Current Status of Iodine Deficiency Disorders (IDD) and Strategy for Its Control in India

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Abstract. Iodine Deficiency Disorders (IDD) reflects the broad manifestations of iodine deficiency including the implications on reproductive functions and lowering of IQ levels in school aged children. Today, IDD is a public health problem in 130 countries and affects 13% of world's population. In India, no state is free from iodine deficiency and 200 million people are 'at risk' of IDD. Daily consumption of salt fortified with iodine is a proven effective strategy and is the measure stressed by the Government of India. The paper describes the major five phases of the IDD Control Programme in India. The paper describes the major five phases of the IDD Control Programme in India since 1962 and synthesizes the spectrum of activities that significantly attributed to the Universal salt Iodisation (USI) efforts launched in 1992. The sustainability of the USI programme is critical since IDD prevalence will rise if programme of salt iodisation weakens. A two pronged strategy needs to be institutionalized for ensuring continued demand for iodised salt, linked to ongoing health, nutrition and education programmes as well as for ensuring supply of quality iodised salt. **[Indian J Pediatr 2002; 69 (7) : 589-596]**

Key words : *Iodine deficiency; IQ Scores; Iodised salt*

Iodine Deficiency Disorders (IDD), a term introduced by Hetzel in 1983, reflects the collective clinical and subclinical manifestations of iodine deficiency.[1] Iodine Deficiency Disorders impact "refer to all of the ill - effects of iodine deficiency in a population, that can be prevented by ensuring that the population has an adequate intake of iodine".[2] IDD occurs when availability of iodine is lower than required amounts and the thyroid gland is not able to synthesise sufficient amounts of thyroid hormone. The low level of thyroid hormones in the blood is the principal factor responsible for damage to the developing brain and other harmful effects known collectively as the Iodine Deficiency Disorders (IDD). Earlier implications of iodine deficiency were viewed to be limited to goitre alone-the visible and most obvious manifestation of IDD.[3] However, since the last two decades, the adverse impact of deficiency of iodine on mental and physical development of children as well as on productivity of adults has been recognised.[4] The severe consequences of iodine deficiency include cretinism, mental retardation, deaf-mutism, squint, spastic diplegia, dwarfism etc. (Table 1).

Today , iodine deficiency is claimed to be the world's single most significant cause of preventable brain damage and mental retardation.[5] Foetus and postnatal survival are reduced by iodine deficiency.[6] Neuromotor and cognitive impairment are important documented consequences of iodine deficiency.[7,8] The neurological clinical features are characteristics and distinct. Less extreme level of iodine deficiency are responsible for impaired learning capacity and performance in school or reduced capacity to handle formal tests of psychomotor functions. A meta analysis of 18 studies of cognitive and neuromotor functions revealed mean IQ scores were 13.5 lower in iodine deficient group as compared to those from comparable communities where there is no iodine deficiency.[9] Impaired school performance is a serious consequence of iodine deficiency. Infact the number of persons affected by lowering of IQ

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Table 1. Effects of Iodine Deficiency in Human - IDD[1,2]

Pregnancy	Spontaneous abortions
	Still births
	Interferes with development of fetal brain, birth of cretins
Childhood	Goitre
	Lowered IQ (10-15 points)
	Impaired learning & preschool performance
	Mental retardation
	Delayed motor development
	Growth failure/stunting
	Lack of energy
	Muscular disorders
	Paralysis
	Speech and hearing defects
	Increased peri-natal mortality
	Increased infant mortality
Adolescent	Mental and physical development retardation
Adult & All Ages	Goitre
	Hypothyroidism
	Lack of energy
	Impaired mental function
	Reduced Productivity
	Increased susceptibility to nuclear radiation

points is much greater than the number of persons affected by severe deprivation of iodine. It is estimated that about 40 million primary school children in India living in IDD endemic areas are not able to achieve their optimum performance with a loss of 10-15 IQ points.[10] The grave implications of iodine deficiency on child's learning capacity and the quality of life of child population is thus evident in the erosion of quality of our human resources.[11]

Neonatal Chemical Hypothyroidism (NCH) is a forerunner to mental subnormality in childhood. As referred earlier, this is due to the fact that the development of brain is dependent on an adequate supply of thyroxine. Diagnosis of NCH is made by measuring thyroxine (T4) and thyroid stimulating hormone (TSH) levels. T4 values below 3 mcg/dl and TSH value more than 50μU/ml indicate NCH. The incidence of NCH in endemic regions of India and its neighbouring countries range from 6-130 per 1000 births.[12] The NCH incidence in Bombay has been reported to be 24 per 1000 births.[13] Kochupillai and Pandav,[14] has reported much higher incidence of NCH in Eastern U.P. districts of Deoria, Gorakhpur, Gonda as compared to Delhi and Kerala. A marked reduction in IQ scores and increased reporting of nerve deafness has been reported in areas with high incidence of NCH. It is reported that about 10% or more of newborns in severe goitre endemic regions are estimated to be at risk of neonatal hypothyroidism and resultant mental and physical development.[15] The situation is further worsened in newborns due to the fact that iodine content of breastmilk in endemic areas is rather low with a mean value of 3.44 and 0.59 mcg/dl.[16] and therefore much lower level of iodine is available to these infants compared to the estimated iodine needs of 90 mcg per day (Table 1).

Table 2. Recommended Daily Intake of Iodine[2]

- 90 μg for preschool children (0-59 months)
- 120 μg for school children (6-12 years)
- 150 μg for adults (above 12 years)
- 200 μg for pregnant and lactating women.

Iodine deficiency during pregnancy is serious and complex since both the mother and foetus are affected, and proper iodine nutriture of the foetus is dependent on mother. Iodine deficiency also affects reproductive functions, leading to increased rates of abortions, stillbirths, congenital anomalies, low birth weight, and infant and young child mortality.[5] Iodine deficiency in mother significantly influence foetal outcome, especially in the development of brain and may cause irreversible brain damage in foetus. The second trimester of pregnancy to the third year after birth is considered the period most critical regarding deficiency of iodine. The damage of iodine deficiency is reported to begin during the second trimester of pregnancy and is reversible during this stage of pregnancy if iodine is supplied. However, the damage sustained after the end of the second trimester of pregnancy is permanent.[17] It is estimated that in India about one fifth of pregnant women are at a considerable risk of giving birth to children who will not reach their optimum physical and mental potential because of maternal iodine deficiency.[18] The implications of iodine deficiency in adolescent mothers could possibly be more damaging. Prevalence of goitre is noted to be higher during this period of accelerated growth, reflecting disturbed metabolism of iodine.[19] Poor iodine nutriture during adolescence needs to be viewed seriously, especially in IDD endemic states of Uttar Pradesh, Madhya Pradesh etc. In these states of India, over 50 percent girls marry before reaching 18 years of age.[20]

IDD has been identified as a significant public health problem in 130 countries, affecting a total 740 million people, or 13% of world's population.[21] South East Asia is the most affected regions with total goiter rate (TGR) of 23.1% prevalence. In India, no state is free from iodine deficiency , 200 million people are estimated to be at risk of IDD.[22] Infact, prior to 1989, prevalence of goitre and cretinism was believed to exist in only broad Himalayan and sub-Himalayan belt. The multicentric study by the Indian Council of Medical Research[24] revealed goitre was prevalent outside the traditional goitre belt. By 1993, it was evident that in India 197 districts were IDD endemic. Using the epidemiological model, it was therefore estimated in early 1990, that in India 150 million people are at risk of IDD with 54 million having goitre, 2.2 million suffer from cretinism and an estimated 6.6 million are affected by milder neurological defects attributed to environment iodine deficiency.[25] Later in 1998, Govt. of India.[22] reported that 200 million people are at risk of IDD, while the number of persons suffering from goitre and other iodine deficiency disorders is above 70 million. Sample surveys conducted in 25 states and 4 Union Territories by the IDD Cell of Government of India revealed that 235 of the 275 districts surveyed were IDD endemic.

In addition to the Government of India surveys, public health experts have undertaken surveys in various parts of India. In 1990s Sankar *et al*[26] reported goitre rate to be 54 percent and cretinism 3.5 percent in Sikkim, while other experts presented data of high goitre rate of 32.9% in Guna and Datia districts of Madhya Pradesh,[27] 42.2% in Assam[28] and 16-19.7% in Delhi,[29,30] In 1999, following intensive Universal Salt Iodisation (USI) programme, a decrease in prevalence of Total Goitre Rate (TGR)has been reported by Kapil *et al*.[31]

Inadequate iodine intake and inadequate iodine utilisation are the major factors responsible for the Iodine Deficiency Disorders (Fig. 1). In addition to the dietary deficiency of iodine, presence of certain substances which adversely influence the utilization of iodine in staple foods is the second major etiological factor of IDD. These

factors are known as "goitrogens" and are generally present as thiogluecosides or glucosinolates; the glucan portion being responsible for its goitrogenicity. Goitrogens are found in abundance in certain tubers and vegetables like tapioca, cabbage and cauliflower. Coarse grains like sorghum, millets as well as mustard, groundnuts and cassavas are known to be goitrogenic.

Lack of iodine in our diet cannot be replenished

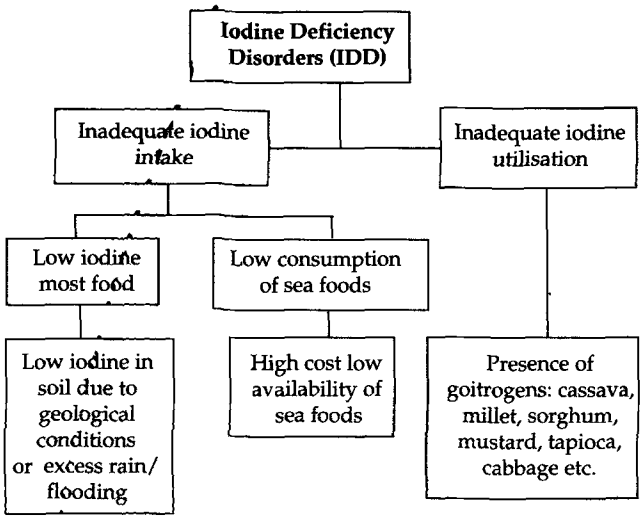

Fig. 1. Iodine Deficiency Disorders (IDD)

naturally from food and water since over a millenia there is continued and increasing leaching of iodine from the soil and vast tracts of land. All crops grown in such soil remain deficient in the trace element iodine. Ground water and foods grown in these areas lack iodine.[2] Iodine therefore needs to consumed in addition to the regular food which is often deprived of this nutrient. Regular consumption of food fortified with iodine is viewed as the most cost effective solution to address the problem of deficiency of iodine and to meet the minimum daily requirement of iodine. Salt has been identified and considered to be the most suitable food vehicle for iodine fortification since fortification of salt with iodine is not only technically feasible but salt is one such food item which is consumed universally and a standard amount is consumed daily by all sections of the population. In regions where iodisation of salt is not a practical option, other measures such as administration of iodised oil every 6-18 months, direct administration of iodine solution and iodisation of water supplies by direct addition of iodine solution have been proposed as practical solutions for correction of IDD.[2]

Consumption of salt fortified with iodine or iodized salt was first suggested in Colombia, South America. Iodine for fortification is available from oil, brine and natural gas well. The main global sources of iodine are the USA, Japan and China. A community scale programme of iodized salt was launched in the U.S. in 1924.[32] In India, following the pilot study in the Kangra Valley between 1954 and 1972 by Sooch *et al*[33] it was evident that regular consumption of iodized salt had a positive impact on iodine nutriture. Salt fortified with potassium iodate (34-66 gms potassium iodiate per kg. of common salt) was proven effective in prevention and control of iodine deficiency Potassium Iodate was recommended in preference to potassium iodide because it was considered more stable.

Following the Kangra iodised salt study, the Government of India defined the level of fortificant under the Prevention of Food Adulteration Act (PFA) - minimum 30 ppm iodine at the production level and minimum 15 ppm at the consumption level.[22] It was estimated that from the average daily intake of 10gms of salt with minimum 15 ppm iodine, the estimated average daily availability of iodine from salt would be at least 150 mcg. It was calculated that about 30% would be lost during cooking while the remaining 10^5 mcg would be ingested and of this only 70% would be absorbed. It was therefore concluded[34] that only 73.5 mcg will be absorbed per day from iodine fortified salt with 15 ppm iodine. This quantity when added to the daily consumption of iodine through food (100-200 mcg) would be, however, less than a total of 300 mcg of iodine and would be infact far below the permitted safe level of 1000 mcg/day.[35] As per the WHO report, a safe dietary intake of iodine could be a maximum of at least 1000 µg. Iodine taken in large quantity is excreted through the kidney in urine and the consumption of iodised salt (officially referred as iodated salt by the Government of India) is therefore absolutely safe.[23]

Government of India, following the experiment in Kangra Valley, introduced the programme of iodized salt in 1962-65 with the establishment of 12 iodisation plants in the country with UNICEF assistance.[36] The programme between 1962-1999 can be classified under the following phases.[37]

1. Phase I (1962-82) :	Implementation of the National Goitre Control Programme (NGCP).
2. Phase II (1983-89) :	Focus on Universal Iodisation of Salt by 1992.
3. Phase III (1989-91) :	Sustaining Production and Creating Demand for Iodized Salt.
4. Phase IV (1992-98) :	Intensification of Universal Salt Iodisation (USI) activities and implementation of the National IDD Control Programme, NIDDCP
5. Phase V (1998-99)	Evaluation and Replanning of USI.

In the first phase of the programme, the focus was on launching the National Goitre Control Programme by defining the national strategy of salt iodisation for prevention and control of iodine deficiency, identifying iodine deficient regions by undertaking goitre surveys

and ensuring supply of iodised salt to these selected identified regions. The endemic states were also encouraged to introduce legal measures to ban the sale of non-iodised salt for edible purposes. In summary, the first phase of the NGCP focused on the following programme policies and addressed specific major issues.[36]

- Iodisation of edible salt was adopted as a policy for the prevention and control of goiter.
- Potassium iodate was agreed to be used as the fortificant for iodization of salt and not potassium iodide. Levels of iodine at production and consumption level were defined under the PFA (Prevention of Food Adulteration Act).
- Periodic survey and resurveys were institutionalized and methodology for goitre survey was developed.
- Salt iodisation plants were established in only public sectors (15 plants)- installed with the capacity of 255,000 tonnes iodised salt per annum.
- Legal measures were introduced—ban notification were encouraged to be introduced by the State Governments prohibiting the sale of non-iodized salt for edible purpose in identified "endemic" areas.

Following the evaluation of the National Goitre Control Programme by the National Foundation of India,[38] commissioned in 1981 by the Government of India, a number of administrative and programme modifications were introduced in the following 10 years i.e. Phase II and Phase III (Table 3) of the NGCP programme.[39] A National Goitre Control (NGC) Review Committee was formed in 1983. Following recommendation of the Technical Goitre Review Committee (TGRC), India adopted the policy of universal iodisation of edible salt. Simultaneously, a working group on salt industry was also constituted to advise the Government of India (GOI) on measures to upgrade salt industry to step up production of iodised salt to meet the requirements of iodised salt for the goitre endemic areas. The major breakthrough was shifting iodised salt production to private sector in mid year 1983 and introducing measures to ensure universal availability of iodised salt.[36] Programme focus shifted from the uni-sectoral approach (Health Department) to a bisectoral approach with the increased involvement of the Salt Department. Production, packaging, transportation and monitoring of iodised salt was streamlined. However, the programme support during this period at the level of State Governments remained confined to sensitization and training of only the medical personnel attached to the Health Department. Effort was also initiated to formulate Information and communication strategy and develop supportive materials to address salt traders. The concept of social marketing was introduced. Table-I highlights the major programme issues addressed during these two phases i.e. IInd & IIIrd phase. At the end of the Phase III, the portable rapid salt testing kit for qualitative testing of iodised salt was developed and this kit proved to be an effective low cost simple tool (referred to as salt testing kits or STKs) for demand generation and monitoring.

The GOI effort to universalize iodization of salt assumed a new dimensions with the international focus on elimination of IDD. The 43rd World Health Assembly Resolution, the World Summit for Children and the second SAARC conference resulted in giving new impetus to the national efforts in elimination of IDD **(37)**. Recognizing that the consequences of iodine deficiency were not limited to "visible" goiter, the nomenclature of the national programme was changed from National Goitre Control Programme (NGCP) to National Iodine Deficiency Disorders Control Programme (NIDDCP) by the Government of India.[22] The NIDDCP goal being to reduce the prevalence of IDD below 10 percent in the endemic districts of the country. The programme focus in 1992-97, in collaboration with UNICEF, shifted from a mere universal Health Ministry programme to working intensively with the Salt Department of the Government of India under the Ministry of Industry to achieve the goal of "Universal access to iodised salt by 1995" or Universal Salt Iodisation (USI). Multisectoral approach with higher involvement of not only Health and Industry Ministries but working with Ministries of Railways, Food and Civil Supplies, Human Resource Development (Education, Integrated Child Development Services) was adopted. Salt producers and salt traders were motivated to achieve the goal of production of 52 lakh tonnes of iodized salt for ensuring universal access to iodized salt. Database on serious implications of iodine deficiencies as well as data profile on salt producers, iodisation capacity and actual production of iodised salt, movement of iodised salt by rail and roads constraints in production & distribution as well as actual availability of iodised salt at state level was updated to facilitate advocacy efforts towards formulating an effective plan for ensuring universal access to iodised salt. It was recognised that high political priority and introduction of legal measures, such as banning the sale of non-iodized salt for edible purpose, especially in the three major salt producing states of the country, (Gujrat, Tamil Nadu and Rajasthan) was of utmost importance to reduce road movement of non-iodised salt to other states of the country.[36] The USI programme focussed on accelerated production and establishment of effective monitoring system at the salt producers level by sensitising and strengthening linkage with the network of salt producers and owners of iodisation units. Guidelines for monitoring iodine levels in salt were further streamlined and publicised. All iodisation units were provided technical support to establish appropriate laboratory and trained personnel. Efforts were made to simultaneously create demand for iodized salt by the salt traders and wholesalers. The traders were sensitised regarding their role in elimination of IDD and contributing to optimum mental development of children in the country by procuring and selling only

iodised salt for edible purposes. In addition, awareness campaign's were organised to educate consumers on the importance of consuming only iodised salt. Demand creation activities at the community level in various states concentrated on social mobilization drive, through the network of Health, ICDS and School Health System as well as by mobilising consumer organizations and salt wholesalers and traders at the state level on the importance of producing, selling and consuming only iodized salt. The usage of iodised salt for feeding of live stock was also promoted. It was emphazised that feeding iodised salt will have a positive impact on meat, milk and egg production as well as on reducing movement of non-iodised salt to states with the legal ban in place - the ban being limited to only human consumption.

Table 3 summarises the broad spectrum of activities which played a significant role in the implementation of USI programme for achieving the goal of universal access to iodised salt. The institutional home for the USI programme was identified to be the Salt Department and the responsibility for the development of appropriate policies and mandates for the execution of the USI programme was assigned to the Salt Department, under the Ministry of Industry. However, the Ministry of Health at the Central Government and State Government levels were responsible for the overall execution of the IDD programme including surveys, information and education activities, monitoring of iodine levels in salt and measuring the impact through goitre surveys and urine testing for iodine.

In the period of 1992- 1996, a 46% increase in the production of iodized salt was reported. The national evaluation of the USI programme in 1997[40] revealed that 89 percent households were using iodised salt -70 percent households consumed iodised salt with 15 ppm or more iodine. The consumption of iodised salt was higher in urban areas (78.1%) compared to rural areas (63.3%). Those states where a MIS (Monitoring Information System) had been well established by the Health Department for monitoring iodine levels in salt using salt testing kits, revealed a higher percentage of population consuming iodised salt - Himanchal Pradesh (97.3%), Manipur (92.9%), Madhya Pradesh (85.7%). Despite the fact that the usage of testing kits (STKs) for assessing level of iodine is not quantitatively as accurate as the usage of titration method, the rapid testing kit proved to be a very important and effective tool for creating demand for iodised salt as well as for alerting the salt marketing chain of salt retailers to iodised salt produces to adhere to the legal measures. The NFHS II data[20] indicates that the consumption of iodised salt in the major salt producing states has dropped in the recent years. The consumption of iodised salt in major salt producing state being 37.1% in Rajasthan, 29.5% in Gujrat and 62.7% in Tamil Nadu. Moreover, the NFHS-II data indicates that more than one quarter of households (28%) in India 1998-99 used salt that is not iodised, while 49 percent households used cooking salt that is iodised at the recommended level of

Table 3. Revised Policy and Programme Directions (1983-91). Phase II (1983-88), Phase III (1989-91)..

- NGCP- Part of PM's 20 Point Programme.
- Production of Iodized salt - private sectors encouraged to produce iodized salt.
- Rail- Zonal Schemes introduced.
- Introduction of subsidy for Iodine up to a defined limited period, i.e. 1992.
- Minimum standards of Iodized salt defined-Amendment of PFA Act and Rules 1954.
- Legal Measures encouraged to be introduced - From limited endemic Northern States - to country level.
- Awareness on Goitre - Social Marketing of salt "Logo" for iodised salt developed and supportive communication materials developed by the Health Department with UNICEF.
- Development of simple monitoring tool - Salt Testing Kits (STKs).

Table 4. NIDDCP Focus 1992–96

Policy Level	Strengthen and increase political support for universal iodisation of salt.
	Implication of iodine deficiency on mental development and I.Q. level were defined and emphasised.
	Introduction of legal measures by all the State Governments for ensuring selling of only iodised salt for edible purpose, with special focus on Salt Producing States.
	Promoting inclusion of iodised salt through the network of Public Distribution System (PDS) by the State Governments.
Production Level	Update database - profile created towards strengthening advocacy with salt producers.
	Sensitization of salt producers traders. Special support to small producers for production of iodised salt-cooperatives formed for iodisation units.
	Ensuring regular supply of iodine and checking cost escalation
	Introducing measures for controlling Road movement of non-iodised salt.
	Strengthening rail movement including monitoring and storage of iodised salt for loading unloading.
	Strengthening monitoring system at the production level (mobile laboratories introduced).
	Standardization of labeling and technical information on iodised packets.
Consumption Level	Launching IEC (Information Education and Communication)activities for demand creation (salt traders and wholesalers, households, consumer organizations).
	Institutionalizing a monitoring Information System (MIS) for iodised salt, establishing a monitoring system using STK linked to health programme at district levels of selected states.
	Initiating measures to discourage functioning of spurious re-packing units for iodised salt.

TABLE 5. Lesson Learnt - USI Programme.

- Appropriate food vehicle - Criteria for selection must be defined.
- Efficacy study/trial important - facilitates policy formulation and contributes to according high political priority.
- Availability of fortificant - controlled prices for fortificant should be ensured. No subsidy should be provided for procuring fortificant.
- Defining standards for fortficant essential. Legal measures facilitate in market management of the product.
- Defining role of concerned sectors at the Central and State levels important.
- Controlling mechanism for price of product must be planned and implemented.
- Important roles of producers / private sector / traders /retailers must be recognised.
- Essential to Institutionalize monitoring system both at the production and consumption levels.
- Programme strategy must focus on simultaneously increasing production and demand for the fortified products.
- Ensuring sustainability of programme by adopting measures for demand creation for the fortified product by linking IEC activities with the ongoing programme activities and not implemented as a vertical programme.

TABLE 6. Criteria for monitoring progress towards eliminating IDD as a public health problem

Indicator	Goal
1. Salt Iodisation	
Proportion of households consuming effectively iodised salt	>90%
2. Urinary iodine	
Proportion below 100µg/l	<50%
Proportion below 50µg/l	<20%
3. Thyroid size	
In school children 6-12 years of age : Proportion with enlarged thyroid, by palpation of ultrasound	<5%
4. Neonatal TSH	
Proportion with levels >5mU/l whole blood	<3%

15ppm or more and 22% households use salt inadequately iodised salt i.e. <15 ppm.

Universal salt iodisation for IDD elimination is not a temporary responsibility of this generation but will remain a need for the society for many years. It is important that the "lessons learnt" from the USI programme are reviewed not only for ensuring sustainability of the USI programme but for launching food fortification programmes for addressing prevention and control measures for others specific nutrient deficiencies. Table 4 summarises some of the important programme issues emerging from the experience of the last four decades of the IDD programme.

The sustainability of USI programme is critical since IDD prevalence will rise if programme of salt iodisation weakens. Efforts for eliminating IDD therefore should continue in a direction which is based on consolidating the gains so far achieved, and by establishing a programme management system for universal access to iodised salt in the country. Limiting factors of the programme, with reference to large number of small salt producers, partnership with industry, continuous increasing cost of potassium iodate, lack of integration of communication messages with the ongoing ICDS or health (RCH) programme, lack of information on monitoring guidelines at consumption level, absence of established surveillance system must be addressed. The challenge is to maintain the momentum by institutionlising a system for ensuring continued demand for iodised salt, ensuring supply of quality iodised salt, conditioning consumers to accept only iodised salt and urging to retain IDD programme a political priority.

A two pronged strategy, focussing on demand generation for iodised salt and simultaneously addressing issues for ensuring availability of the appropriately fortified quality iodised salt at an affordable cost by the population should continue to be emphasized . The activities related to sustaining demand for iodised salt and monitoring level of iodine in salt at the consumption level should be integrated with the current national efforts on women and child development through linkage with the ongoing development programmes i.e. Reproductive and Child Health (RCH), Integrated Child Development Services (ICDS), Urban development programmes, Mid-Day-Meal(MDM) and curriculum of the school system and Panchayti Raj Institution (PRI). In the state of Uttar Pradesh, demand generation for iodised salt has been initiated as a part of the biannual strategy for provision of package of services in the Child Health and Nutrition Months.[42]

Simultaneous to demand creation, concerted efforts must be directed at retaining universal accessibility to iodised salt by continuing to work with the salt producers, big and small, who are motivated to produce required amount of iodised salt for the population. In addition, the monitoring system at production level must remain functional for quality control. The strengthening of mobile laboratory concept introduced in 1994-96 for reaching the salt produces located in isolated regions must be strengthened. Producers and the Salt Department must ensure that the cost effective movement of iodised salt by rail and road is followed as per the distribution guidelines of the Government. Database of salt traders and retailers needs to be generated and continuously updated with a view to timely initiate continuously dialogue with them to procure and sell only white powdered packaged iodised salt. For ensuring a regular continued supply of iodised salt suitable salt market

management system must be established with the introduction of measures for keeping a control not only on the cost of imported iodine but also on the cost of "refined" white powdered packaged iodised salt. These factors are important and govern the marketing price of various all other types of iodised salt i.e. non-refined iodised powdered salt, iodised bargara salt, iodised karkach salt etc. In addition, Food and Civil Supplies of all the State Governments could introduce a policy for inclusion of iodised salt in the list of food items to be marketed through the Public Distribution System (PDS). Usage of iodised salt should be made mandatory in the feeding programmes of ICDS or Mid-Day-Meals of the school system.

The social, health and economic benefits of salt iodisation programme, for both human and animal population, is very significant. IDD Programme efforts must be sustained and constantly monitored. The Nodal State level Health Departments in collaboration with State based Medical College or any other suitable institution could establish an IDD Surveillance System. The internationally accepted indicators (Table IV) could be institutionalised for monitoring the IDD status(2). Sustained elimination of iodine deficiency must continue to remain a national responsibility and efforts for universal access to iodised salt must continue to receive political support and attention of public health network in the country.

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