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Universal Salt Iodisation: the Sikkim Experience

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Introduction

Iodine deficiency disorders have been recognised as a public health problem in India since the 1920s. Unlike other micronutrient deficiencies caused by insufficient food intake, iodine deficiency disorders (IDDs) are due to deficiency of iodine in water, soil and foodstuffs; IDD therefore affects all socio-economic groups living in defined geographic areas. Initially, IDD was thought to be a problem confined to the sub-Himalayan region. Following the successful trial of iodized salt in the Kangra Valley, Himachal Pradesh, a National Goitre Control Programme (NGCP) was launched in 1962. Initially the programme aimed at providing iodised salt to the well-recognised sub-Himalayan 'goitre' belt. However, there was no substantial reduction in iodine deficiency disorders because of the erratic availability of iodised salt, availability of cheaper non-iodised salt and the lack of awareness regarding the need to use iodised salt.

Surveys carried out in the eighties showed that IDD exist even in riverine and coastal areas. No state in India is completely free from iodine deficiency disorders. In view of this,, a decision was taken for the universal iodisation of salt for human consumption. The policy began to be implemented in a phased manner from 1986. This article traces some of the studies on iodine deficiency disorders and their prevention and control measures in the remote, hilly, land-locked state of Sikkim.

Epidemiology of iodine deficiency disorders in Sikkim

Sikkim is a small hilly state of India in the eastern Himalayas with a known high prevalence of goitre and cretinism, but the precise magnitude and epidemiology of IDD was not known. In 1988-1989, the Medical Research Division of the Government General Hospital in Namchi carried out detailed house-to-house survey in south district of Sikkim, funded by the Sikkim Science Society. These studies revealed the existence of severe iodine deficiency affecting almost the entire population of Sikkim. These studies alerted the authorities to the alarmingly high levels of iodine deficiency disorders in the state.

The Government of Sikkim provided full support to extending the survey throughout the state. A comprehensive document on 'Policy, Strategy and Plan of Action to control IDD in Sikkim" was approved by the Government of Sikkim. As envisaged in the document, a Thyroid Centre was set up at the Government General Hospital, Namchi, with the following mandate:

- to collect and compile data on the epidemiology, the geographical distribution, and severity of IDD in the state.
- to cater to the training needs to develop personnel of requisite expertise for the IDD control programme.
- to carry out research in the field of IDD and
- to serve as the state's reference centre for the IDD control programme.

A special IDD Task Force was set up in the Thyroid Centre. The Task Force carried out many studies to ascertain the distribution and severity of IDD in the state. The salient features of some of the important studies are described below.

Surveys carried out in 1989-1990

The state's population in the 1980s was 316,385, of which the urban population was only 16.15%. There are four districts and 440

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Text Box 1
WHO Classification of goitre by palpation
0. No palpable or visible goitre.
1. A goitre that is palpable but not visible when the neck is in the normal position (i.e. the thyroid gland is not visibly enlarged). Nodules in a thyroid that is otherwise not enlarged fall into this category.
2. A swelling in the neck that is clearly visible when the neck is in a normal position and is consistent with an enlarged thyroid gland when the neck is palpation
PAHO definition of endemic cretinism
An agreed definition of endemic cretinism was adopted by the Pan American Health Organization (PAHO) in 1986, and later confirmation in 1994 WHO/UNICEF/ICCIDD.
The definition consists of three major features:
1. Epidemiology: It is associated with endemic goitre and severe iodine deficiency.
2. Clinical manifestations: These comprise mental deficiency, together with either: (i) A predominant neurological syndrome including defects of hearing and speech and characteristic disorders of stance and gait of varying degree; or (ii) Predominant hypothyroidism and stunted growth. Although usually the neurological syndrome predominates in some areas a mixture of the two syndromes has been observed.
3. Prevention: In areas where adequate correction of iodine deficiency has been achieved, endemic cretinism has been prevented

inhabited revenue blocks (RB). An RB is the smallest administrative unit comprising of one to five villages or hamlets. The populations of the RBs varied and were divided on the basis of population range into four groups; those with < 200 households, those between 200 and 500 households, those between 501 and 1999 households, and those between 2000 and 4999 households. For the survey, 249 RBs were randomly selected. A two-stage sampling procedure was adopted. In stage one, RBs were randomly selected from the list of all inhabited RBs, giving proportional representation to RBs from all population ranges. In stage two, households were randomly selected from the selected RBs using the electoral lists.

A survey worker visited the selected houses and completed the household information sheet including detailed personal and family history. The survey team comprising of a physician, an Auxiliary Nurse Midwife, and a Male Health Worker, visited the selected houses at a later date and carried out the examinations. A second visit was made if more than one of the inhabitants were unavailable for examination. The clinical examination was carried out by one of the two physicians for the entire survey.

Goitre was classified as per the WHO criteria[1] and endemic cretinism, was classified according to the PAHO criteria[2]

Clinical examination for goitre and a detailed neurological examination was carried out. For endemic cretinism, the criteria used were the presence of following features in varying severity: deaf-mutism or bilateral hearing loss and speech abnormality; neuromotor abnormalities with disorders of gait and/or stance; mental deficiency. Urinary iodine estimation was carried out in a representative sample. Urine samples were collected at the end of the survey from 8 RBs, two from each district, selected randomly. In each of the selected RBs, 10 % of the households were studied. In these households, all members 5 years of age and above were asked to give urine samples. Casual urine samples were collected in wide mouthed plastic bottles and transported to the central laboratory the same day. Modified alkali ash method described by Baker et al [3,4] was used for urinary iodine estimation.

Iodine deficiency disorders survey

The survey was started in November 1989 and was completed over a period of 18 months. A total of 17,837 individuals from 3,197 households from 249 RBs were examined during the survey. The age and gender distribution of the population studied is shown in Table 1.

There were 8,953 males and 8,884 females. Nearly 43% of the subjects studied were below the age of 15 years and 14.5% of the subjects were above the age of 45 years, similar to the population distribution in the state.

Goitre

Goitre was detected in 9637 individuals (4347 males and 5290 females[5]) Table 2.

The overall goitre prevalence was 54%. Grade I goitre was the most

Table 1 Age and gender distribution of population studied

	Age group in years					
	0-4	5-14	15-44	45-49	>60	Total
Males	1259	2623	3655	838	578	8953
Females	1218	2521	3967	744	434	8884
Total	2477	5144	7622	1582	1012	17837

Table 2 Prevalence of goitre age-group-wise

	Age group in years					
	0-4	5-14	15-44	45-49	>60	Total
Males	11.60	55.32	51.41	60.14	63.49	48.55
Females	11.33	56.56	71.34	75.94	76.27	59.55
Total	11.47	55.93	67.57	68.97	68.97	54.03

Table 3 Prevalence of goitre and urinary iodine in different districts of Sikkim

Name of the district	Prevalence of goitre	Urinary iodine
		Mean (SD) ug/dl
East District	60.9	3.07 (2.21)
South District	54.7	4.07 (3.30)
West District	51.3	3.39 (2.59)
North District	45.8	4.45 (2.96)
Sikkim	54.0	4.00 (2.68)

frequently encountered type followed by grades II and III in descending order of frequency. Goitre prevalence was found to increase with age. As many as 96% of the households had at least one member with goitre. Endemic goitre was observed in all the RBs surveyed. There were only 7 RBs with goitre prevalence less than 30%. In 99 RBs the goitre prevalence was less than 50% whereas in 150 RBs (60%) the goitre prevalence was more than 50% indicating the severity of the endemic. The prevalence of endemic goitre in different districts is given in Table 3.

Goitre, as this survey showed, was found to exist everywhere in Sikkim. No area was completely free of it, and many areas were found to have significantly high endemicity. The fact that 54% and 47% of these, respectively were grade II and III goitres indicated the severity of the endemia. Goitre prevalence of similar and higher magnitudes have been reported from some severely iodine deficient regions of India[6,7].

Cretinism

A total of 617 subjects were diagnosed as having endemic cretinism[8]. The age wise distribution of those with cretinism is given in Table 4.

The overall prevalence of cretinism was 3.5% (Table 5).

Neurological cretinism was the predominant form. Of the 617 persons with endemic cretinism, 84 were below the age of 10 years. Of the 249 RBs surveyed, endemic cretinism was observed in 194 RBs (77.9%). More alarmingly, cretinism prevalence was 10% or

Table 5 Prevalence of endemic goitre, cretinism and urinary iodine levels in different districts of Sikkim

	No Examined	Prevalence of		UI Mean (SD)
		Goitre	Cretinism	
Sikkim	17,837	54.0%	3.46%	4.00 (2.68)
East District	4,588	60.9%	4.93%	3.07 (2.21)
South District	5,320	54.7%	3.68%	4.07 (3.30)
West District	5,407	51.3%	2.83%	3.39 (2.59)
North District	2,522	45.8%	1.67	4.45 (2.96)

Table 4 Age and gender distribution of those with endemic cretinism

	Age group in years						
	0-10	11-20	21-30	31-40	41-50	>50	Total
Males	47	79	95	46	29	20	316
Females	37	98	89	49	21	7	301
Total	84	177	184	95	50	27	617

more in 13 RBs. Familial clustering was noted. Of the 617 persons with cretinism, 228 belonged to 99 families. There were 75 families with two cases of cretinism each, 19 families with three each, 4 families with four each and one family with 5 members with cretinism. There were 58 persons with cretinism who were married. Of three such couples, one had four normal children, another had one normal child, and the third had both normal children and children with cretinism. In addition to severe mental retardation, 76% of those with cretinism were deaf and mute and most others had some degree of hearing loss. About 14% were totally dependent and another 23% needed considerable assistance in daily activities. Goitre was present in 399 of those with cretinism (goitre prevalence of 64.7%), This was significantly higher than the prevalence of 54% in the general population ($p<0.001$).The commonest neurological feature was deaf-mutism, found in 472 persons (76.5%). Clinical examination revealed all these 472 to be totally deaf with no response to sound, and all of them were mutes as well. Only 2 out of the 617 with cretinism had normal hearing on clinical examination. None of them had any articulate speech, although many of them had mushy indistinguishable articulation.

Endemic cretinism, as this survey showed, was widespread across all regions of the state. Only 13.6% of these persons were below the age of 20 years, and the prevalence of cretinism in the age group below 10 years was 1.6 %, which was significantly lower than the overall prevalence of cretinism. This survey was the first to describe the pattern of neurological deficits in persons with endemic cretinism in India. As the survey used households as the basic sampling unit, it could measure cretinism prevalence in various age groups.

Clinical features of endemic cretinism vary in different countries. Neurological cretinism was the predominant type. Zaire (now Democratic Republic of Congo) is the only endemic area where myxedematous cretinism was found to the predominant form[9,10]. A review of the literature reveals that deaf-mutism is the most salient neurological feature in endemic cretinism[11,12,13]. Butterfield and Hetzel[13] have reported 26% prevalence of goitre in those with cretinism, whereas the present study found a much higher prevalence at 64.7%. This may only indicate the severity of iodine deficiency and that the thyroid gland is intact and responds in a similar way to iodine deficiency as it does in the non-cretinous population of the endemic regions.

The mean urinary iodine concentration was found to be 4 ug/dl (SD

2.68). The median value was lower at 3 ug/dl. This indicates the skewed distribution, with a large number of individuals with lower urinary iodine values below the mean. There was a positive correlation between goitre prevalence and cretinism (r2=1) and a negative correlation between goitre prevalence and urinary iodine levels (r2=0.55).

Studies on iodine deficiency

A thyroid function study[14] was conducted in Sadam, a small village in south Sikkim. Severe iodine deficiency existed in this village (prevalence of goitre 73.5%; cretinism prevalence 4%; mean urinary iodine excretion 4.13 ug/dl with SD 3.1). A total of 72 out of 142 households were randomly selected. All the inmates of the selected households above 14 years of age were examined for goitre, and blood samples were collected for estimation of concentration of thyroid hormones (triiodothyronine T-3, thyroxin T-4) and thyroid stimulating hormone (TSH).

A total of 244 subjects were examined, of which 137 were male and 107 were female. Goitre was detected in 149 (61.1%) individuals. The mean T-3, T-4 and TSH concentrations in the non-goitre group were (SD in parenthesis) 110.13 ng/dl (26.19), 10.12 ug/dl (2.38) and 1.01 uu/ml (0.52), repsectively. The corresponding values for the goitre group were, 132. 22 ng/dl (46.25), 9.06 ug/dl (2.04) and 11.33 uu/ml (1.19), respectively. The differences in the mean concentrations between the goitre and non-goitre groups were statistically significant. An inverse correlation was reported between the goitre size and T-4 on the one hand, and TSH and T-4 on the other hand. The study showed that there was functional decompensation of the thyroid in the majority of subjects with goitre.

Neonatal life and infancy constitute critical periods in adaptation to iodine deficiency, as thyroxine plays a very important role in the development and maturation of the central nervous system in utero and in the immediate post-natal period[15,16]. The functional reserve of the thyroid gland is reduced in the iodine-deficient state. Many studies have shown the existence of maladaptation in persons with goitre. Kochupillai et al[17] have shown that the mean basal TSH levels in 25% of subjects with goitre was elevated and in hypothyroid range in a severely iodine deficient region in India. The changes in T4 and TSH observed in our study were modest compared to the other studies[17,18] and this is probably due to the ongoing iodised salt prophylaxis program in Sikkim.

Intellectual and motor functions in school children in Sikkim

The level of intellectual functioning and motor performance were assessed in 90 school children in the age group of 10 to 12 years selected randomly from four severely iodine-deficient villages[19]. Goitre was detected in 91% of the subjects. Mean urinary iodine concentration was 4.23 ug/dl (SD 2.16). The urinary iodine concentration was less than 2 ug/dl in 26% of the subjects and less than 5 ug/dl in 84% of them, indicating the severity of iodine deficiency.

Bender Visual Motor Gestalt Test, Binet-Kamat Test for mental ability and Raven's Coloured Progressive matrices were the tests used. The results show an impairment in intellectual and other neuropsychological functions in a high percentage of the children. Visuomotor coordination was poor in 62 (69%), and Binet-Kamat test results showed that 19 (21%) children were intellectually subnormal (IQ<70). A majority of the children (>80%) had significant impairment in language, meaningful memory, non-meaningful memory, conceptual thinking, numerical reasoning and motor skills. The children did better on non-verbal reasoning and social intelligence. The test results show impairment of psychomotor development in children born and brought up in an iodine deficient environment.

The results of this study and other studies[20] indicate that motor and visuomotor performance may be selectively affected and probably are more vulnerable in children in iodine-deficient areas. Bleichrodt et al[21] studied children belonging to two populations; one living in an iodine-deficient village and a control population living in an iodine-sufficient village. The mean test results for the iodine-deficient group were significantly lower than those of the control group in several measures.

The mechanism(s) by which iodine deficiency/thyroid hormone deprivation alters human brain function is not known. Available evidence suggests that psychomotor development is affected by iodine deficiency, not only in the cretinism group but also in the non-cretinism groups.

Clinical study of endemic cretinism

A total of 119 subjects with neurological cretinism were studied to define the pattern and extent of neurological involvement in endemic cretinism[22]. Of these, 65 were men (54.6%) and 54 were women (45.4%). Goitre was seen in 57 (47.9%). All those with endemic cretinism had moderate to severe neurological deficits. The most salient neurological feature was deaf-mutism which was seen in 91 cases (76.5%). Examination of motor system revealed rigidity, more marked in the lower limbs, patellar hyper-reflexia in 106 (89.2%) and Babinski's sign in 40 (33.6%). All were clinically euthyroid but two of those with cretinism had biochemical evidence of hypothyroidism. Audiometry in a subset of 38 with cretinism revealed that only two of them had normal hearing. The hearing loss was found to be bilateral and equal and was severe to profound in 22 subjects, mild to moderate in 9, and bilateral but unequal in 5 subjects. Neurological cretinism is a distinct and easily identifiable clinical entity. It is an important indicator of the severity of iodine deficiency in the community.

As early as 1908, two clinical presentations of endemic cretinism were described[23]. One or the other may be the predominant form in a particular endemic area and mixed forms may also be encountered. In most endemic areas where cretinism is found, neurological features predominate[13]. The pathogenesis of endemic cretinism remains obscure. The clinical pattern in endemic cretinism suggest that the critical insult probably occurs during the early second trimester of pregnancy, when the cochlea (8-10 weeks) and neurons of the cerebral cortex and basal ganglia of the foetus are formed. Delong[11,24] has proposed a hypothesis which suggests that neurological cretinism might be caused by a critical degree of hypothyroidism during the early second trimester resulting from a combination of deficient maternal thyroid hormone contribution and a delay in onset of effective foetal thyroid function. It is presumed that foetal thyroid function becomes compensated during the third trimester by virtue of foetal thyroid hyperplasia, resulting in the child being euthyroid by the time of birth but bearing the irreversible effects on brain and inner ear of the mid-trimester window of thyroid deficiency. The prophylactic role of iodine in preventing endemic cretinism is well established[25]. Thus, iodine deficiency is a key factor in the pathogenesis of endemic cretinism and, if severe enough, may be the sole factor. The clinical variations in the syndrome may be the results of differences in the timing, duration, or severity of deficiency and the presence of other factors which act in conjunction with it[26].

Research to policy to programme

The Government of Sikkim had been aware of the severity of IDD in the region. The iodised salt programme started in the state in 1984. A notification as per the PFA Act was issued in September 1985 to ban the sale of non-iodised salt. However, the programme had not been effective. Initial screening had shown very poor quality of iodised salt at the consumer level, and the iodine loss was high under the humid conditions. In 1989, the household coverage of adequately iodised salt was only 37%. Another 12% of households were using salt containing some iodine. More than 50% of the households were using non-iodised salt. Overall, the iodised salt program was simply languishing.

The IDD Task Force, armed with the finding of alarmingly high rates

Text Box 2

Dr. C. Gopalan's contribution to the universal salt iodisation programme

This author was serving in the Army Medical Corps of the Indian army and was posted on deputation as Medical Specialist to the Government of Sikkim. The small hilly state of Sikkim had endemic goitre and cretinism, but the precise magnitude and dimensions of iodine deficiency disorders (IDD) was not well defined. In 1988-1989, the Medical Research Division of the Government General Hospital in Namchi carried out a detailed house-to-house survey in the south district of Sikkim. The study was funded by the Sikkim Science Society. Our team consisted of Dr. B.M. Rai, a senior Sikkim medical administrator, Dr. T Pulger, a reconstructive surgeon Dr. Bimal Rai a young enthusiastic medical officer, several physicians from Sikkim, and myself. We conducted a series of studies on IDD in Sikkim and reported the findings.

Noting the alarmingly high rates of endemic goitre and cretinism in Sikkim, the IDD Task Force of the state recommended the use of iodised oil for the high-risk population. Many countries around the world had successfully used iodised oil as an urgent interim measure to combat IDD. Only one French firm manufactured iodised oil for injection. The Government of Sikkim wrote to the Union Health Ministry requesting permission to import iodised oil for injection. There was a long delay in getting a reply. I went to the Health Ministry in New Delhi to enquire about the permission. The Joint Secretary told me to discuss the issue with Dr. C. Gopalan.

It was a cold Delhi evening when I reached Dr. Gopalan's house. He was setting out for his evening walk and asked me to join. I had already sent him a summary of the findings from our survey. I raised the subject of iodised oil. I explained the extent and severity of the IDD problem in Sikkim. I put forth my point of view about why the use of iodised oil was warranted as a cost-effective interim measure to control IDD. He heard me out patiently. His first question was, “Is there a salt famine in Sikkim”? I said “No”. He stated, “Starting a program with iodised oil is a sure way to indefinitely delay salt iodisation”. He advised me, “Go back and direct all your energies to setting up a robust program to improve access to iodised salt. You are a soldier, do it on a war footing.”

I was far from convinced at that time. But, respecting his expertise and experience, I followed his advice. My colleagues and I really worked on a war footing to ensure that there was improvement in access to iodised salt. In less than one year, we were able to improve access to iodised salt to nearly optimal levels. Follow-up studies after two years of effective salt iodisation showed that not a single child with cretinism was born in the two cohorts that were followed. My co-investigators from Sikkim and I are grateful to Dr. Gopalan for his foresight and categorical advice directing us to focus on salt iodisation. This helped to set up the universal salt iodisation (USI) programme in Sikkim on a firm and sustainable path. Not only Sikkim, I believe the entire country was lucky to escape several rounds of iodised oil, which would very likely have further delayed the salt iodisation program. Today we can be proud of the fact that our country has successfully achieved universal salt iodisation, with 92% of households consuming salt containing some iodine.

Albert Einstein stated “Wisdom is not a product of schooling but of the lifelong attempt to acquire it.” Looking back, nearly three decades later, I acknowledge that Dr. Gopalan's profound wisdom acquired from a lifetime of work as a research scientist and observant thinker enabled the country to achieve the public health triumph of universal salt iodisation.

of endemic goitre and cretinism, recommended use of iodised oil for the high-risk population. Many countries around the world had successfully used iodised oil25. Evidence available from these programs, showed that iodised oil would be a good interim measure in Sikkim. The greatest advantage with iodised oil is that iodine supplementation can begin almost immediately. This will provide iodine supplementation to high risk population for two to five years while organizing more complicated schemes of salt iodisation. Considering the fact that Sikkim is a landlocked state and all the salt had to be imported, it was felt that iodised oil had a definite place. In China, Indonesia and Nepal millions of doses had been used and found to be extremely satisfactory. However, this was not acceded to by Government of India and the IDD Task Force decided to focus all their energies in setting up a robust iodised salt program.

The IDD Task Force conducted a situational analysis of the iodised salt programme. It was found that both crystalline iodised salt and powdered iodised salt were available in the state. A vast majority of the people (82%) were buying crystalline iodised salt. It was also found that many (nearly 50%) were buying salt in large quantities. Most people bought the same salt for both human and livestock consumption. The state was obtaining salt through rail wagons from Gujarat, and a few salt nominees appointed by the government received the salt and distributed it.

The IDD Task Force initiated measures to enlist political commitment for IDD elimination and community participation for the success of the programme. A salt movement policy was prepared and it was promptly approved by the government. Earlier there were two to three salt nominees for the state. This was brought down to one nominee. In those days, all salt movement by rail was strictly controlled by the office of the Salt Commissioner. In close coordination with the Salt Commissioner's office and the state's salt nominee, all salt was packed under one common brand name. Production level quality control was augmented. The salt nominee played a key role and was actually one of those responsible for the eventual success of salt iodisation in Sikkim.

Management information system

A management information system (MIS) was established for monitoring the quality of iodised salt at the wholesale, retail and household levels. The existing staff of the primary health care system were trained and used. There are only two entry points by road into Sikkim. One health worker was posted at the check posts at each of these entry points to check all salt consignments. Only salt brought in by the authorised nominee was permitted entry. Salt samples were tested at the entry point using spot testing kits (STK). Samples were collected for quantitative estimation of iodine content and sent to Thyroid Centre, the central laboratory. Four iodine monitoring laboratories, one in each district, were set up/augmented. A full-fledged laboratory was set up at the Thyroid Centre, with facilities to estimate urinary iodine levels and radio immunoassay for estimation of thyroid hormone profiles. The radio immunoassay laboratory was set up with support from BARC, Mumbai and AIIIMS, New Delhi. Training was imparted to laboratory staff in iodine estimation by titration method. All the district laboratories were linked to the central referral facility at the Thyroid Centre, which provided quality control support to all district laboratories. There was regular exchange of samples between the central laboratory and the district laboratories.

Frontline health workers and Anganwadi workers were trained and given spot testing kits. They were encouraged to test salt samples from households. On a monthly basis the frontline workers submitted their reports to Thyroid Centre through their respective district laboratories. For quantitative estimation of iodine content, salt samples from households and retail outlets were collected and sent to the respective district laboratory. Every month, a consolidated report on results from spot testing kits and titration was submitted to Thyroid Centre before the 15th of the succeeding month. Thyroid Centre compiled the state-wide iodised salt coverage and submitted the data to the IDD Task Force. The MIS has, in addition to fulfilling its primary objective, played a major role in advocacy of the programme. Reports were shared regularly with district and state government officials and political leaders.

All the above measures resulted in rapid improvement in availability and use of iodised salt at household levels. MIS data at wholesale, retail and household levels showed significant improvement in quality of iodised salt. More than 200 salt samples from the retail level and 1000 samples from the household level were analysed by iodometric titration every year. At the end of 1991, after one year of rigorous monitoring, it was revealed that all samples tested by iodometric titration had some iodine (more than 5 ppm). Samples from the retail level showed that 78% of the samples had adequate iodine, and at the household level 64% had adequate iodine. In the next year the latter figures went up further to 93% and 79%, respectively. The Thyroid Centre had monitored the salt iodisation program for 9 years from 1990 to 1998. Iodised salt coverage had been consistently above 95% with usage of adequately iodised salt at household level hovering around 80% to 85%.

Follow-up survey

A follow-up survey was conducted in 1998. This covered 3,000 people in 525 households from 15 villages in the south district of Sikkim. The overall goitre prevalence was 16.8%, with 11.3% grade I. The prevalence of cretinism was 1.83%. Goitre prevalence by age group was: 0-4 years, 0%; 5-14 years, 11%; 15-44 years, 19%; 45-59 years, 28%; and 60 years and above, 43%. Of the 55 subjects with cretinism, 2 were less than 10 years old, 12 were 11-20 years, 26 were 21-30 years, 6 were 31-40 years, and 9 were 41 years or older. None of the 28 identified with 'subcretinism' or cretinoidism were less than 4 years old, 2 were 5-14 years, 19 were 15-44 years, and 9 were 45 years or older.

Urinary iodine estimation was done in a sub-sample of the surveyed population. The median urinary iodine concentration was 12 ug/dl, showing a significant increase compared to the levels recorded in the 1989-90 survey. The above findings indicated impressive progress. The goitre prevalence in children under 15 was down to 11%; this is important because these children had lived most of their lives after the programme began. Of those in the 5-14-year-old group, most were probably conceived in the first part of this period, before the use of adequately iodised salt.

From the original sample of households studied in 1989-90, a sub-sample of households in the south and west districts of the state have been selected and have been under follow up. A cohort of more than 5000 persons is being carefully followed up to record the incidence and prevalence of endemic goitre and cretinism, and to study the intellectual and motor development in children born and brought up in an iodine-replete environment. The follow-up survey after 30 years is planned for the year 2020-21.

Summary and conclusions

In India, the prevalence of IDD is relatively low except in the sub Himalayan region. Sikkim was one of the states with high IDD rates. India initiated the IDD control programme in 1962. Initially coverage was focussed on the regions with high goitre prevalence. However, following the demonstration that there are pockets of IDD in every state, the country adopted the universal salt iodisation programme.

In the Eighties the coverage under the programme was quite low across the country. In the remote land-locked goitre-endemic state of Sikkim, streamlining and strengthening the salt iodisation program required considerable effort and time. Studies undertaken in Sikkim between 1989 and 1990 showed low coverage under the salt iodisation programme and high prevalence of severe iodine deficiency disorders (IDD). Inview of the lifelong intellectual impairment and disability associated with IDD, the Government of Sikkim constituted an Expert Group to discuss and recommend a detailed plan of action for prevention and control of IDD. The Group recognised that the best and most sustainable long-term measure for control of IDD was universal use of iodised salt.

Sikkim implemented a salt iodisation programme vigorously, and in less than one year achieved optimum coverage with adequately iodised salt. Follow-up studies after two years of effective salt iodisation showed that not a single person with cretinism was born in the two cohorts that were followed. Over the last 30 years, universal salt iodisation has continued in a sustained manner in Sikkim.

India's universal salt iodisation programme's success owes a lot to the foresight and wisdom of Dr. C.Gopalan. His review of the National Goitre Control Programme in 1981 in the NFI Bulletin provided the blueprint for the success of universal salt iodisation. The Government of India focussed on achieving substantial improvement in iodised salt production and transport. In 2007,the use of iodised salt for human consumption was made mandatory throughout the country. By 2015, 92% of the households were accessing iodised salt. India is likely to sustain the programme of universal access to iodised salt in order to prevent IDD.

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NUTRITION NEWS

The 51st National Annual Conference of the Nutrition Society of India, is scheduled to be held on 8th and 9th of November 2019 at Rajiv Gandhi Centre for Biotechnology at Thiruvananthapuram Kerala

The theme of the conference is "Nutrition Security: Blending Tradition with Modern Technology". It will explore the use of traditional knowledge and technology in attaining Food Security and Nutrition (FSN) and showcase innovations and their impact on FSN. Two pre-conference workshops will be organized on 7th November 2019.

WORKSHOP-I: Clinical and Hospital Nutrition.

WORKSHOP-II: Application of Mass Spectrometry in Nutrition Research

FOUNDATION NEWS

NFI-NAMS Symposium on "Triple Burden of Malnutrition in India: A Research update" will be held in the Kamla Raheja Auditorium, NAMS House, New Delhi on 18.10.2019. In Dr. C. Gopalan Centenary Year the Symposium brings together the results of research studies on triple burden of malnutrition carried out by Nutrition Foundation of India in pregnant women, pre-school and school children and adult women.

Dr P K Dave, President Emeritus NAMS, will give the inaugural address
Dr. Prema Ramachandran will provide an overview of Dr C Gopalan Centenary Symposium

The programme for the symposium is given below

Dr. K. Kalaivani: Management of mild anaemia in pregnancy
Dr Anshu Sharma: Management of moderate anaemia in pregnancy
Mrs Amrita Pramanik: Community based studies on weight gain during pregnancy in urban low middle income group
Dr. Prema Ramachandran: Calcium and vitamin D supplementation during infancy and early childhood
Ms Kamini Prabhakar: Use of MCPC card to improve IYCF and infant nutrition
Dr Shavika Gupta: Nutritional status of preschool children from low income groups
Mrs Honey Kumari: Intra-family differences in nutritional status in low middle income families
Dr Saakshi Bhushan: Dual nutrition burden in school children attending public school
Mrs Anshi Goel: Dual nutrition burden in women from low middle income group

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