

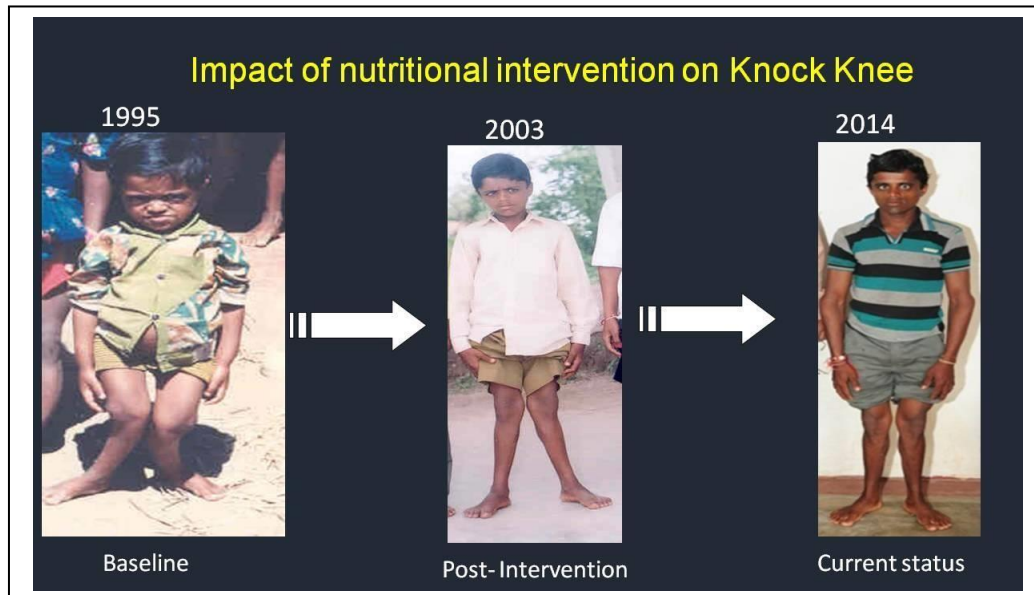


# Knocking Down Fluorosis

**Dr. Tapas Chakma**  
Scientist 'G'

ICMR-National Institute For Research in Tribal Health, Jabalpur, Pin-482003

Email: tapas\_chakma@rediffmail.com



**Figure 1. Impact of nutritional intervention on “knock knee”**

## Executive Summary:

Fluorosis causes “knock knees” and severe dental damage. Over 18 million people are affected by dental fluorosis and nearly eight million by skeletal fluorosis in India<sup>1</sup>. At Mandla in Madhya Pradesh (MP), fluorosis along with nutritional deficiencies led to “knock knees” among children <20 years<sup>2,3</sup>. Our study found the following gaps in addressing this problem:

Lack of intersectoral/departmental coordination

Lack of knowledge about local indigenous nutrition-dense food

Non-availability of fluorosis diagnostic facility

This policy brief is aimed at addressing the above-mentioned gaps based on the results of a successful water and nutritional interventional strategy in several districts of MP. Interventional strategies implemented included change in the source of water supply and nutritional supplementation of calcium, vitamins D<sub>3</sub> and C, and iron for 3-6 months. Also, IEC campaigns targeted at increasing the consumption of locally available ‘Chakoda Bhaji’ (Casia Tora) using correct cooking techniques were disseminated by local health workers.

After five years of intervention, the prevalence of “knock knee” reduced from 51% at baseline to 2.6% in children <20 years. Similar interventions undertaken in Seoni district of MP with larger population (>5000) also showed significant reduction in the prevalence of “knock knee” (33%) and other symptoms (80%) after two years. Also, complete reversal of bone deformity due to fluorosis was observed in mild cases and partial reversal in severe cases after intervention. Based on these findings, it is recommended that these successful interventions can be scaled-up for control of fluorosis in the affected regions. In addition, some long-term recommendations are also suggested.

### **Policy Recommendations:**

#### Short-term:

1. Promote “Kitchen Garden” for *Casia tora*
2. Specific targeted IEC/BCC campaigns to promote local availability of micronutrient-rich diet.
3. Initiate calcium, and vitamins C and D<sub>3</sub> supplementation at schools.

#### Long-term:

1. Establishment of district coordination committee comprising of the representatives from Health, Public Health Engineering and Women and Child welfare departments.
2. Establishment of fluoride testing facility at district hospital (approximate cost seven lakhs).

### **Background:**

Fluorosis has emerged as an important public health problem in India. It affects multiple body organs and systems. Its clinical manifestations start from damaged and discolored teeth and end in crippling conditions. It is estimated that in India, over 18 million people are affected by dental fluorosis and nearly eight million people by skeletal fluorosis<sup>1</sup>. Most of the eastern, southern and western districts in Madhya Pradesh (MP) have excess fluoride in ground water, and are heavily inhabited by socially and economically vulnerable tribes.

The root cause of this problem is the fluoride levels in drinking water supply coupled with lack of awareness, other nutritional deficiencies and lack of diagnostic facilities. Hence, addressing these issues is essential for a successful fluorosis control programme in tribal populations of India.

## **Aim/Objective:**

This policy brief is aimed at facilitating the scale-up of a successful interventional programme for fluorosis control in India. The intervention consisted of two components:

- a) Water intervention
- b) Nutritional intervention

**Water intervention:** The main aim of water intervention was provision of safe drinking water so that the fluoride entry is stopped. For this purpose, we implemented renovation of traditional wells that contain fluoride-free water, or supply of piped water. This involved liaisoning with the Public Health Engineering Department at Mandla by coordinating with the District Magistrate's office. Financial assistance was provided by the Rajiv Gandhi National Drinking Water Mission (RGNDWM), Ministry of Rural Development, GOI.

**Nutritional intervention:** During the initial survey, we observed severe deficiencies of micronutrients in the diet. Hence, supplementation of calcium, vitamins D<sub>3</sub> and C and iron was provided for 3–6 months, as all these micronutrients are required for bone mineralization<sup>4,5,6</sup>. A locally available shrub called Chakoda Bhaji (Cassia Tora) was found to contain three micronutrients (calcium, vitamin C and iron), and was being consumed by the villagers. Hence, a dual strategy was initiated. With the help of district health authorities, therapeutic supplementation<sup>7</sup> of calcium, vitamins D<sub>3</sub> and C and iron was undertaken for 3–6 months depending upon the severity of the child. Also, RMRCT (now NIRTH, Jabalpur) undertook an IEC campaign through group meetings of village women with the help of Anganwadi workers and Female Health Workers periodically for three years to increase the consumption of Chakoda Bhaji at least five times per week, which they were only using  $\leq 1$  time per week. During these campaigns, numerous myths about Chakoda Bhaji were debunked. The women were also asked to change the cooking process i.e. not boiling the leaves and throwing away the water.

After five years, an evaluation was performed that showed very significant results. There was reduction in the prevalence (<20 years) of “knock knee” from 51% at baseline to 2.6% after intervention. There was a reduction in urinary secretion of fluoride from 41% to 9%. Similar intervention was conducted in Seoni district of MP<sup>8</sup> with larger population (>5000). After two years of intervention, there was significant reduction in the prevalence of “knock knees” (33%) and other symptoms (80%). A case-wise evaluation showed complete reversal of bone deformity due to fluorosis in mild cases and partial reversal in severe cases.

Based on our success, UNICEF, Bhopal and INREM foundation (Tata trust) implemented this intervention model in Dhar and Jhabua districts, and found similar results. Hence, there is strong evidence to show that this intervention model works and is suitable for scaling-up by the state government to other fluorosis-affected tribal areas in MP. However, certain existing gaps need to be addressed to ensure a successful scale-up.

### **Gap Analysis:**

The concept of nutrition supplementation in the National Programme for Prevention and Control of Fluorosis is weak and needs to be strengthened. There is a lack of intersectoral approach and coordination for fluorosis mitigation. Initial therapeutic supplementation of micronutrients requires intervention from the Health department. Supply of safe drinking water requires intervention from the Public Health Engineering department. Nutritional supplementation through dietary modification requires intervention from the Women and Child Welfare department. Most districts in MP have no coordination between these three departments. There is also a lack of knowledge about fluorosis and local indigenous nutrition-dense food in the population, which requires urgent intervention. Fluorosis diagnostic facility (fluoride estimation in urine or blood) is not available in most district hospitals and medical colleges, and should be established.

### **Policy Recommendations:**

**Short-term:** Promote “Kitchen Garden” for *Casia tora* and target orientated IEC/BCC campaign to promote local availability of micronutrient-rich diet. Calcium, and vitamins C and D3 supplementation at schools should be initiated.

**Long-term:** A coordination committee comprising of representatives from Health, Public Health Engineering, and Women and Child Welfare departments at the district level with the district magistrate as the chairman and CMHO as the secretary should be established. Fluoride testing facility at district hospital (approximate cost seven lakhs) should be established.

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