IDD NEWS

IQ+ Jagriti

VOL. II, ISSUE 2, APRIL 2004

Dear Colleagues,

Most public health programmes that have adapted multi-sectoral approach have found that this strategy contributes greatly towards its success. The elimination of Iodine Deficiency Disorders (IDD) is one such programme notable for its multidisciplinary approach. In addition to professionals in the field of health care, the important stakeholders in this programme are the government system, the voluntary sector, opinion leaders and importantly the industry. In so far as the implementation part of universal salt iodisation (USI) for elimination of IDD is concerned, the role of salt industry has been vital. They have been instrumental in achieving current levels of iodised salt coverage in India.

This shows how Public Private Partnership can contribute to efficient implementation of a public health program. In appreciation of the vital support extended by the salt industry, we dedicate this Issue of ëIQ + Jagritií on the salt industry.

We will value much your feedback and comments.

Dr. Chandrakant S. Pandav

Regional Coordinator,
ICCIDD-South Asia Region

Forthcoming Issues and Themes:

- Legislation (PFA Act, its application etc.)
- Communication - (IEC, grassroots level programmes, professional level etc.)
- Stakeholders - (Multisectoral approach, various stakeholders involved)
- IDD and Livestock
- Human interest stories on IDD, Salt & Iodised Salt are welcome

We invite contributions on the above subjects for publication in the future Issues of the Newsletter.

ICCIDD

The International Council for Control of Iodine Deficiency Disorders (ICCIDD) is a non profit, non governmental, organisation dedicated to and ensuring sustainable optimal iodine nutrition. The membership is multi-disciplinary including endocrinologists, public health workers, salt producers, management specialists, communicators, laboratory analysts, researchers, among others. An international Board of Directors promotes ICCIDDís goals, working in close coordination with countries and international organisations. Support for activities has come from International aid programs of Canada, Australia, The Netherlands, and USA, as also from the World Bank, UNICEF and others. More information is available at the ICCIDD website: www.iccidd.org

असतो मा सद्गमय
तमसो मा ज्योतिर्गमय
मृत्योर्मा अमृतं गमय

From the unreal lead me to the real;
From darkness lead me to light;
From death lead me to immortality.

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ICCIDD: Vision, Mission & Dedication

Vision:The vision of ICCIDD is a world, virtually free from Iodine Deficiency Disorders with national endeavors to maintain optimal iodine nutrition, primarily through consumption of iodized salt, which should be made easily available and affordable for all people for all times.

Mission: The mission of ICCIDD is to provide a focused advocacy to governments and development agencies, of a continued priority for iodine nutrition, providing technical expertise in a multidisciplinary approach.

Dedication: ICCIDD dedicates itself to programs fully supported at the national level for permanent, sustained success and will work with all partners and national entities towards that end.

Recent publications on Iodine / IDD in indexed and unindexed journals

Articles published in 2003 (Indexed)	
S.No.	Title
1	Assessment of Iodine Deficiency Disorders in Urban Areas of Udaipur District, Rajasthan Indian Pediatrics, Vol 40, June 17, 2003 Pg 406 ñ 409
2	Assessment of Iodine Deficiency Disorders in District Bharatpur, Rajasthan Indian Pediatrics, Vol 40, February 17, 2003 Pg 147 - 149
3	Iodine Deficiency Disorders in 15 Districts of India Indian Journal of Pediatrics, Vol 71, January 2004 Pg 25-28
4	Iodine Status of Pregnant Women Residing in an Urban Resettlement Colony of Delhi Obstet Gynecol Ind, Vol. 53, No.6: Nov/Dec 2003 Pg 554-557
5	Iodine Nutritional Status of Adolescents Indian Journal of Pediatrics, Vol 70, Oct 2003 Pg 787- 788
6	Prevalence of Iron, Vitamin A, and Iodine Deficiencies Amongst Adolescent Pregnant Mothers Indian Journal of Pediatrics, Vol 70, April 2003 Pg 299 ñ 301
7	Studies on Endemic Goitre and Associated Iodine Deficiency Disorders (IDD) in a Rural Area of the Gangetic West Bengal The Ind J Nutr Dietet,40, 2003 Pg 53 ñ 58
8	Prevalence of Iodine Deficiency Disorders in Adolescents Indian J Pediatr 1992; 59: Pg585 ñ 591

Articles published in 2003 (Unindexed)	
1	Combating Malnutrition in India Through Community Efforts IJCM, Vol. 28, No.3 July-Sept 2003 Pg 99 - 106
2	Nutritional Status of Adolescent Girls in Rural Area of Varanasi Indian J Prev Soc Med, Vol 34, No 1 & 2, 2003 Pg 53-61
3	Nutritional Resons to Iodine Supplementation in Goats Fed Mustard Cake Diet Animal Nutr Feed Tech 2003, 3(1), 17-25 (No article available in lib.) Pattanaik AK, Khan SA, Kumar A Centre of Advanced Studies for Animal Nutrition, IVRI, Izatnagar 243 122

ICCIDD acknowledges the contribution of UNICEF in bringing out this Issue of the Newsletter.

ROLE OF SALT DEPARTMENT IN ELIMINATION OF IDD IN INDIA

K Sundaresan*

Spectrum & Magnitude of IDD

Iodine is one of the essential nutrients required for normal mental and physical development of the human beings.

The human body requires around 150 micrograms of iodine every day, which works out to less than a teaspoonful (5 gm over a life span of seventy years). The disorders caused due to deficiency of nutritional iodine in the food/diet are called Iodine Deficiency Disorders (IDD). It affects the people of all ages, both sexes and different socio-economic status. It can result in abortion, still-birth, mental retardation, deaf-mutism, dwarfism, squint, cretinism, goitre of all ages, neuro-motor defects. It also causes a loss of about 13 IQ points in children hampering human resource development.

The surveys conducted by the Central/State Health Directorates, Indian Council of Medical Research (ICMR) and Medical Institutes have revealed that not even a single State/Union Territory is free from the problem of IDD. According to the Director General Health Services, Ministry of Health & Family Welfare, New Delhi, out of 312 Districts surveyed in 28 States and 6 Union Territories, 254 districts are IDD endemic where the prevalence is more than 10 per cent. In India, it is estimated that 200 million people are at risk of IDD.

SaltñThe Most Accepted Carrier for Iodine Supplementation

Salt is the most effective and widely accepted vehicle for supplementation of iodine for the following reasons:

- Mixing of iodine with salt does not impart any colour, taste or odour to the salt
- Irrespective of economic status, all the population universally consume salt in a fairly uniform quantity daily
- As production of salt is limited to a few centres, monitoring of the production, supply and quality of iodised salt is relatively less cumbersome to any other method of iodine supplementation

National Goitre Control Programme

Government of India launched National Goitre Control Programme (NGCP) in 1962 whereby it was decided to supply iodised salt for human consumption to identified, ìGoitre endemicî areas like Sub-Himalayan Region. The production of iodised salt was restricted to only three different plants under Public Sector/Government at Sambhar Lake in Rajasthan, Howrah in West Bengal and Kharagoda in Gujarat. The program was implemented by Directorate General of Health Services of the Ministry of Health in collaboration with Salt Commissioner. The program was restructured in 1984, following the recommendations of Central Council of Health and Family Welfare and the Government took a policy decision to iodise the entire edible salt in the country in a phased manner by 1992. Two of the major policy decisions taken were:

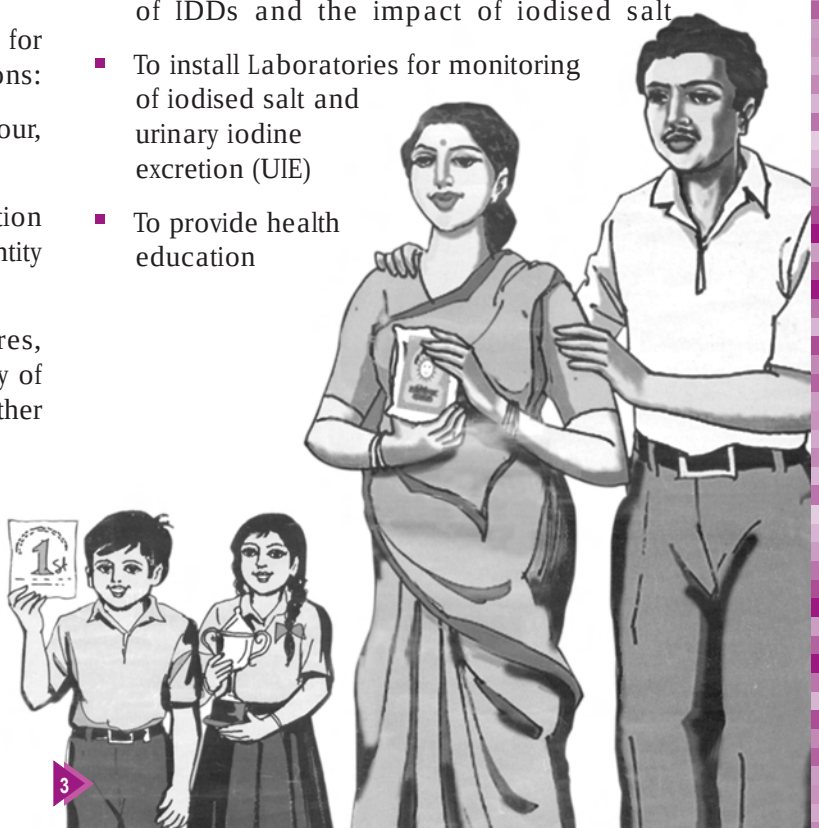
- Salt Department, (under Ministry of Commerce & Industry, Government of India,) was identified as the nodal agency to monitor the Production and Quality Control of Iodised Salt at Production Sources and Distribution of Iodised Salt in the entire country
- Private Sector were permitted to manufacture commercial production of Iodised Salt

The program commenced in April 1986 in a phased manner.

National Iodine Deficiency Disorders Control Programme (NIDDCP)

In August, 1992, the NGCP was renamed as NIDDCP with a view to cover a wide spectrum of Iodine Deficiency Disorders. The following are the objectives of NIDDCP

- To carry out surveys to assess the magnitude of Iodine Deficiency Disorders
- To produce and supply iodised salt in place of common salt
- To resurvey after every five years to assess the extent of IDDs and the impact of iodised salt
- To install Laboratories for monitoring of iodised salt and urinary iodine excretion (UIE)
- To provide health education



Salt Departmentís Role & Universal Salt Iodisation

Over the last two decades various measures had been taken by Salt Department and tremendous progress has been made as far as creation of iodisation capacity, production and supply of iodised salt:

- The production of iodised salt, which was just about 300,000 tons in 1985, has now reached about 4.2 million tons in 2003. The total requirement of edible salt for human consumption is about 5.0 million tons.
- More than adequate capacity for salt iodisation has already been created in the country to the tune of 12.3 million tons (from 859 units) which includes a capacity of 3.7 million tons of Refined Iodised Free Flow Salt/ Vacuum Evaporate Iodised salt (from 40 refineries)
- About 75 to 80 per cent of the population have access to Iodised salt as revealed from the actual supplies of about 3.9 million tons of iodised salt during 2003.

Production of Iodised Salt

Salt Department facilitates establishment of Salt Iodisation Plants and Refineries by providing technical knowledge. Commercial manufacture of Iodised salt is recognized by registering the units after field inspection to ensure that the plants are installed as per approved design for production of iodised salt. Small Scale Manufacturers were facilitated to join the mainstream salt iodisation Program by providing forty salt iodisation plants and potassium iodate free of cost through UNICEF financial assistance. The External Evaluation of the status of the NIDDCP (1996) conducted by the Canadian International Development Agency (CIDA) has remarked that India has offered to the world two programmatic technologies: iodizing machinery and the spot testing kit which are important tools for producing good quality iodised salt.

Till 1992, to encourage the massive salt iodisaton program, the iodizing chemical ñ potassium iodate was subsidized by cash or in kind. Similarly registration for Salt Washeries / Refineries are accorded by Salt Department. The production of Refined Salt during 2002 was 1.3 million tons, a little less than one-third of the total production. More than 35 per cent of the iodised salt produced is marketed in small packing of 1 or Ω kg. This enables better retention of iodine in the salt and also shows the increasing consumer preference for consumer packs and switch over from traditional purchase practices.

Distribution of Iodised Salt

Salt Commissioner, in coordination with Railways, draws a program called, ìZonal Schemeî every year for distribution of iodised salt by rail to all parts of the country. As an incentive for iodised salt manufacturers, preference in traffic under ëB Priorityí is accorded to iodised salt and under ëC Priorityí to Refined Salt. The objective is to ensure equitable distribution in all parts of the country and timely movement without any scarcity of the essential commodity, Salt. About 70 per cent of the total supplies of iodised salt for human consumption is by rail and the rest is by road. Salt Commissioner, from time to time, keeps a close watch on the movement and requirement pattern and schedules transportation program accordingly throughout the year. No scarcity of salt is reported from anywhere in the recent past which shows the effective monitoring of the distribution by the Salt Department.

Quality Monitoring

A total of 26 Salt Test Laboratories are established at production centres. Field officials regularly visit the iodisation plants, railway loading stations and ports for drawing of iodised salt samples at the time of production, from the stock and at the time of loading. While they carry out on the spot test by use of Field Test Kit, the samples are also analysed at the Departmental Salt Test Laboratories. The results are communicated to the concerned manufacturers for implementing the appropriate corrective measures. The field officials at the time of their visits also check the records maintained by the manufacturer regarding laboratory results recorded by them, procurement of potassium iodate, etc. In case of repeated defaults, penal action is also resorted to in the form of deduction of wagon quota for movement by rail, suspension and cancellation of the registration for commercial manufacture of iodised salt. They also check whether the manufacturer also complies with the statutory labeling and packing standards for edible salt.

In addition, nine Mobile Salt Test Laboratories have also been deployed at important production centres in various states for on the spot analysis of iodised salt. This assists in keeping a strict vigil on production and supply of iodised salt at the Plant site as well as at loading stations. Performance reports are issued to the manufacturers immediately advising them for improvement of quality wherever necessary. Mobile laboratories are also used for advocacy purposes viz., distribution of posters, placards, booklets on IDDs and other publicity materials. They are also used for Situation Analysis Studies in various districts on quality, availability and price of iodised salt and also to assess the awareness levels. On an average about 90,000 samples are drawn and analysed at our laboratories and as many as twice that are tested by Spot Test Kit. About sixty-two per cent of samples were found to be adequately iodised.

This is corroborated further from the results of the National Family Health Survey (NFHS-II, 1998-99) which indicates that about forty-nine per cent of the population are consuming adequately iodised salt and that seventy percent are consuming iodised salt. Management Information System (MIS) reports on quality of iodised salt available at consuming states, received from fourteen states reveal that about eighty-one per cent of the samples tested have some iodine.

Govt. of India - UNICEF Activities

Salt Department with financial support from UNICEF organized various activities since the last decade for creating awareness amongst the public on IDD and benefits of iodised salt through rallies, human chain, national / state level seminars/workshops and celebration of Global IDD Day on 21st October every year. Some of the activities are listed:

- Publication of books/pamphlets/video-films/ Brochures / release of full page supplements in leading regional / national dailies / printing of ëSuní logo on postal stationery
- Undertaking studies for assessing awareness levels, situational analysis of availability, quality and price of salt, census of salt manufacturing units / iodisation units, national multicentric study on monitoring quality of iodised salt through networking of medical colleges in southern states, Knowledge, Attitude and Practice (KAPB) studies etc.
- Organisation of national / regional / state level meetings of all stakeholders of NIDDCP to solicit their cooperation
- Sensitisation / Advocacy meetings with salt manufacturers & traders
- Strengthening quality monitoring system at production sources through training of Quality Control Personnel of Salt Department and Industry, distribution of field test kits, deployment of Mobile Salt Test Laboratories at major production centres
- Evaluation of Universal Salt Iodisaiton (USI) in India 1997-98

The progress achieved on Universal Salt Iodisation (USI) over the last two decades was possible because of these various Information, Education, Communication (IEC) activities undertaken by the Department which contributed to the increase in production and consumption of iodised salt in the country.

Goal of USI ñ Bridging the Gap

The Governmentís Goal of NIDDCP is to reduce the prevalence of IDDs below ten percent in the entire country by 2010 A.D. A total of 20-25 per cent of the population are still to be provided access to iodised salt. Further the iodised salt consumed by everyone should be adequately iodised and iodised salt manufacturers and traders should shoulder great responsibility in ensuring the quality of iodised salt before supplying it to masses.

As the nodal agency, Salt Departmentís role is pivotal and crucial for not only achieving the Universal Salt Iodisation and consumption but also for sustaining the progress achieved. Salt Commissionerate is thus playing a coordinating role involving all the stakeholders and is making sustained efforts for ensuring their unstinted cooperation and commitment for effective implementation of NIDDCP.

Salt Commissioner, Government of India, Ministry of Commerce & Industry

Cost of Iodine for Salt Iodisation

Total annual requirement of iodised salt in India (For 1,000 million population @5 kg/person/year)	5 million tons
Iodine required for salt iodisation @30 ppm of iodine at production level OR 30mg/kg OR 30gm/ton	150,000 kg (150 tons)
Approximate price of iodine @Rs.666/kg. Therefore, total price for 150 tons	Rs.100 million (for 1,000 million population
Cost of iodine per person per year	10 paise

Retail Prices of Iodised Salt Available in the Market

Type of salt	Price (Rs. per Kg)
Crystal iodised salt in loose quality	1.5 - 2.0
Powdered iodised salt in loose quality	2.0 - 2.5
Powdered iodised salt, packed	2.5 - 4.0
Refined iodised salt (branded)	>4.0

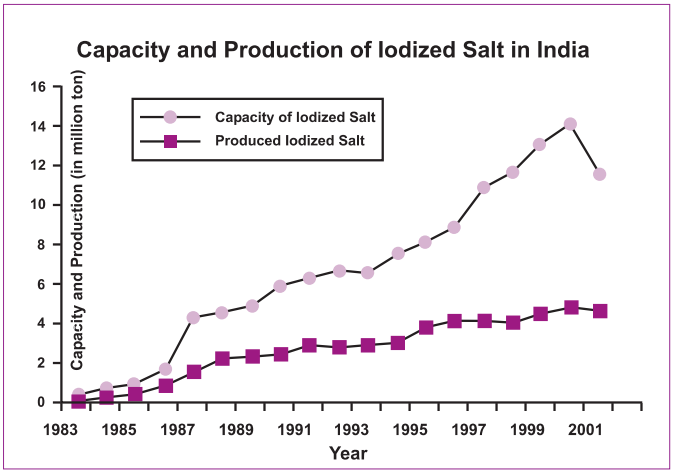
Iodine Deficiency Disorders (IDD)

3.3.117 Iodine deficiency disorders have been recognized as a public health problem in India since the 1920s. Unlike other micronutrient deficiencies, iodine deficiency disorders are due to deficiency of iodine in water, soil and foodstuffs and affect all socio-economic groups living in defined geographic areas. Initially, iodine deficiency disorders was thought to be a problem in sub-Himalayan region. However, surveys carried out subsequently showed that iodine deficiency disorders exist even in riverine and coastal areas. No state in India is completely free from iodine deficiency disorders. It is estimated that 61 million people are suffering from endemic goitre and about 8.8 million people have mental/motor handicap due to iodine deficiency. Universal use of iodised salt is a simple, inexpensive method of preventing iodine deficiency disorders.

3.3.118 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 ëgoitreí belt. However, there was no substantial reduction in iodine deficiency disorders due to the erratic availability of salt, availability of cheaper non-iodised salt and the lack of awareness regarding the need to use iodised salt. In view of the fact that no state was free of iodine deficiency disorders, a decision was taken for the universal iodisation of salt for human consumption, which was implemented in a phased manner from 1986. The progress in implementation of this programme was tardy as the production and availability of iodised salt was a fraction of what was required. In August 1992, the NGCP was renamed as the National Iodine Deficiency Disorders Control Programme (NIDDCP), taking into its ambit the control of a wide spectrum of iodine deficiency disorders with the goal of reducing the prevalence of IDD below 10 per cent in endemic districts of the country. Based on the recommendations of the Central Council of Health, the Government took a policy decision to iodise the entire edible salt in the country by 1992. There has been a steady progress in the production of iodised salt over the past few years in India.

3.3.119 Available data suggest that there has been substantial increase in the availability and consumption of iodised salt during the 1990s. However, the NFHS-2 showed that even in the late 1990s only 49 per cent of households use cooking salt that is iodised at the recommended level of 15 parts per million or more, about 28 per cent of the households use salt that is not iodised at all and 22 per cent use salt containing less that 15 ppm of iodine. The data shows that in coastal states like Tamil Nadu, Andhra Pradesh, Kerala, and Gujarat, the percentage of households consuming adequately iodised salt is much lower than in many of the northern states where the availability of iodised salt is more than 90 per cent. One of the reasons could be that the salt transported by road are not subject to any kind of check regarding iodisation and this loophole in the law permits transport of non-iodised salt by road to areas upto 250 km. Therefore, these areas have ready access to non-iodised salt.

3.3.120 A national consultation was held in April 1999, to discuss the scientific and epidemiological evidence on benefits and safety of iodised salt in the prevention and control of iodine deficiency disorders; the consensus statement from the consultation confirmed that under the existing conditions in India universal iodisation of salt for human consumption was safe and will enable the country to combat IDD. In October 2000, the central government lifted the ban on sale of non-iodised salt for human consumption. However all the states and Union Territories, except Kerala and Gujarat have issued ban notifications on the sale of non iodised salt for human consumption in their entire territories under the Prevention of Food Adulteration Act. There is a partial ban in Andhra Pradesh and Maharashtra. *(The entire State of Andhra Pradesh is now under the purview of the ban).*

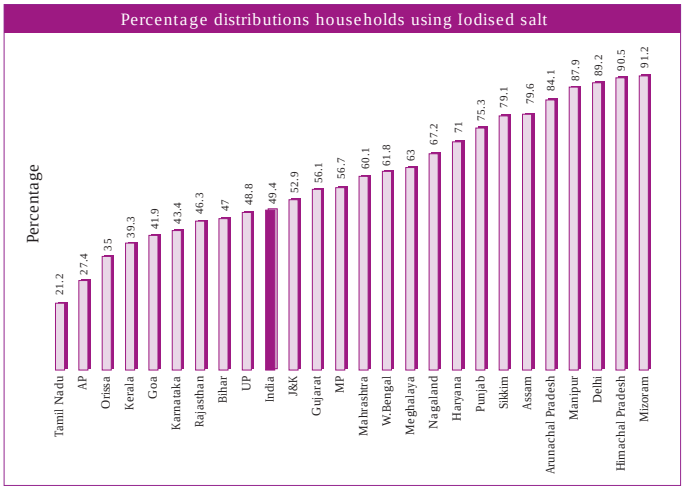


It is essential to ensure that only iodised salt is made available for human consumption in order to enable the children of the 21st century to attain their full

intellectual potential and take their rightful place in a knowledge based-society. Efforts to improve the quality of iodised salt will include:

- Mandatory certification of the adequacy of iodisationas a pre-requisite for getting priority for the transportation of salt;
- Ensuring that the salt is packed in half or 1 kg consumer poly pack at production site itself to prevent deterioration in quality during transportation and storage;
- Periodic checking of the iodine content of salts available at wholesale/retail outlets; and
- Quality check at the household level through anganwadi/ school-based testing using salt iodine test kit.

3.3.122 IEC to increase the demand for good quality iodised salt will have to continue. Efforts to reduce price differentials between iodised and non-iodised salt and provide ready access to iodised salt through PDS will have to be considered. Monitoring of the production, distribution, quality of salt at various levels, along with the studies on goitre prevalence among schoolchildren, urinary iodine excretion status, thyroid status of school children, neonatal thyroid status by appropriate screening techniques may be used to assess the progress of reduction in iodine deficiency disorders. In areas where iodine deficiency disorders continue to be high, despite the adequate availability and extensive use of iodised salt, the possible role of goitrogens may have to be investigated.



3.3.123 The Tenth Plan goals are to:

- Achieve universal access to iodised salt;
- Generate district-wise data on iodised salt consumption; and
- Reduction in the prevalence of iodine deficiency disorders in the country to less than 10 per cent by 2010.

ROTARY AND MEDICAL COLLEGE SURAT JOIN HANDS IN ADVOCACY OF IODINE DEFICIENCY DISORDERS

A REPORT

A workshop on iodized salt promotion and breast-feeding sensitization was jointly organized by the Department of Community Medicine, Government Medical College, Surat and the Inner Wheel Club of Surat-District 306- on 26th and 27th July 2003 at the Southern Chamber of Commerce.

The Workshop on iodized salt promotion was inaugurated by Mrs. Maheshwari a leading social worker of Surat. 110 representatives of the Inner Wheel Clubs of Saurashtra, Central and South Gujarat attended the workshop. In the scientific session, faculties from Department of Community Medicine, Government Medical College, Surat presented various aspects of the Iodine Deficiency Disorders.

Dr. Vikas K. Desai, Professor and Head, Department of Preventive & Social Medicine (PSM), Government Medical College, Surat gave an overview of the problem of IDD in the world, in India and in Gujarat. She outlined the objectives of the workshop, which were to train and sensitize the participants on the various aspects of IDD and to involve them in the control of the same. She also shared personal experiences about her work in the field of IDD Control in Gujarat.

This was followed by a presentation by Dr. S.J. Kapadia, Assistant Professor, Department of Preventive & Social Medicine, Govt. Medical College, Surat on the importance of iodisation of salt in the control and prevention of IDD and current scenario in its implementation. Dr. Mohua Moitra, Assistant Professor, Department of Preventive & Social Medicine, Govt. Medical College, Surat addressed the frequently asked questions on Iodine Deficiency Disorders.

The presentations were followed by a demonstration of testing of salt samples by field testing kits. The brochure on ìMyths and Realitiesî related to iodize salt (developed by UNICEF) was distributed among all the participants. The session was then open for the participants for questions. Queries like how iodine deficiency actually occurs in the environment, alternatives to salt iodisation, some impediments in the implementation of the programme were discussed with the faculty.

The workshop concluded with a consensus on the following issues.

- The representatives of the Inner Wheel Clubs would disseminate information on iodine deficiency disorders and the importance of daily consumption of adequately iodised solt in the community.
- They also agreed to undertake projects for community awareness in their respective places.

ALTERATION OF IODINE REQUIREMENT IN RELATION TO THIOCYANATE CONSUMPTION FOR ELIMINATION OF IDD

Amar K Chandra*, Indrajit Ray**

The indicator of iodine deficiency ëeliminationí is a median value for urinary iodine concentration of 100 µg/L, i.e. 50% of the samples should be above 100 µg/L, and not more than 20% of samples should be below 50 µg/L[1]. However, further modification in the above indicator is proposed wherein the median urinary value is set at 100 µg/L, and not more than 20% of the urine sample should be below 100 µg/L instead of earlier recommended 50 µg/L[2], because there were no biochemical iodine deficiency in certain regions as per earlier indicator[1] but mild to moderate degree of endemic goitre was prevalent. Analysing the extensive data obtained from iodine sufficient areas, the median urinary iodine as the primary indicator for effectiveness is set between 100-200 µg/L[3]. These modifications are made considering the median urinary iodine excretion pattern and goitre prevalence of the studied population. There are geographical regions where the people are not only exposed to varying degrees of iodine deficiency but also further exposed to thiocyanate load because of the consumption of cyanogenic food plants (precursors of thiocyanate). The effect of thiocyanate may be neutralized by adequate iodine supplementation[4]. The question thus arises that what should be the adequate iodine intake or optimum iodine nutrition in such regions[5]. In this article the adequate level of iodine intake has been worked out for prevention and control of IDD, based on existing dietary supplies of iodine and thiocyanate and goitre prevalence in Tripura located in sub Himalayan goitre endemic belt of north east India.

In respect of IDDs, Tripura has a special relevance. Seventy per cent land of Tripura is hilly. The state is drained by many rivers, which are prone to overflow causing frequent floods in the plains during the monsoon season. Large amount of iodine is leached away from the surface soil by heavy rainfall in the elevated regions and by floods in the river valleys and is carried into the sea. Central Goitre Team of India conducted a goitre survey in Tripura in 1970 and found overall goitre prevalence of about 17%[6]. Recognizing the consequences of iodine deficiency as a public health problem, entry of non-iodised salt into the state was banned in 1988.

During 1992-94, clinical goitre survey was conducted on overall population in randomly selected localities of Tripura that showed decline in prevalence rate was not satisfactory in spite of salt iodisation programme. The second phase of our study was done in Tripura during 1995-97. In all 10,801 school children of the age group 6-15 years were clinically examined for goitre from 22 study areas and the overall prevalence population was 21.63 per cent. Of the studied, 1,057 urine samples analysed 8.52 per cent had iodine level of <20 µg/L, 7.56 per cent had 20-49 µg/L, 23.36 per cent had 50-99 µg/L and 60.17 per cent had levels >100µg/L[7] indicating that the population had no iodine deficiency as per WHO/UNICEF/ICCIDD indicator[1] but had iodine deficiency following other indicators[2,3]. Considering the consumption pattern of cyanogenic plant foods & to rule out the possible involvement of factors other than iodine deficiency in all 1,032 urine samples were analysed for thiocyanate & the mean thiocyanate values in study areas were in the range of 0.319-1.0899 mg/dl[7].

In Table I urinary iodine and thiocyanate values are represented as median urinary iodine and median urinary thiocyanate, mean and median of iodine and thiocyanate ratios (I/SCN), and the ratios of median I/median SCN along with numbers of samples studied. Table II shows correlation of age-wise goitre rates and averages of age-wise goitre rates with urinary iodine and thiocyanate levels and their ratios obtained from 22 study areas dividing the population in the primary (6-10 years) and the post-primary (11-15years) age groups. A significant negative correlation is found between age-wise goitre rates of post-primary age group and median urinary iodine levels [$r = -0.2507$, $p<0.005$] but a positive trend is noted between age-wise goitre rates for post-primary age groups and the median urinary thiocyanate levels. In consistent with these findings there are significant negative correlations of age-wise goitre rates for post-primary age groups with the means of individual iodine and thiocyanate ratios (I/SCN) ($r = -0.3383$, $p<0.0005$), the medians of individual I/SCN ratios ($r = -0.3434$, $p<0.0005$) and the ratios of median I / median SCN ($r= -0.3744$, <0.0005). A stronger negative correlation ($r = -0.5165$) between the averages of age-wise goitre rates and ratios of median I and median SCN with lower level of significance ($p<0.01$) is found. No such correlation is found in primary age group.

Significant negative correlation between goitre rates and median iodine levels of post-primary groups confirms iodine plays mitigating role in the development of goitre.

Conversely, a positive trend between goitre rates and median urinary thiocyanate levels and significant negative correlation (of higher order) between goitre rates and iodine / thiocyanate (I/SCN) ratios in the post-primary groups reveal that thiocyanate plays an aggravating role in the development of goitre. Consumption of large quantities of food containing thiocyanate or thiocyanate precursors does not necessarily results in the development of goitre but the development of goitre is critically related to the balance between the dietary supplies of SCN in relation to iodine[8]. Therefore, proper iodine supplementation in adequate quantities may prevent and control the development and persistence of goitre in the population of post-primary age groups/overall population in the studied region.

Absence of any negative correlation among goitre rates, iodine and iodine/thiocyanate ratios in the primary age group indicates the dominance of additional predisposing factors that might have intensified the bodyís need for iodine and thereby causing relative iodine deficiency produced by goitre. Dominance of these factors in this age group might be related to the condition of preadolescence.

The regression analysis of age wise goitre rates of post primary groups and ratios of median I and median SCN (I/SCN) showed that in the studied region, the desirable ratio of median I/median SCN should be at least 28 to prevent the development of goitre at endemic level (i.e. above 5%). To achieve this ratio in the studied population having highest thiocyanate exposure (0.894mg/dl), the desirable median urinary iodine level may be 28 x 0.894 ≅ 250 µg/L. Probably for the interference of dietary supplies of thiocyanate in studied region, median urinary iodine level of 100 µg/L including the cut-off values is not sufficient to prevent IDD.

To maintain median urinary iodine level 100 µg/L in a region the suggested per capita iodine requirement of the population is about 150 µg in adult[9]. Accordingly to set the median urinary iodine level at 250 µg/L to combat the effect of dietary SCN, per capita daily iodine intake level may be (150 x 250)/100g i.e. 375 µg per day.

WHO considers a daily iodine intake up to 1000 µg is entirely safe. However only a minority part of adult population of > 45 years who were deficient in iodine since birth may develop iodine induced thyrotoxicosis (IIT)[10]. A steady and continuous supply of iodine at the level of 375 µg/day per individual of the studied region would not pose any threat of public health.

To meet the recommended need of 150 µg iodine/ per day per individual, the iodine level in the edible salt at the consumption point in India is set at 15 ppm[11]. Accordingly, to supplement 375 µg iodine per day per individual, iodine level in edible salt may be (15 x 375)/150ppm i.e ≅ 37.5pm at the consumption level in the studied region. The iodation level should not be less than 50 ppm at the iodisation point so as to compensate for the loss, which takes place between salt iodation plants and the consumer.

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REFERENCES

1. Indicators for assessing iodine deficiency disorders and their control through salt iodization. WHO/UNICEF/ICCIDD, WHO/NUT/94.6, 1994.
2. Karmarkar MG, Pandav CS. Interpretation of indicators of iodine deficiency disorder: recent experiences. National Medical J India, 12, 113-117, 1999.
3. Delange F, Benoist B, Burgi H, ICCIDD working group. At what median urinary iodine concentration is a population iodine sufficient?. IDD News letter, 17, 10-11, 2001.
4. Lazzrus JH, Hall R (eds). Hypothyroidism and goitre. Clinical Endocrinology and Metabolism, Philadelphia/London: Bailliere Tindall/Saunders, pp683-702, 1980.
5. Chandra AK, Ray I. Authors reply to ëIndicators for assessment of IDDí. Indian J Pediatrics, 1168-1169, 2001.
6. Pocket book of health statistics of India. Central Bureau of Health Intelligence, Director General of Health Services, Ministry of Health and Family Welfare, Government of India, 1978 and 1980.
7. Chandra AK, Ray I. Dietary supplies of iodine and thiocyanate in the etiology of endemic goitre in Tripura. Indian J Pediatrics, 68, 399-404, 2001.
8. Delange F, Thilly C, Bourdoux P, Hennart P, Courtois, Ermans AM. Influence of dietary goitrogens during pregnancy in humans on thyroid function of the newborn. In: Delange F, Iteke FB, Ermans AM (eds). Nutritional factors involved in the goitrogenic action of cassava. IDRC-184e, Int Dev Res, Cent, Ottawa, pp 40-50, 1982.
9. Recommended iodine levels in salt and guidelines for monitoring their adequacy and effectiveness. WHO/UNICEF/ICCIDD, WHO/NUT/96.3, 1996.
10. Hetzel BS, Pandav CS (eds). SOS for a billion, 2nd ed, Oxford University Press, Delhi, pp 357-365, 1997.
11. Pandav CS, Anand K. Towards the elimination of iodine deficiency disorders in India. Indian J Pediatrics, 62, 545-555, 1995

TABLE I. Urinary iodine (i) and thiocyanate (SCN) levels, and their ratios in 22 study areas of Tripura

Sl. No.	Names of study areas	Sample No.	Median Urinary Levels		I/SCN Ratios (µg/mg)		
			I (µg/d1)	SCN (mg/dl)	Means ± SD	Medians	Medians I Median SCN
1.	Taranagar	44	10.0	0.462	28.508 ± 20.180	19.375	21.645
2.	R.K. Nagar	40	12.9	0.448	26.915 ± 14.130	21.847	28.795
3.	Agartala (Capital City)	45	15.0	0.391	40.999 ± 24.211	37.439	38.363
4.	Madhupur	45	9.5	0.247	35.598 ± 25.244	28.588	38.462
5.	Teliamura N.A. (Kalitila)	40	12.5	0.606	26.449 ± 24.796	18.109	20.627
6.	Kunjaban	44	5.0	0.462	16.650 ± 11.353	15.897	10.823
7.	Purba Ramchandraghat	44	15.0	0.786	17.313 ± 8.341	16.935	19.084
8.	Khowai N.A. (UttarDurganagar)	44	8.3	0.534	16.100 ± 11.557	15.093	15.543
9.	N.C. Nagar	77	10.0	0.678	14.348 ± 13.275	12.871	14.749
10.	Mohanbhog	42	10.7	0.427	26.692 ± 19.736	22.808	25.059
11.	Bhuratali	47	16.5	0.822	17.827 ± 10.237	16.645	20.073
12.	Baishnabpur-Kathalchari	41	9.1	0.561	18.963 ± 9.407	17.263	16.221
13.	Jolaibari	51	15.0	0.678	17.225± 10.633	16.502	22.124
14.	Belonia N.A. (Arya Colony)	75(58)	16.5	0.894	17.439 ± 12.775	16.376	18.456
15.	Kalabaria	52(48)	16.5	9.894	21.558 ± 17.642	19.283	18.456
16.	Dakshin Chandrapur	40	11.5	0.714	15.401 ± 9.633	16.861	16.106
17.	Rajkang-Rangkang	50	7.5	0.462	21.122 ± 21.023	15.382	16.234
18.	Manik Bhandar	50	12.8	0.750	20.557 ± 17.332	16.170	17.067
19.	Manughat	48(45)	10.0	0.462	24.726 ± 19.155	23.102	21.645
20.	Sonaimuri	49	5.0	0.462	14.958 ± 13.680	11.927	10.823
21.	Ragna	48(47)	15.7	0.462	31.926 ± 25.664	28.588	33.983
22.	Kailasahar N.A. (Vidyanagar)	41	12.5	0.462	25.466 ± 20.304	25.308	27.056

Total samples for iodine: 1057 Total samples for thiocyanate: 1032

Number of samples for thiocyanate values is given in parenthesis, where numbers of samples for median iodine values are not same.

TABLE II. Correlation of age-wise goitre rates and averages of age-wise goitre rates with iodine (I) and thiocyanate (SCN) levels, and their ratios in the primary and the post-primary age groups of 22 study areas of Tripura

Sl. No.	Variables	Correlation coefficient (r) with the levels of significance (one tail t-test)	
		Primary age groups (6-10 years)	Post-primary age group (11.15 years)
1.	Age-wise goitre rates and medians of urinary iodine levels	+0.0388 p>0.30	-0.2507 p>0.005
2.	Age-wise goitre rates and medians of urinary SCN levels	+0.0034 p>0.45	+0.0958 p>0.15
3.	Age-wise goitre rates and means of I/SCN ratios (µg/mg)	+0.0388 p>0.30	-0.3383 p>0.0005
4.	Age-wise goitre rates and medians of I/SCN ratios (µg/mg)	+0.0532 p>0.25	-0.3434 p>0.0005
5.	Age-wise goitre rates and ratios of median I/median SCN levels (µg/mg)	+0.0746 p>0.20	-0.3744 p>0.0005
6.	Average of age-wise goitre rates and ratios of median I/median SCN (µg/mg)	+0.1022 p>0.30	-0.5165 p>0.01

Information Sharing

1. M.S.Swaminathan Research Foundation in collaboration with Ministries of Agriculture & Consumer Affairs, Food and Public Distribution, National Academy of Agricultural Sciences, United Nations World Food Programme, FAO, International Fund for Agricultural Development organized the National Food Security Summit. The valedictory address was delivered by His Excellency, Dr. A.P.J.Abdul Kalam, the President of India.

2. Symposium on ìNutrition-Challenges Aheadî was organized by Institute of Home Economics, University of Delhi at New Delhi on 5th February, 2004

3. INCLEN Global Meeting XX, Agra, India from 11th to 14th February, 2004: The Twentieth Global Meeting of International Clinical Epidemiology Network was held with participants from all across the globe. The core theme of the Meeting was, ìLeveraging Research through Policy & Practiceî.

4. International Conference on Edible Salt , Jaipur, Rajasthan, India, was held on the 14th and 15th February, 2004.

5. International Symposium on Thyroid Disorders, Nepal, 20th to 22nd February, 2004 organized at Manipal College of Medical Sciences and Teaching Hospital, Pokhara, Nepal.

6. National Multi-sectoral Workshop on National Iodine Deficiency Disorders Control Programme New Delhi on 26th and 27th February, 2004 was organized under the aegis of Director General of Health Services, Government of India at Vigyan Bhawan, New Delhi. This was a senior policy level review and planning programme. It had participation of all State and Union Territory Directors of Health Services as well as representatives from Ministries of Industry, Railways, Consumer Affairs, and Salt Department and Department of Women and Child Development as well as national Institutions like All India Institute of Medical Sciences and international bodies like WHO, UNICEF, The MI, ICCIDD, industry and trade representatives.

7. 31st Annual National Conference of Indian Association of Preventive & Social Medicine (IAPSM) was held on 28th and 29th February, 2004 at Postgraduate Institute of Medical Education and Research Chandigarh which had a participation of over 750 public health professionals from all over the country.

8. Two Workshops on Micronutrient Malnutrition Control in India under the aegis of IndiaCLEN are being organized on the theme of Workshops on ìMicronutrient Malnutrition Control in India: Workshop on Developing Operational Research Projectî. The first workshop was from 26th to 28th March 2004 at New Delhi and the second is planned to be held from 25th to 27th June, 2004.

9. World Consumer Day 15th March, 2004. The apex body of Consumer Coordination Council of India, with the support of Government of India and WHO SEARO had organized a two-day International Consultation in New Delhi on the 15th and 16th March, 2004 on the theme ìConsumer and Waterî.

10. A multi-centric IDD survey has been conduced by National Institute of Nutrition (NIN) under Indian Council of Medical Research. The study was a national level programme with locations selected from each State on a representative basis. The final report was released by Mr Prasada Rao, IAS, Secretory to Govt. of India, Ministry of Health and Family Welfare at a function held at NIN, Hyderabad on 17th March 2004.

11. Special training programs for iodised salt laboratory personnel were conducted in Gandhidham, Gujral and Jaipur, Rajasthan in the months of March and April 2004.These were collaborative programs of the Salt Department, ICCIDD and the Micronutrient Initiative.

Announcement

Release of book ìTowards the global elimination of brain damage due to Iodine Deficiency (Editors: Basil Hetzel, Francois Delange, John T. Dunn, Jack Ling, Venkatesh Mannar, Chandrakant S Pandav)ì, published by Oxford University Press, New Delhi on 31st May 2004 at New Delhi

As a lump of salt dropped into water becomes dissolved in water and cannot be taken out again, but wherever we taste the water it tastes salt, even so, my dear, this great, endless, infinite Reality is Pure Intelligence along.

Brihadaranyaka Upanishad

Sweetness of Salt - An Indian Story

The story is of a vain king with three daughters. One day the king decided to test the loyalty and love for him of his offspring, and so asked each daughter in turn to describe her love for him. The eldest daughter declared that her love was as vast as the sky and as pure as gold while the second added that her love was as deep as the ocean and like precious stones. These responses pleased the king greatly. The third and youngest daughter was shy and had difficulty putting her emotions into words. Eventually she said that her love was like a daughters love for her father. The king probed further, demanding to know what the third daughterís love resembled. Eventually she explained that she loved her father as much as both of them loved salt. The king was outraged at such a cheap suggestion and from that day refused to have anything to do with the unfortunate girl. Eventually, after the passing of many years and after the two eldest daughters had been married to kings and given handsome dowries, the queen asked the still furious king to marry off the third daughter. The king married her to the first beggar he saw and sent the hapless child from the palace to lead a life of begging with her husband. The girl was brave and accepted the banishment.

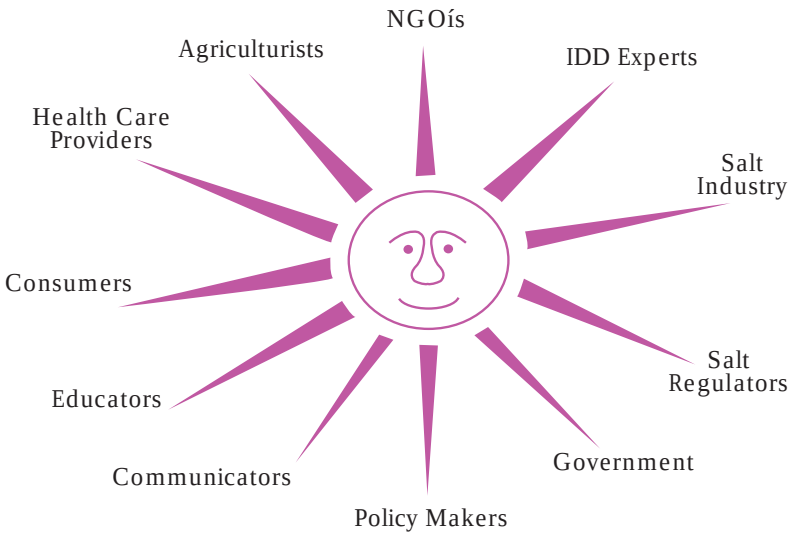
As in all good fairy stories, the young husband was not a beggar at all but someone full of intelligence and ambition who had come to the kingdom seeking work and begged for food only once ñ the day the king saw him. The princess sold her ornaments and they worked hard at farming the small plot they were able to purchase from the proceeds. Eventually after much determined hard work, good management and luck they became rich and influential.

One day they invited the unsuspecting king to dinner in their own palace. The arrangements were the most lavish and the king was greatly impressed. Of course he did not recognize the veiled hostess as his own daughter. A sumptuous meal was served from golden bowls onto golden plates. None of the dishes contained any salt, however. The angry king shouted at the hostess for insulting him thus. His daughter then removed her veil and gently pointed out to her father how much he liked salt and how it was far more important to him on a daily basis than gold and jewels. The shamed king on seeing the truth of his daughterís statement of all those years before, now begged her forgiveness. To make amends he gave his kingdom to the couple who lived happily ever after.

Adapted from ìOn the Salt Marchî by Thomas Weber

आयोडीन युक्त नमक प्रतिदिन।
बुद्धि और स्वास्थ सुरक्षित हरदिन।।

Daily consumption of Iodised salt is a healthy habit



Sustaining Elimination of IDD

ìIodine Quota Intelligence Quotientî

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