Also timeline photos of Nilesh, over the years complemented by X ray analysis (see Figure 7), established case based evidence of this approach of Safe water and Good nutrition to tackle such extreme Juvenile Fluorosis in children coupled with complex Malnutrition problems. This case was written and published by Dr Raja Reddy in various forms, and most importantly into evidence and teaching within the API Textbook of Medicine¹⁷ and elsewhere¹⁸. Alongside popular articles and presentations on these cases have been produced¹⁹



Figure 6: Recovery of Nilesh from Fluorosis over time

Issues of acceptance, sustainability, and public health evidence

Ever since initial results of recovery of children started coming up and got popularized through different mediums, the questions of transportability of ideas and therefore basic issues of both science and scalability started coming up to INREM since late 2012 and early 2013. Especially crucial were the contributions of several individuals in this effort. A review of INREM's effort by Alka Palrecha of People in Centre pointed out to the need for mass communication efforts to reach out message to wide audience in Jhabua and community based centres that could take interventions to a longer time duration ¹⁹. Advice from Social Communication strategist D K Bose stressed on people's understanding of the issue, their learning of how to cope with the problem and then

spreading positive cases amongst people in their own language. The PhD work of Nilmadhab Mohanty on INREM's work gave critical emphasis to framing of messages in positive and negative direction and their impact on people's response to change in behavior particularly in nutrition²¹

Apart from this, the initial work also raised need for larger evidence on what really works in reviving

these Fluorosis affected children – is it water, is it nutrition, is it something specific in nutrition, or is it just 'growth factor' playing for these children?

At this stage, INREM was in its next stage of planning its work for Jhabua, and taking several of these observations into mind designed the next level of interventions. It was realized to have greater focus on health education, on spreading positive messages, on using earlier experience to help newer cases, to widen spread within Jhabua and nearby, and have more sustainable interventions for both safe water and better nutrition.



Figure 7: X-rays of Nilesh from 2011 and 2013 showing recovery in leg bowing and other symptoms

Current action in Jhabua and elsewhere and developing results

From late 2013, a next stage of Fluorosis mitigation interventions started in Jhabua and elsewhere. INREM's direct effort now spread to gradually address the most highly affected people and villages within Jhabua district, and then in neighbouring districts of Ali Rajpur and Banswara. Elsewhere, INREM's ideas started taking root, and especially in Nagaon district of Assam, a similar effort started to happen from early 2014. Recently, similar action has started in Nalgonda on a small scale.

The following changes took root in Jhabua on the Fluorosis mitigation approach

- a) A mass communication effort was adopted with an education of local folk group that resulted in creation of Nukkad naatak for Fluorosis. This Nukkad naatak which has incorporated a mix

of messaging experiences, and positive learning from earlier examples such as Nilesh and Kailash, also works by having new characters which children can associate with. Having now been screened to tens of thousands people since mid 2014, this Naatak has become an important communication tool, along with new flavours such as one script especially for Mothers and others such fine tuning. The same Nukkad natak has been played other districts also.

- b) Since monsoon of 2014, INREM started the process of getting few farmers to start growing small vegetable gardens with Trellis cultivation method and vermiculture, for growing food that can help develop better resistance to Fluorosis. Initially adopted by around 20 farmers, this has now spread with products from these gardens reaching to several thousand population by now. See Appendix F for a description and analysis of these Nutrition gardens and Figure 8 for an example
- c) Identification and promotion of Safe water sources is an important part of INREM's work now. Till now around 2000+ community members have shifted to such safe water sources in these villages. The aim is to have as much people shifting to such sources so that the need for fluoride removal filters does not arise. A four step approach of Rejuvenation, Promotion, Protection and Access to these safe sources is being followed. They also learned how to protect the safe source. A gradual behavioural change has been found among the community.
- d) Rehabilitation of affected children and adults is now an important focus of INREM's work. For children, the focus is on education ie by getting them to appreciate the larger emphasis on Safe water and Good food which will help them to achieve better health. This is helped by village based computer learning centres. For adults who are affected with Fluorosis, the emphasis is on helping them to express their own aspirations which are then helped by the community



Figure 8: Nutrition gardens for Sustainable nutrition for resistance from Fluorosis

and elsewhere to go towards it. This computer based learning initiative has taken a good momentum among young children suffering from fluorosis. A hope of “I can” is on their face!

As of now as Table shows, INREM’s work has reached to 28 villages touching a population of more than 20,000 in Jhabua. More cases of recovery keep getting recorded, with around 400 children now registered in the Acute Fluorosis recovery programme. Many new cases of recovery such as Pangu from Jasoda, Vanti from Ghawaliya, Pintu from Nawapada and others keep coming every month.

On the other hand, similar work in Tapatjuri area of Nagaon district in Assam since 2014 is also showing similar results as from Jhabua ²². Severely affected children from Tapatjuri are recovering in a similar way as Jhabua over the past 2 years of Safe water and Nutrition intervention. This effort is being coordinated along with both the PHE and Health departments of Assam government on behalf of INREM by Mr A B Paul who is retired as Chief engineer from PHE, Assam. This effort is now being upscaled by the government across Nagaon and to rest of Assam jointly with PHE and Health depart making FMSC (Fluorosis Mitigation Support Centre) in Nagaon and in other places. In the surrounding areas of Jhabua district, now Ali Rajpur and Dungarpur are coming up as places where INREM’s model of working is gradually expanding.

Number of Villages with Fluoride in Jhabua	INREM’s current reach in Jhabua	Population reached	Skeletal Fluorosis affected Children	Mothers in Preventive Fluorosis programme	Rehabilitation for Severe Patients
95	28 villages	20617	309	530	40

Table 3: Scale of Need and reach of INREM’s Jhabua Fluorosis Programme

What do we learn from Jhabua Fluorosis

Some important messages come out from Jhabua Fluorosis

- a) Acting early on Fluorosis can help save many children from a life of deformity and crippling
- b) A mix of Safe water and Good nutrition regime needs to be promoted widely
- c) Urgent action is needed for some affected people
- d) Long term sustainable interventions such as Rainwater conservation of Safe water sources and Nutrition Gardens need promotion for the future
- e) Communication of both positive examples and cautioning against danger are needed
- f) Constant interactive local communication is essential for Fluorosis action
- g) Affected adults need to be taken out of pain and suffering with similar approach as children

These important messages coming out of the Jhabua experiences gives hope to many people across India who are suffering from Fluorosis and related symptoms. It also tells us to act quickly for improvement of life of these people.

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Appendix A: Bio-Ethics Procedures followed by INREM

The Ethics Committee performs according to the ICMR (Indian Council for Medical Research) "Guidelines on Ethical issues for research in social science and health". This committee has laid guidelines for our work in following ethical practices for health interventions and research. A process of receiving consent from participating patients of the fluorosis programme was finalized by this Ethics committee.

Appendix B: Initial Patient test results

Out of 25 children who were diagnosed and monitored for Skeletal fluorosis, all of them has urinary fluoride more than 1 mg/l and blood serum fluoride more than 0.04 mg/l. The maximum Urinary fluoride was 22 mg/l and Blood serum fluoride was 0.2 mg/l. The bones X-rays showed significant deviations of long bones and also early age Osteoporosis which is a mix of Fluoride and Malnutrition. The Urinary and Blood serum fluoride tests were conducted at Dr A K Susheela's laboratory in New Delhi and the X-ray Diagnosis was performed by Dr Raja Reddy's team in Apollo Hospitals, Hyderabad. One example of an X-ray diagnosis is provided here as a sample.



Appendix C: Calculations on Daily Calcium and Magnesium intake

	Maize sample 1	Maize sample 2	Maize sample 3	Tuwar	Wheat	Paddy	Total daily intake (mg/day)
Calcium (mg/kg)	148.93	381.47	238.65	756.13	566.08	628.66	
Avg Calcium (mg/kg)	250						
Magnesium (mg/kg)	1074.22	1348.88	1140.18	1170.34	1265.59	1195.12	
Avg Magnesium (mg/kg)	1200						
Avg daily intake	250 g/day			50 g/day	10 g/day	5 g/day	
Calcium mg/day	65 mg/day			35 mg/day	5 mg/day	3 mg/day	100 mg/day
Magnesium mg/day	250 mg/day			60 mg/day	12 mg/day	5 mg/day	197 mg/day

Milk and meat products occasionally consumed would provide around 100 mg/day of Calcium at maximum. Therefore Calcium consumption would not exceed 200 mg/day on average

Appendix D: Nutritional supplementation protocol and nutritional content of food delivered to patients

Nutritional Content

Til Chikki	
Calcium mg/piece	264 mg
Magnesium mg/piece	36 mg

1 full pharma supplement tablet	
Calcium mg	1000 mg
Magnesium mg	150 mg
Vitamin D3 IU	1000
Zinc mg	4

	1 full Amla tablet
Vitamin C/Amla tablet	4.6 mg

Nutritional Supplement Protocol

Para on calcium deficiency, fluoride intake, and hence additional supplementation @ 40 mg calcium per mg of fluoride

Starting	Skeletal		Others	
	Calmag	Amla	Calmag	Amla
Children				
0-5 years	0.25	0		
5-12 years	0.5	1		
12-adult	1	1	0.5	1
Adult				
PLM	1	1	0.5	1
Other	1	1	0.5	1
1 year	Skeletal		Others	
Children	Calmag	Amla	Calmag	Amla
0-5 years	0.25	0		
5-12 years	0.25	1		

12- adult	0.5	1	0	1
Adult				
PLM	1	1	0	1
Other	1	1	0	1
2 years	Skeletal	Others		
Children	Calmag	Amla	Calmag	Amla
0-5 years	0.25	0		
5-12 years	0.25	1		
12- adult	0.25	1	0	1
Adult				
PLM	0.5	1	0	1
Other	0.5	1	0	1

Appendix E: Nutrition contents of Cassia tora cold dried powder

Parameters	Nutrient composition
Calcium	4480 mg/100 gm
Iron	30 mg/100 gm
Magnesium	360 mg/100 gm
Crude Protein	25 gm/100 gm
Vitamin C	93.68 mg/100 gm

Appendix F: Nutritional gardens, descriptions and analysis

Nutrition gardens have come about as one approach from INREM which aims at building better nutritional security amongst families affected by Fluorosis. Apart from our programme of nutritional pharma-supplementation, we have piloted and now expanded to medium scale nutrition gardens; these gardens which now provide one important source of required nutrients apart from their regular consumption from their field, from government programmes and purchase from market. The mixed two level Trellis approach of Nutrition garden for Fluorosis mitigation which we piloted last year was now taken to many more households in these six months. Around 50 families went for 25 ft by 25 ft large nutrition gardens and 160 families the smaller 5 ft by 5 ft nutrition gardens. In order to ensure good quality production, INREM provides support with seeds, vermicompost and steel wire for making the upper deck for trellis. Community members have contributed with wooden or concrete poles, for these gardens. The results of these have been highly encouraging. In the next phases, we plan to expand to around 200 large nutrition gardens. This combined approach of nutrition for Fluorosis mitigation is finding adoption among community members now on a wide scale.

@fluorideindia on twitter

Facebook group fluorideindia

@fluorideindia on Medium

About Fluoride Knowledge and Action Network (FKAN)

The Fluoride Knowledge and Action Network (www.fluorideindia.org) is a nationwide body formed in 2013 with an objective of bringing solutions to Fluoride affected people across India. The FKAN was initiated by Arghyam, a philanthropic trust based in Bangalore and is coordinated by INREM Foundation, an Anand, Gujarat based organization working on Water quality and Health issues.

Within the few years of its existence, the FKAN has grown towards a unique network consisting of the prime experts of the Fluoride issue, main institutions within the Government that are mandated to deliver the solutions, and important civil society groups which are innovating on new ideas.

In few states such as Assam, Telangana, Madhya Pradesh, Karnataka and Andhra Pradesh, the network has been able to develop working models of mitigation efforts, both as community based programmes, as well as convergence within Government institutions. A key effort of FKAN has been to bring Safe water, Health and Nutrition perspectives together on this single issue, and on one platform.

Limbs of a Disaster – A typical twisting of limbs known as Genu Velgum in a very complex condition for a Skeletal Fluorosis affected woman. As fate, she accepts her condition and carries on with her daily life.

A Stigma from Water – A Walking stick is the only companion for many Skeletal Fluorosis affected patients in Nalgonda. Life moves around this stick, and it becomes more real than other humans around.

Young minds with new hope – Nutrition is the ray of hope for children, who are promised good food in Anganwadi and Mid-day meal programmes by new zeal of work. They will carry memories of this disease, and perhaps none else.

Threads of Recovery – Within gloom, few bright spots of recovery are seen more in Nalgonda now. Appropriate surgery at the right time saves this man from further deterioration and gives his family something to smile for.



FLUORIDE KNOWLEDGE AND ACTION NETWORK (FKAN)

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