Evolution of Iodine Deficiency Disorders Control Program in India: A Journey of 5,000 Years

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Summary

Iodine deficiency disorders (IDD) has been documented since around 5,000 years. However, geological factors like frequent glaciations, flooding, and changing of course of rivers has led to iodine deficiency in soil. As a result everyone remains at risk of IDD, if optimum intake of iodine is not sustained. Evolution of the IDD control program in India has been a dynamic process. The model of IDD control program in India provides important lessons for successful implementation of a national health program. In formulating National Health Programs; policy environment, scientific inputs, political will, and institutional structure for decision making are necessary but not sufficient. Continuous and dynamic generation of reliable and representative state and national level data, proactive recognition of values of key stakeholders and addressing them through sustained advocacy, development of partnerships among stakeholders, institutional continuity, and mentorship are critical for achieving sustainability of results.

Keywords: Evolution, IDD control program, India

Introduction

Iodine deficiency disorders (IDD) is the most common cause of preventable brain damage globally.1 IDD comprise of a spectrum of illnesses including goiter, cretinism, hypothyroidism, brain damage, abortion, still birth, mental retardation, psychomotor defects, and hearing and speech impairment. IDD leads to major learning disabilities in children. Children born in iodine deficient areas were found to have 13.5 intelligent quotient (IQ) points less than those in iodine sufficient areas.2 Sustainable elimination of IDD is also intricately linked with achievement of six Millennium Development Goals (MDGs). Globally 1.88 billion people are at risk of IDD due to insufficient iodine intake.3 In India around 350 million people are at risk of IDD, calculated based on coverage with adequately iodized salt. IDD are endemic in India with 303 districts out of 365 districts surveyed reporting total goiter rate (TGR) greater than 10%.4

Universal Salt Iodization (USI) is key strategy for control of IDD. In 1994, World Health Organization (WHO) and United Nations Children’s Fund (UNICEF) Joint Committee on Health Policy recommended USI as a safe, cost-effective, and sustainable strategy to ensure sufficient intake of iodine by all individuals.5 Salt iodization, which costs US$ 0.05 per persons per year and has a benefit-cost ratio of 81, has been identified as a priority area for targeting hunger and malnutrition by Copenhagen Consensus Statement 2012.6

India was one of the first countries globally to start a national IDD control program and the IDD control program in India has evolved over the years. The dynamic evolution IDD control program and the efforts for its sustainable elimination in India provides a unique opportunity to study the interaction between research, policy, and program and decision making process and to identify solutions for the future. Evolution of IDD control program in India also highlights the complex
policy environment in which National Health Programs operate and to identify key enabling and impeding factors for its sustainability. This paper presents the evolution of IDD control program in India and lessons learned thereof for successful implementation of a National Health Program.

Evolution of IDD Control Program in India

Manifestations of iodine deficiency have been known to the mankind since around 5,000 years. Mention of goiter can be found in ancient Indian and Chinese scriptures.7 Earliest reference to goiter can be found in 2838 BC when seaweed “sargassum” was described as a remedy for goiter. Atharveda, an ancient Indian Scripture, also mentions about “Galganda” or a swelling in neck and the fact that it is treatable. In modern times, goiter was first documented in India in the Gilgit and Chitral Valley of Kashmir in the year 1905 by McCarrison.8 Several researchers including Stott and Ramalingaswamy reported goiter in earlier part of the century from different parts of India.9,10

Salt iodization as an intervention to address goiter was first initiated in United States of America (USA) and Switzerland in 1920s.11 In India, effectiveness of salt iodization to control IDD was established by the landmark study in the Kangra valley in Himachal Pradesh from 1956 to 1972.12 The results of this study have been supported by evidence from other international community-based intervention programs as well.13,14 These studies from USA and Switzerland clearly show effectiveness of daily consumption of iodized-salt and reduction in prevalence of goiter.

Success of the Kangra Valley Study led to establishment of National Goiter Control Program (NGCP) in India in year 1962.15 Promotion of consumption of iodized salt in the endemic areas was the key strategy for control of goiter under this program. In view of the emergence of new evidences, the program was modified and renamed as National Iodine Deficiency Disorders Control Program (NIDDCP) in 1992. In the same year Government of India advised all states to ensure mandatory salt iodization for direct human consumption under the provisions of Prevention of Food Adulteration (PFA) Act, 1954 pursuant to the advice of Central Committee for Food Standards. Further amendment was done in PFA Act in 1997 to ban sale of non-iodized salt for direct human consumption throughout the country.16 In year 2000, ban on sale of non-iodized salt for direct human consumption was lifted,17 again to be reinstated in 2005 after sustained advocacy.18 Recently, in year 2011, the Supreme Court of India and a committee established under its direction upheld the scientific basis of mandatory salt iodization for control of IDD.19 In the same year, regulations under Food Safety and Standards Act, 2006, which has replaced PFA Act 1954, were notified banning sale of non-iodized salt for direct human consumption.20

Phases of IDD Control Program in India

The evolution of IDD Control Program in India can be divided into four phases [Figure 1].

Phase 1: Scientific research leading to program (1956-1983)
Success of the Kangra Valley study led to establishment of the NGCP in 1962 at the end of the second Five-Year Plan.15 Focus of the NGCP was on endemic districts. During this period, only 12 salt iodization plants were established, all of which were in public sector, with annual production of 0.2 million tons. The total salt production was estimated to be 15% of the requirement. During this phase, NGCP remained a low priority health program as a result of area specific approach and recognition of IDD as a mild cosmetic problem restricted to Himalayan region.

![Figure 1: Phases in evolution of iodine deficiency disorders (IDD) control program in India](http://www.ijph.in)
Phase 2: From goiter to IDD (1983-2000)

New scientific evidence emerged from India and abroad, showing significant impact of iodine deficiency on early brain development, cognition, and learning abilities of children. Whole country was shown to be endemic for IDD and very high prevalence of neonatal hypothyroidism were reported from some parts in the country. The linking of iodine deficiency with problems in learning and its consequent effect on achievement of the goal of “Education for All” convinced the political leadership of the critical importance of the problem and helped in securing the high level of political commitment. In 1983 in the Annual Meeting of Central Council of Health, it was decided that all edible salt in India would be iodized by year 1992 and the private sector was allowed to setup salt iodization units. In light of these developments, program was modified in 1992 and renamed as NIDDCP with renewed focus on USI.

Government of India notified a national level ban on sale of non-iodized edible salt in year 1997. These measures caused an increase in production of iodized salt from 0.2 million tons in 1986 to 4.4 million tons in 2000. This also led to an increase household consumption in iodized salt with 49% households consuming adequately iodized salt (³15 parts per million (PPM). However, natural calamity in salt producing areas of Gujarat in 1998 and 2001 affected the production and quality of iodized salt, which led to decrease in the household coverage of adequately iodized salt.

Phase 3: Lifting the ban on sale of non-iodized salt (2000-2005)

The lifting of ban and consequent decline in household coverage with adequately iodized salt spurred the scientific community in generating scientifically valid information to address this challenge. IDD survey conducted by International Council for Control of Iodine Deficiency Disorder (ICCIDDD) in seven states during the period 2000-2006 reported that IDD remained endemic in these states. None of the states or Union Territories was found to be free of IDD. Intense advocacy was carried out involving all key stakeholders to address the claims made against the policy of USI.

Phase 4: Reinstatement of ban on sale of non-iodized salt and consolidation of sustainable elimination of IDD (Since 2005)

As a result of sustained advocacy and generation of evidence, Core Advisory Group on Public Health and Human Rights of National Human Rights Commission was asked in 2004 to critically examine the public health consequence of lifting of ban on mandatory salt iodization for human consumption. The Core Advisory Group recommended that the USI is a public health need which should be implemented throughout the country without any relaxation in the ban on sale of non-iodized salt for human consumption. Consequent to this, the ban on sale of non-iodized salt was reinstated in 2005. A schematic representation of the efforts for reinstatement of ban on non-iodized salt for human consumption in India is presented in Figure 2.

Partnerships were developed among stakeholders for sustained advocacy and pushing the agenda of sustainable elimination of IDD. National Coalition for Sustained Iodine Intake (NCSII) was established in 2006 with partners like government departments, office of the Salt Commissioner of India, academic institutions, research organizations, salt producers, bilateral and multilateral developmental organizations, and civil society group. Small and medium scale salt producers were engaged for capacity building to improve the quality of iodized salt. Various innovative business models including introduction of iodized salt in Public Distribution System are also being implemented to increase coverage with iodized salt. This multipronged approach with supply and demand side intervention led to a quantum jump in the household coverage with adequately iodized salt in India. Coverage Evaluation Survey (CES) 2009 reported that 71% households are consuming adequately iodized salt with another 20% consuming salt with some iodine.
The iodized salt production also increased to 6.2 million tons in the year 2010-2011. Progress in salt iodization through different phases of IDD control program is presented in Table 1.

**Discussion**

There have been many examples of successful implementation of National Health Programs in India and other developing countries. But one of the major stumbling blocks has been ensuring “sustainability” of the programs once the preset goals and targets have been achieved after initial intensive phase. The challenges for ensuring “sustainability” can be much more complex and daunting as compared to the program initiation phase.

IDD control program in India has been a public health success story. We are within the grasping reach of the target of greater than 90% household level coverage of adequately iodized salt of USI. India has been at the forefront of global efforts by contributing to research and program for elimination of IDD. NGCP was one of the earliest national programs dedicated to elimination of IDD. Successful evolution of IDD control program in India highlights factors for successful and sustainable implementation of a health program which may be relevant to the implementation of other health programs in the country or even to other programs related to social sector. The experience and lessons learned can be generalized to other countries as well. Following factors
were critical for achievement of success of IDD control program in India:

**Generation of regular, representative, and reliable scientific data**

Regular, representative, and reliable data at the state and national level is required for development of effective and efficient policy and programs and effective advocacy. Kangra Valley study provided robust evidence for salt iodization as an intervention for control of IDD and led to establishment of NGCP. Generation of evidence is an iterative process and the policy and program should respond to new evidence. Generation of new evidence in 1980s led to a paradigm shift in understanding of iodine deficiency from mere cosmetic problem to an issue of child health and development and extra-Himalayan reach of the disease. This led to renaming of the program and changes in strategy. Similarly, generation of new evidence in 2000-2006 led to reinstatement of ban on sale of non-iodized salt for human consumption.

**Stakeholder analysis and development of partnership**

Stakeholder analysis is a process of systematically gathering and analyzing qualitative information to determine whose interests should be taken into account when developing and/or implementing a policy or a program. Stakeholders include persons or organizations, which have a vested interest in the policy that is being promoted. Knowing who the key actors are, their knowledge, interests, positions, alliances, and importance related to policy allows policy makers to interact more effectively with key stakeholders and increase support for a policy and program. Development of partnership between various stakeholders viz. government institutions, academic institutions, international and national nongovernmental organization, civil society organization, and salt producers helped in sustainability in efforts towards achieving USI and elimination of IDD.

**Institutional continuity and mentorship for achievement of sustainability**

Active involvement of All India Institute of Medical Sciences, New Delhi in IDD control program provided institutional continuity and allowed mentorship for generations of researchers and workers in the field of IDD. This has ensured sustainability and leadership development to take forward the agenda of sustainable elimination of IDD.

**Addressing value system of stakeholders**

Health issues have social, economic, and political ramifications. In the formulation of policy in a democratic environment, in addition to identification of the health problem/issue, information in the form of evidence based data on effective and efficient intervention to eliminate the problem and formal and informal networks; there is a need to factor in “values”. Neglect of values by the policy makers may lead to serious setback to the program implementation as seen in case of NIDDCP.

Some of the reasons cited for lifting of ban on non-iodized salt was price differential in iodized and non-iodized salt; IDD being viewed as a problem affecting only a small section of the society; difficulties faced by salt producers under PFA Act, 1954; politics and economics of liberalization in terms of the program being labeled as run by multinational aid agencies and companies; and principles of choice. It was reasoned that: “Matters of public health should be left to the informed choice, and not enforced through compulsion”. Addressing these issues through sustained advocacy led to lifting of ban on non-iodized salt and improvement in household coverage with adequately iodized salt.

**Legislation for achieving public health goals**

The PFA Act 1954 and its successor, the Food Safety and Standards Act 2006; which prevents the sale of non-iodized salt for human consumption, was instrumental in creating enabling environment for achievement of USI in India. Temporary discontinuation of the legislation during the period 2000-2005 led to decline in household coverage with adequately iodized salt.

**Involvement of private sector in public health efforts**

Cooperation from salt industry is one of the main factors in achieving high coverage with adequately iodized salt. Engagement with medium and small scale salt producers and focus on improvement in quality of iodized salt through maintenance of quality assurance has been one of the prime reasons for improved household coverage with adequately iodized salt.

**Conclusion**

IDD and its control measures have been documented since around 5,000 years. However, geological reasons have led to deficiency of iodine in soil. As a result, everyone remains at risk of IDD, if optimum intake of iodine is not sustained. Evolution of control program in India provides
important lessons for successful implementation of a national health program. In the formulation of a policy in a democratic set up, “values” of the stakeholders play a vital role and should be incorporated as integral inputs into the process of policy making and program implementation. However, development of partnerships, availability of reliable scientific data, institutional continuity and mentorship, sustained advocacy, and political commitment is important for achieving sustainability of the program.

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