2 Nutrition

2.1 Evaluation of effect of intervention (safe drinking water and micronutrient supplementation) on endemic fluorosis in Mandla, Madhya Pradesh

Dr. Tapas Chakma

Status : Ongoing project (August 2002 - July 2003)

Objective

To assess the impact of intervention on prevalence of dental and skeletal fluorosis.

Methodology

The intervention measures suggested in fluorosis affected villages were in force since 1996. Effect of intervention was evaluated in two worst affected villages. Evaluation comprised of obtaining medical histories, doing clinical and radiological examination, analysis of various biochemical parameters, conducting dietary survey and estimation of fluoride level in urine and drinking water sources. Fluorosis affected individuals (identified in 1996) were examined for signs and symptoms for fluorosis. Fluoride level was estimated using fluoride ion selective electrode (Orion Research Inc.).

Salient findings

Clinical

The overall prevalence of genu valgum was 34.2% at baseline (1996), which came down to 1.2% after intervention (2003) in Tilaipani village. The prevalence of dental mottling was 74.4% in 1996, which came down to 70% after intervention in the same village. The bowing of lower limbs, which were seen in 1996, disappeared in 2003 (Fig 2.1.1). There was a complete reversal of bowing among mild cases and partial reversal in severe cases (Fig 2.1.1). similar reduction was also observed in Hirapur village.

Radiological

Radiological features like coarse trabecular pattern, multiple growth arrest lines, thickening of cortex which were present in most of the cases at base line were not seen in the present series of X rays of the same children. Mild form of bowing of tibia & fibula, which were seen in many cases, were totally corrected after intervention. Even in severe cases of bowing, there has been a great radiological improvement (Fig 2.1.1). Bony exostosis, which is considered to be one of the severe forms of skeletal fluorosis, was seen in few cases at baseline. But in the present series of X rays of the same children, no bony exostosis were seen.

Biochemical

A total of 86 blood samples from Tilaipani village were collected before intervention and subjected to biochemical analysis. The mean value of serum alkaline phosphatase was 16.6± 6.4 KA units while it was 3.4 ± 0.9 mg% for serum inorganic phosphorus and 9.5 ± 0.5 mg% for serum calcium. In present study, 75 blood samples were again collected and retested for these biochemical parameters. All the values were found to be within normal limits.

Fluoride content of water

In the year 1996, water samples from different hand pumps in the study area contained fluoride levels ranging from 9.2 ppm to 10.8 ppm. After recommendations to Government of Madhya Pradesh, all the hand pumps were dismantled. In the present study, water samples from other drinking water sources i.e. open well, river, pond etc. were analysed for fluoride contamination, which shows fluoride levels within permissible limit of <1.0 ppm.

Dietary surveys

Dietary intake pattern before and after intervention of Tilaipani and Hirapur villages is shown in Table 2.1.1. Average intake of protein, calories, calcium and iron was significantly ($p<0.05$) less than the recommended dietary allowance (RDA). Vitamin C intake was also significantly lower. The average consumption of cereals and pulses was higher than RDA, whereas that of green leafy vegetables, sugar and jaggery, milk and milk products & oil and fats was significantly ($p<0.05$) below the RDA. However the intake of micronutrients like Iron, Calcium, Copper & Zinc were increased after intervention. This is mainly due to increased intake of green leafy vegetables.

Table 2.1.1 : Intake of various nutrients before (1996) and after (2003) intervention.

Nutrient	1996	2003
Protein (g)	56	63
Iron (mg)	12	16
Fat (g)	15	12
Vit. C (mg)	25	17
Copper (mg)	2	3
Zinc (mg)	9	10
Calories (kcal)	2009	2125
Calcium (mg)	200	611
Magnesium (mg)	780	869
Cereals (g)	516	500
Pulses (g)	43	73
Green leafy vegetables (g)	17	35
Roots & tubers (g)	47	20
Other vegetables (g)	46	48
Milk (g)	18	5
Sugar (g)	7	3

Fluoride content of urine

About 41% urine samples had acceptable (<2ppm) levels of fluoride in 1996. This proportion increased to 92% in 2003.

Conclusions

Due to intervention, the fluoride levels in water were reduced to less than 1 ppm. Occurrence of new cases has been prevented. There is complete reversal of mild skeletal deformities and partial reversal in severe deformities. There has been no effect of intervention on dental mottling.

By the time the annual report is ready, this project would be completed.

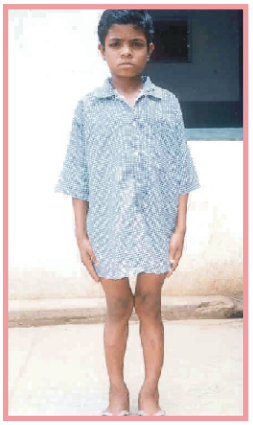
Recommendations

1. Maintain supply of safe drinking water in all the fluorosis-affected areas.
2. Strengthen 'Information Education Communication' about locally available calcium rich diet.
3. Implement School Dental Health Screening Programme to ensure early detection of problems to avoid permanent changes.

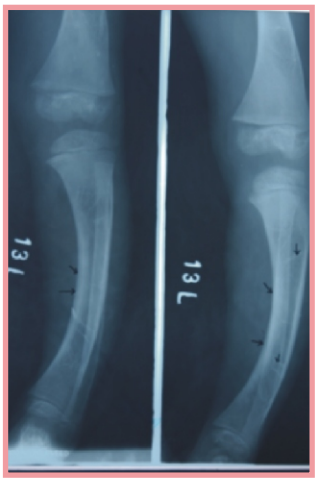
Fig 2.1.1 Impact of fluorosis intervention on clinical and radiological parameters of genu varum.

1995

Intervention



2003



2.2 Investigation of cause of deformities suspected due to high fluoride level in drinking water in villages of Dudhi block, district Sonbadhra, U.P.

Dr. C.K.Dolla, Dr. Surendra Kumar

Status : One time investigation (August 2004 - November 2004)

Objective

To investigate the cause of reported deformities.

Methodology

A preliminary study was carried out in four villages of Dudhi block of Sonbhadra district, Uttar Pradesh (Jirgadandi, Rohania, Chuyyamitti, Nigai) to know the cause of skeletal deformities suspected due to excess fluoride in water. A total of 53 drinking water samples including two from river water were collected in plastic bottles. Clinical examination was done for dental mottling and skeletal deformities in 59 randomly selected individuals in Rohania village. Based on clinical severity, 68 spot random urine samples were collected from Jirgadandi and Rohania villages. X-rays of pelvis, legs and arms were taken. Diet history on staple food, consumption of milk was obtained. Fluoride levels in water and urine were estimated by fluoride ion selective electrode (Orion) by standard laboratory techniques.

Salient findings

Fluoride levels in water samples varied from 1.1 to 9.7 ppm, 1.9 to 7.9 ppm, 2 to 3.4 ppm, and 0.3 to 1.1 ppm in Jirgadandi, Rohania, Chuyyamitti and Nigai villages respectively. The concentration of fluoride in river water varied from 2.7 ppm to 2.8 ppm. The 68 spot urine samples from Jirgadandi and Rohania villages had high fluoride levels.

Dental fluorosis (Dean's criteria) was seen as mild in 28/59, moderate in 20/59, severe in 11/59 individuals. Skeletal deformities observed were knock-knee in 21/59, kyphosis in 8/59 and restriction of joint movements in 7/59 individuals in Rohania village. The main staple diet was maize. X-ray findings revealed diffuse osteopenia in right forearm, anterior bowing in lower leg, increased bone density in knee joint and obtrusion of acetabuli in pelvis (Fig 2.2.1 and 2.2.2).

Fig 2.2.1 A boy with genu valgum

Fig 2.2.2 X-ray of lower limb showing bowing of tibia and fibula

2.3 Impact of ICDS input on health and nutritional profile of preschool children in Kundam block of Jabalpur district

Dr. Surendra Kumar, Dr. C.K.Dolla

Status : Ongoing project (October 2002 - September 2004)

Objective

To assess the impact of ICDS on health and nutritional status of preschool children.

Methodology

Preschool children from ICDS & non-ICDS villages of Kundam block, Jabalpur district were studied. The total number of children covered from ICDS & non-ICDS villages were 511 & 617 respectively. Clinical examination was carried out to detect various morbidities. Height, weight and mid arm circumference were measured using standard anthropometric instruments.

Salient Findings

Nutritional Status

The mean height of children was 83.7±15.8 cm in ICDS villages and 80.3±14.7 cm in non-ICDS villages. The mean weight of children in ICDS & non-ICDS villages was 10.4±3.4 kg & 9.4±3.3 kg respectively. Figure 2.3.1 shows nutritional status of children in both types of villages. Severe undernutrition (Grade-III as per Gomez classification) was high in non-ICDS villages (17%) as compared to ICDS villages (8.4%).

Immunisation

It was observed that immunisation coverage among the ICDS villages (59.7%) was significantly higher than non-ICDS villages (32.9%) ($P<0.001$).

Morbidities observed

ARI was the commonest morbidity observed in both ICDS and non-ICDS villages, followed by worm infestations. In general, the prevalence of morbidities was less in ICDS villages (Figure 2.3.2) as compared to non-ICDS villages.

The study shows that ICDS has definite impact on health and nutritional status of preschool children in tribal areas.

By the time the annual report is ready, this project would be completed.

Fig. 2.3.1 Nutritional status among ICDS and non-ICDS vilages

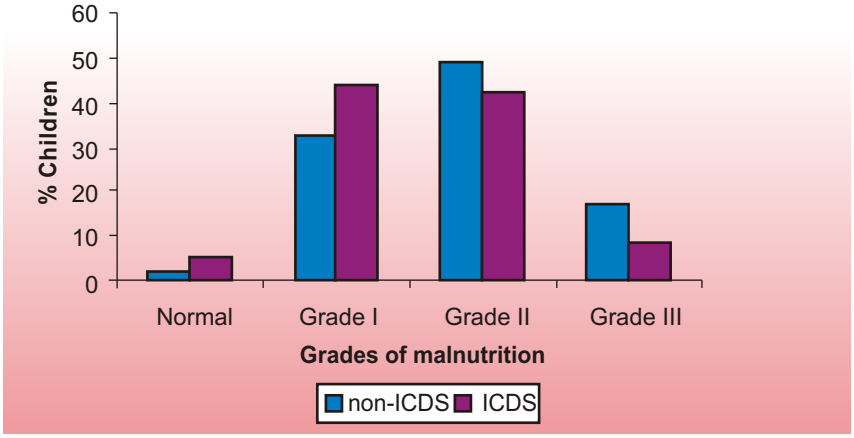
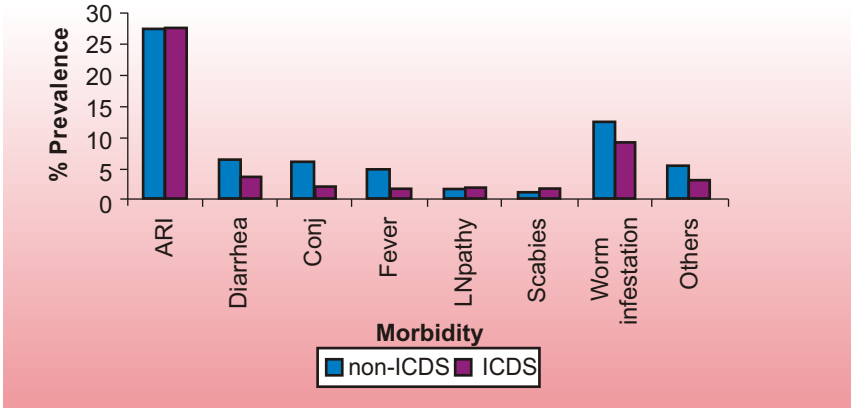


Fig. 2.3.2 Morbidity status among ICDS and non-ICDS villages



2.4 Assessment of iodine deficiency disorders in Baigachak area of Dindori district

P.L.Pande, Dr. Surendra Kumar

Status : Ongoing project (June 2004 - May 2005)

Funding Agency : ICMR (Extramural)

Objectives

1. To determine the prevalence of goitre in Baiga tribe.
2. To assess the iodine status of goitrous & non goitrous individuals.
3. To assess thyroid functions of goitrous individuals.
4. To assess the iodine content of the salt consumed by the population.

Methodology

Taking into consideration the prevalence of iodine deficiency (45%) obtained in an earlier study conducted by the centre in 1986, a sample size of 2000 has been drawn for the present study. All the school children from Baigachak area were examined for goitre. Urine samples were collected from these children and subjected to iodine estimation by wet digestion method. Blood samples were collected from goitrous children & sera separated. Various thyroid function tests like T3, T4 and TSH will be performed on these samples by ELISA. Salt samples were also collected from market as well as household and subjected to iodine estimation by using a kit supplied by NIN, Hyderabad.

Salient Findings

Four hundred & forty seven individuals were examined for iodine deficiency disorders. Clinically, iodine deficiency was seen in 83 individuals. Majority of the patients were in the age group of 15-44 years followed by 5-14 years. Iodine deficiency seemed to be more prevalent in females (Figure 2.4.1).

Urine samples could be collected from 59 individuals. Severe iodine deficiency was detected in 24 (39%) samples, while moderate and mild deficiency was seen in 21 (34%) and 12 (19%) samples respectively (Fig 2.4.2). Salt samples from market (n=4) as well as from house hold (n=26) showed an iodine content of 3.2 to 9.5 ppm, which were within normal range.

Fig. 2.4.1 Prevalence of Goitre

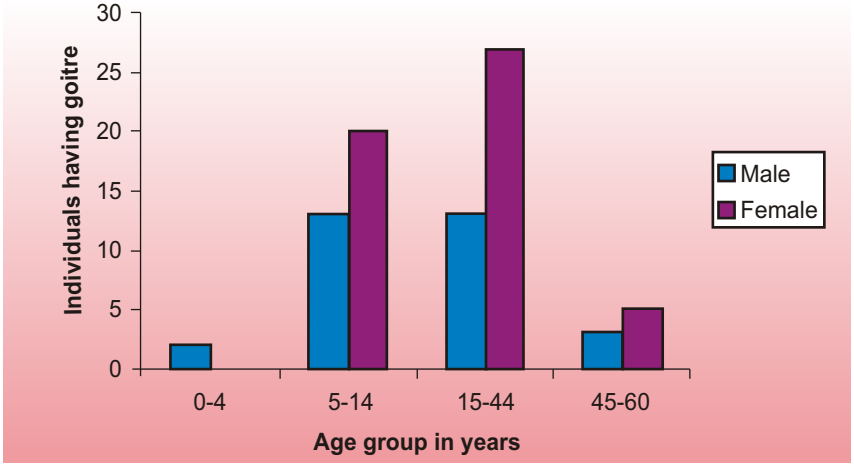
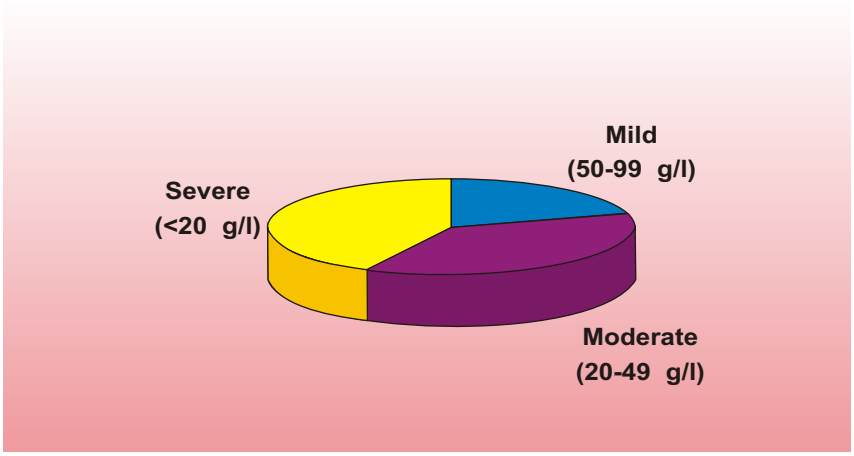


Fig. 2.4.2 Iodine Deficiency



2.5 Nutritional status of adolescents in tribal areas of Madhya Pradesh

Dr. K. Damayanti, Dr. Tapas Chakma

Status : Ongoing project (January 2003 - December 2005)

Objectives:

1. To assess the nutritional status by anthropometry in tribal and non-tribal adolescents.
2. To assess the dietary intake and food habits of tribal and non-tribal adolescents.
3. To see the growth pattern of tribal and non-tribal adolescents in a cross sectional sample.
4. To see the influence of socio-cultural and economic factors on nutritional status and growth of tribal and non- tribal adolescents.

Salient Findings:

So far 40% of the sample has been covered (i.e. 495 tribal and 291 non-tribal adolescents) for anthropometry, socio-economic parameters and dietary intake.

The mean differences in the height and weight of tribal and non-tribal adolescents are shown in figures 2.5.1 & 2.5.2. The anthropometric data reveals that there are no significant differences between tribal adolescents and non-tribal adolescents with respect to height and weight. But with respect to height, girls are taller than boys up to the age of 13-14 years and then boys overtook the girls and finally, boys are 11cm to 15 cm taller than girls at 17-18 years (Fig 2.5.1). With respect to weight also, tribal adolescent girls are heavier than boys up to the age of 16 years and then boys overtook the girls in the 17-18 year age group (Fig 2.5.2) and finally boys are 5-10 Kg heavier than girls.

Prevalence of nutritional deficiency signs is given in Table 2.5.1. Based on clinical signs, anaemia is the major problem followed by goitre. There is no difference in the prevalence of nutritional deficiency signs between tribal and non-

tribal adolescents.

The Mean nutrient intake of different age groups is given in Table 2.5.2. The iron and calcium intake was very low. The carotene and calcium intake is higher than reported values due to higher consumption of green leafy vegetables by few households. The nutrients intake as percent of recommended dietary allowance is

Table 2.5.1 Clinical signs of nutritional deficiencies in tribal and non tribal adolescents

Nutritional deficiency signs	Tribal (n=495)		Non-tribal (n=291)	
	Number	Prevalence(%)	Number	Prevalence (%)
Anaemia	116	23.4	55	18.9
Angular Stomatitis	7	1.4	4	1.4
Glossitis	1	0.2	2	0.7
Goitre	17	3.4	8	2.7

Table 2.5.2 Mean nutrient intake of tribal adolescents

Age Group (yrs)	Energy (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Carotene (µg)	Thiamine (mg)	Riboflavin (mg)
10-12	1712 ±324	56.8 ±14.9	339 ±300	15.1 ± 5.9	2582 ±4344	1.3 ± 0.5	1.8 ± 2.3
13-15	2060 ±474	67.7 ±18.0	464 ± 352	19.1 ± 7.1	4027 ±4954	1.6 ± 0.7	2.7 ± 2.7
16-18	2016 ±281	63.9 ±13.6	365 ±288	18.6 ± 7.1	1874 ±3151	1.5 ± 0.6	1.5 ± 1.7

Fig. 2.5.1 Mean differences of height in adolescents

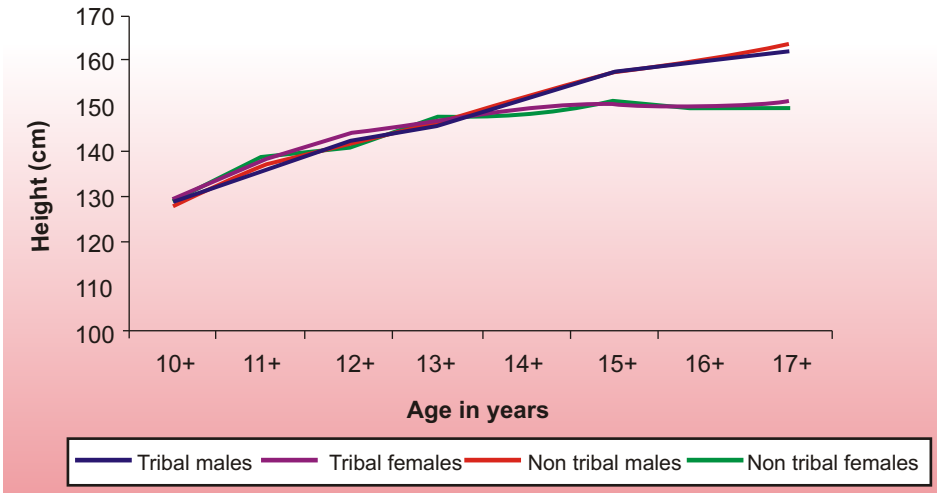


Fig. 2.5.2 Mean differences of weight in adolescents

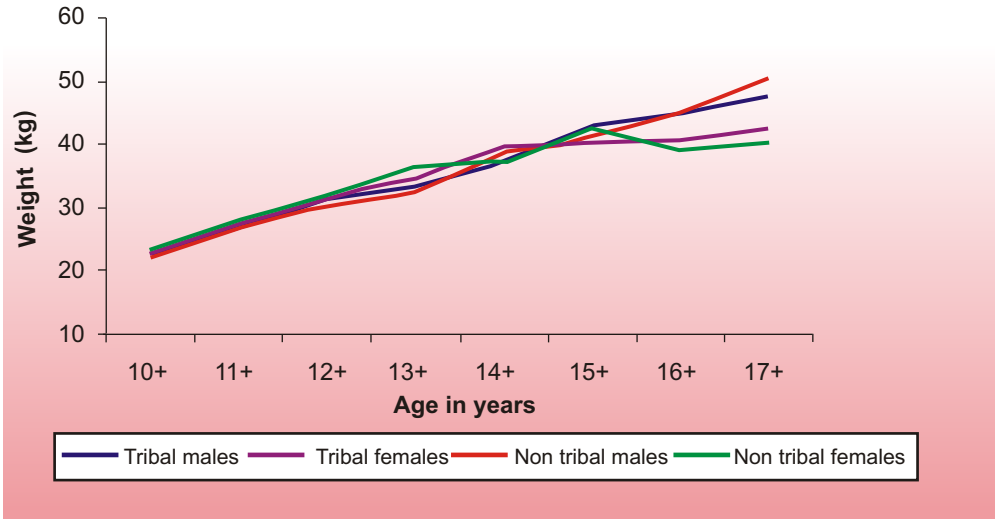


Fig. 2.5.3 Intake of nutrients as % RDA