

CHAPTER II

Reducing Iodine Deficiency Disorder in Nepal by Improving Salt Consumption Practices through the “School Teachers Training”

2.1. Introduction:

Lack of iodine in the body causes various health abnormalities, collectively known as Iodine Deficiency Disorders (IDD). Endemic goitre is considered a public health problem when it affects more than 10% of an examined population. “An area is arbitrarily defined as endemic with respect to goitre if more than 10 % of the population or of the children aged 6 - 12 years are found to be goitrous” (Hetzel,1988).

Approximately 30 % of the world’s population are at risk of iodine deficiency disorders. Estimated 212 (14.4 %) millions population in South East Asia are at risk of IDD. In Nepal Total Goitre Rate is over 30 % which indicates that Nepal has a severe iodine deficiency disorders (UNICEF, 1995).

Most of the mothers prepare food in every household in the country. Majority of them were using crystal salt only after washing their salt due to looks like dusty, dirty, and black. The blackness of salt is due to iodine’s natural (violet) colour.

People's salt washing behavior may lose their iodine in their diet by washing iodine from the salt and they may not get required amount of iodine in their diet. Similarly salt storing practices also lose iodine from the salt. Most of the people are store salt in near and over the chulo and ageno (oven). Due to the direct heat iodine will be lose.

The Nepal Multiple Indicator Surveillance (NMIS), 1996 showed that only 50 % of the salt in the markets contained at least 30 Parts Per Million (PPM) of iodine. Which is the recommended level of iodine in the salt consumption in the country. Rest of salt contained marginal iodine level in the markets.

In Nepal, there are mainly two programs are running for reducing iodine deficiency in the country. The iodized oil capsules and salt iodization program. The iodized oil capsules distribution program is going to be phase out at the end of 1999. So that the iodization of salt is only the remaining program in the country. Which is the more common and most widely used program in the world. It is also cost effective program than the other methods.

In Nepal there are several factors influencing iodine deficiency, the most prominent and natural lose of iodine was due to the deforestation, erosion, glaciers, heavy rainfall and flooding. Due to the lose of iodine from the soil, people may not get iodine in their food which is grown in iodine deficient soil.

The water iodine levels also indicates the level of iodine in the soil, in Nepal the iodine level in the water was below 2 micro gram per liter, which indicates that Nepal is the one of the iodine deficient area (Hetzel, 1988).

Lack of iodine in the diet may cause several consequences like Abortions, Still births, Neurological cretinism, Hypothyroidism, Goitre with its complications, like obstruction in throat, and Cancer may be developed.

Then perinatal mortality, Infant mortality and Malnutrition has been occurred in that community. After that the Adult's work output, children's school performance and health and quality of life is decreased.

To reaching those at risk populations through schools is an important way to teach the oncoming generations about the importance of using iodised salt. Through this channel people may rely on respected and believable sources of information and these routes through the child - to - mothers and cooks should certainly be put to use as much as possible because teachers are trusted and well known in our community. If the teachers do not know about the importance of iodine, or give contrary information, then the IDD program is fails.

In this study I have discussed about Health Belief Model (HBM), which described the perceived threat of diseases and likelihood of change of behavior. For this purpose I have discussed here the Communication / Behavior Change (CBC) Framework to create awareness to the people to improve the people's salt washing and storing behavior by implementing teachers training program in Rautbesi village of Nuwakot district.

Therefore to improve the health status in terms of perinatal mortality, infant mortality, work output and productivity, as well as school performance, health and well being of the people, I would like to propose teachers training by which peoples present traditional salt consumption practices could be improved through the child - to - parents channel. Hence, people may get sufficient iodine in their diet as well as their own body.

2.2. Importance of iodine :

The need for iodine is vital from the time a child is in the mother's womb. Iodine is an essential micro - nutrient for normal growth and development in animals and man. The thyroid gland needs an adequate supply of iodine to manufacture thyroid hormones. These hormones are vital for the normal development and functioning of brain and nervous system, and for the maintenance of body heat and energy.

Absence of thyroid hormones causes severe mental retardation, bone growth failure, and maturation of almost all organs of the body. The human body needs only one teaspoon of iodine for a life time. This vital micro nutrient, however, must be absorbed in small doses - throughout one's life.

“The thyroid gland, which synthesises this hormone, beginning from the 2nd trimester of intra uterine life extracts iodine with great efficiency from its blood supply to meet the needs for thyroxin biosynthesis” (Kochupillai, 1997).

To ensure the normal growth and development of the foetus, it is essential for women of reproductive age to receive a constant and adequate supply of iodine women who is deficient in iodine may produce an abnormal child (like cretin). As the brain is

particularly susceptible to damage during the foetal and post natal period, the child may become permanently retarded. Even after birth, a child needs a steady supply of iodine to be free of IDD all his or her life. The recommended daily intake of iodine is given in the Table 2.1.

Table 2.1. Recommended daily intake of iodine is as follows :

Stage	Age in years	Microgram
Infant	0 - 6 month	40
Infant	6 - 12 month	50
Children	11 +	120 - 150
Pregnant women	15 - 49	175
Lactating women	15 - 49	200

Source : WHO / UNICEF / ICCIDD (1993).

2. 3. Introduction of iodine :

Iodine is a rare chemical element having 53 atomic number and 127 atomic weight. Elemental iodine was extracted from the seaweed and was named iodine because of its colour, which means violet in Greek (Hendler, 1990). Iodine was discovered by Bernard courtois in 1804.

It occurs naturally as iodide or iodate salts and it is obtained from sodium and potassium compounds. "It is a essential micronutrient, required for the synthesis of the thyroid hormones, thyroxin (T4) and triiodothyronine (T3) containing respectively 4 and

3 atoms of iodine. The healthy human adult body contains 15 - 20 milligram of iodine of which 70 - 80 % is in the thyroid gland and the blood level is about 8 -12 micrograms per dl" (Park, 1994). "Iodide (chemically bond iodine) is rapidly absorbed through the gut. The average renal clearance of iodide is 37 ml per minute in males and 25 ml per minute in females" (Silva, 1985).

2.4. Natural sources of Iodine :

Iodine is naturally found mainly in the ocean water, soil, water and atmospheric air. The iodine contains of the soil determines its presence in both water and locally grown foods. "The 90 % of the iodine comes from foods eaten, the remainder from drinking water. The deficiency is geochemical in nature" (Park, 1994).

"The average iodine concentration in the earth is 300 microgram per kilogram, and in the air it is approximately 0.7 microgram per cubic meter. The concentration of iodine in sea water is about 50 - 60 microgram per litre, about the same as in human serum. Rain contains much more iodine (1.8 - 8.5 microgram/l) than the air. Ocean water contain about 60 microgram per litre of iodine, mainly as iodate, whereas surface water contain an average 1 microgram per litre of iodine, mainly as iodide" (Stanbury, 1985).

"Coal and Oil contain large amounts of iodine and hence by combustion they can contribute substantially to atmospheric iodine. The concentration of iodine in atmosphere are 1.0 microgram per cubic meter or less, which is generally low concentration, but the

“standard man” breaths 20 cubic meter of air per day, so that even low levels can contribute 14 - 20 microgram to the iodine intake per day” (Stanbury, 1985).

Foods rich in iodine include Seaweed's such as Kelp, fish, Shrimp, Lobster, Clams, Oysters, some other animals (thyroid gland) and iodised salt (Hendler, 1990). But those iodine rich Sea food is not found in those high risk IDD endemic areas in Nepal.

“The iodine content in animals depends on the concentration of this element in the plants on which they feed. The iodine content of human vegetable foods is much lower. The iodine content of meat is on the whole higher than that of vegetables. The iodine up take by plants in proportion to the iodine present in the environment and that explains why the same food item may have a widely different iodine content depending on the locality where it has been produced” (Stanbury, 1985).

“Most terrestrial plants have a rather low iodine content, averaging 1 mg / kg for Plankton and some algae which actively concentrate iodine. It is of interest that Spanish moss (which has no roots, so that its nutritional requirements are met entirely from the atmosphere contains as much iodine as plants from the same location with root systems” (Stanbury, 1985).

In Nepal there is still found lack of natural sources of iodine in the hilly and mountaineous districts. So, iodine supplementation is needed to overcum the IDD problem of the country.

The average iodine content of food is given in the table 2.2 below. Those food items are not equally consumed by the people in the ocuntry.

Table 2.2. Average iodine content of food (in μg iodine / g) :

Food	Fresh basis		Dry basis	
	Mean	Range	Mean	Range
Fish (fresh water)	30	17 - 40	116	68 - 194
Fish (marine)	832	163 - 3180	715	471- 1591
Shell fish	798	308 - 1300	3866	1292 - 4987
Meat	50	27 - 97	–	–
Milk	47	35 - 56	–	–
Eggs	93	–	–	–
Cereal grains	47	22 - 72	65	34 - 92
Fruits	18	10 -29	154	62 - 277
Legumes	30	23 - 36	234	223 - 245
Vegetables	29	12 - 201	385	204 - 1636

Source : WHO, (1996).

2.5. Iodine deficiency disorders :

Iodine deficiency disorders is the serious public health problem in the world. There are 1.6 billion population are at risk of IDD in the world. Approximately 100, 000 cretins are born every year in the world. In the South East Asia 486 millions population are at risk of IDD.

2.5.1 Consequences of Iodine Deficiency :

Insufficient iodine in the diet may cause several consequences. Mostly in Foetus, Neonate, Child adolescent, and Adult were affected by these consequences. Those are mentioned in the Table 2.3.

Table 2.3. Consequences of iodine deficiency :

Stage	Consequences
Foetus	Abortions, Still births, Congenital anomalies, Increased perinatal and Infant mortality, Neurologic cretinism (mental deficiency, deaf mutism, spastic diplegia, squint) and in Myxoedematous cretinism (dwarfism, mental deficiency) and psychomotor defects.
Neonate	Neonatal goitre, and neonatal hypothyroidism.
C h i l d adolescent	Goitre, Juvenile hypothyroidism, impaired mental function, retarded physical development.
Adult	Goitre with its complications, like obstruction in throats, and Cancer, Iodine - induced hyperthyroidism, Hypothyroidism, impaired mental function.

Source : Hetzel (1989).

Due to those consequences mainly children are suffered from mental retardation and they did not get opportunity to go to school and in adult they can not get opportunity to do work due to the cretin. Due to the Cretins those who are handicapped who are unable to “pull their weight”. In this, and due to other iodine deficient reason they are unable to feed themselves so they have to be looked after by others, which represents a significant burden on the family and local community. Afterward this is a burden for the nation.

2.5.2 World wide situation of IDD :

Iodine Deficiency Disorders is a public health problem in developing country as well as developed country too. Approximately 100,000 cretins are born every year in the world and 50 million children's lost their physical and mental development. 1.6 billion population are at risk of IDD in the world. The table 2.4 below show the number of population at risk of IDD and table 2.5 show magnitude of iodine - related malnutrition in the WHO South East Asia region.

In developed country like Germany, where 10 % school children are suffered from the Goitre. Italy has a Total Goitre Rate of 20 % and Croatia 25 % . In South East Asia 486 million people are at risk of IDD and that 176 million people in the region suffer from Goitre. In Nepal Total Goitre Rate is over 30 % which indicates that Nepal has a severe iodine deficiency disorders (UNICEF, 1995).

Table 2.4. Total number of people and percentage of regional population living in areas at risk of IDD and affected by goitre.

WHO region	T o t a l population (millions)	At risk of IDD (millions)	Percentage of region at risk	Population with goitre (millions)	Percentage of region
Africa	550	181	32.8	86	15.6
Americas	727	168	23.1	63	8.7
E a s t e r n Mediterranean	406	173	42.6	93	22.9
Europe	847	141	16.7	97	11.4
South East Asia	<u>1355</u>	<u>486</u>	<u>35.9</u>	<u>176</u>	<u>13.0</u>
Western pacific	1553	423	27.2	141	9.0
Total	5438	1572	28.9	655	12.0

Source : Detels Roger et al., (1997).

Table 2.5. Magnitude of iodine - related malnutrition in the WHO South East Asia region.

Type of malnutrition	Indicator	Mean regional prevalence %	Estimated number affected (millions)
Goitre	Percentage of population with goitre	8.8	99.3
Cretinism and other IDD handicap	Percentage of population with cretinism or mental or motor handicap due to IDD	1.6	17.5

Source : FAO/WHO / ICN (1992).

2.5.3. National situation of Iodine Deficiency Disorders in Nepal :

The government of Nepal has established the two projects, to eliminate the Iodine Deficiency Disorders from Nepal, after the first national goitre survey conducted in 1965 - 1967. Among 19 villages with 5265 samples, overall total goitre rate is 55 % found in that first national goitre survey. Then the IDD problem was identified and preventive measures had started.

In 1969 Ramalingaswami et al. found extremely high goitre prevalence rates 74 - 100 % in school children in two widely separated sites of very different altitude Jumla 2250 meter, and Trishuli (Nuwakot district) 550 meter.

The first Goitre Control Project was established in 1973 under the Salt Trading Corporation, for procurement, distribution, and production of iodised salt throughout the country.

In 1976 Delange et al. not only conformed high rates of endemic goitre (55%) and cretinism (5.1 %) in the general population in Trishuli (Nuwakot district) but also demonstrated a low iodine content of water, soil and food (Hetzl, 1988).

The second, Goitre and Cretinism Eradication Project was established in 1978, under the Expanded Program of Immunisation of the Ministry of Health for a mass Iodised oil injection campaign primarily in mountain and hill areas of the country. Which is started from 1983 and phased out in 1993, due to the lack of equipment's, like, Syringe, needles, lack of skilled manpower, lack of resources etc.

The 2nd and recent national goitre survey conducted in 1985 / 86 in 21 districts with 48,042 samples, total goitre rate is 39.6 %, in Nuwakot district 32.6 %. In 1992 two districts goitre survey conducted in Nuwakot and Ilam shows that 23 - 46 % prevalence of goitre, among the 1800 samples of school children aged 6 - 12 years.

In 1993 the GCEP become integrated within the Nutrition section of the Child Health Division in the Ministry of Health, and from 1994 Iodine oil capsules administered orally were delivered through the existing network of Primary Health Care

System, mobilising Village Health Workers. Iodised oil capsules distribution program was going to be phase out in the end of 1999 (Fifth year plan July, 1997 - June, 2002).

A 1994 Nutritional status of adolescent girls survey in Dang district shows 97 % of palpable and visible goitre in Thabang village which is in Hill areas, and 75 - 77 % of palpable and visible goitre in Satbaria village which is in Terai areas in same district (NPC, HMG of Nepal and UNICEF Nepal, 1996).

From the 1995 HMG of Nepal has started to provide financial assistance to the national IDD program through subsidising the cost of transportation of salt to remote areas (15 districts). In those area salt is carried out by Helicopter, Aeroplane, Mule, and Porters. The table 2.8 show the existing situation of IDD in Nepal.

Table 2.8. Situation of IDD in Nepal :

IDD Situation in Nepal	Intermediate goal	Intermediate goal	Nepal's goals for
1990	1996	1998	2001
40 %	28%	9%	1%

Source : NPC, HMG of Nepal and UNICEF Nepal (1996).

2.5.4. National objectives of Iodine Deficiency Disorders in Nepal :

1. To reduce IDD to 90 % by 1998 through the provision of iodised salt and iodised oil capsules to 95 % of children and women of child bearing age and ensuring knowledge of causes and effects of IDD in 50 % of the population in the 40 targeted districts.
2. Establishment of an effective monitoring system to assure the adequate level of iodine in salt.

To fulfil this objectives Nepal has established the following activity which is providing by the following institutions.

2.5.5. Existing program:

1. Iodised oil capsules distribution in 40 targeted districts, by the Nutrition section.
2. District health personnel IDD orientation training in each year 8 - 10 districts, by the Nutrition section.
3. IDD booklets, Posters, Pamphlets distribution in those targeted districts by the Nutrition section.

In October 1996 an international IDD month celebrating by the Nutrition section with IDD rally, Essay competition, and School teachers workshop. Which has organised in 3 different dates.

- a) IDD rally was conducted in Kathmandu valley with more than 50 Riksha and about 300 school children has been participated on October 12 Th. 1996. IDD vest and play

cards has been distributed to the Riksha drivers and IDD batch and play cards were distributed to the school students.

b) On 19 Th. October essay competition was organised among the secondary school's in the country. Advertisement was given in the local national news paper "Gorakha patra".

c) A two days IDD workshop conducted in Kathmandu valley with 30 participation of school teachers from the Kathmandu valley school's.

4. Iodised salt distribution through the Salt Trading Corporation.

2.5.6. Existing constraints :

1. Iodised oil capsules distribution program is going to be phase out at the end of 1999 (Fifth year plan July 1997 - June 2002).

2. No proper monitoring of iodised oil capsules, no information about iodised oil capsules distribution (Annual report 1995 / 96).

3. No systematic distribution of IDD learning materials such as, Posters, Pamphlets, Booklets (By the Nutrition section chief and my own experience).

4. No proper monitoring of iodised salt distribution, and difficult to control non - iodised salt supplied by nearest borders (Annual report 1994 / 95 and 1995 / 96).

2.5.7. National situation of IDD related problems :

There are some IDD related problems which can be influenced by the Iodine Deficiency Disorders. They are mentioned in Table 2.6 and 2.7 below.

Table 2.6. Infant and child mortality rate (per 1000 live birth) in Nepal :

Region	Neonatal	P o s t neonatal	Infant (0 - 1)	Child hood	Under 5
Mountains	67.0	43.8	132.3	79.2	201.0
Hills	44.4	24.8	85.5	50.1	131.3

Source : National Fertility Family Planning Health Survey (1993).

Table 2.7. 1995 situation of mortality rate in Nepal :

Mortality rate	Percentage
Perinatal mortality rate (per 1000 live birth)	75
Neonatal mortality rate (per 1000 live birth)	55
Infant mortality rate (per 1000 live birth)	93

Source : WHO (1996).

Figure 2.1. Conceptual Framework :

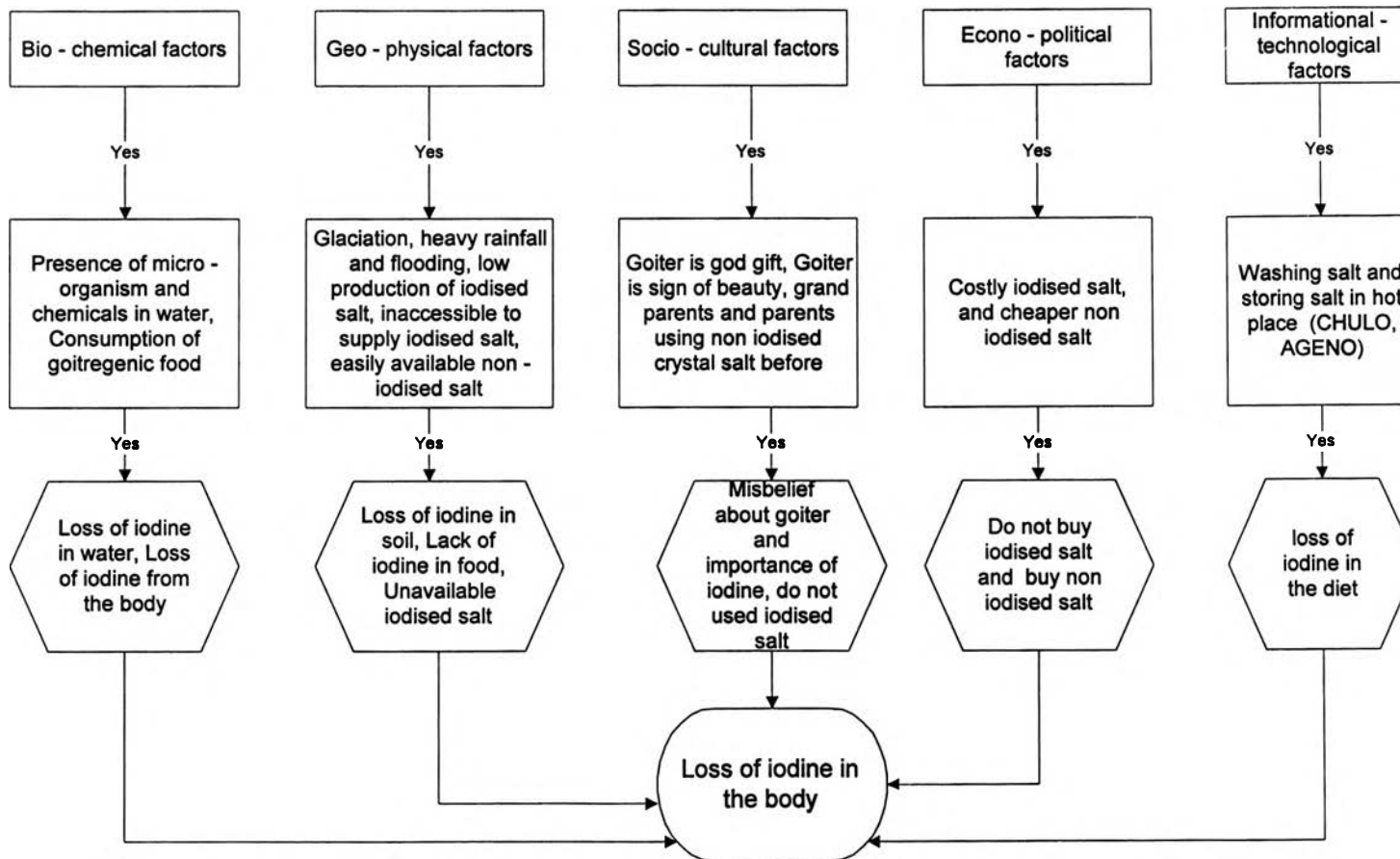


Figure no. 1. A conceptual framework of causes and consequences of iodine deficiency disorders.

2.6. Factors affecting Iodine Deficiency Disorders in Nepal :

Iodine deficiency problem in Nepal recognised for over 30 years, particularly in the Mountainous areas and some hilly areas of the country. Several factors played a role in limiting the successful eradication of endemic goitre, such as soil iodine level, water iodine levels, agricultural produce, as well as geographic characteristics of areas along with their social, poverty, and food consumption pattern and lack of awareness among the population about IDD's also a important factor to rise the IDD problem.

Nepal is one of the land - locked developing country, having Terai (the plain) in the south, and hilly and mountainous area in the north. Where 77 % land area occupied by 53.3 % people. In those areas where maximum chances of loss of iodine in the soil, water, and food and diet is due to the bio - chemical, geo - physical, socio - cultural, econo - political, and informational - technological factors. They may be described in detail below.

2.6.1. Bio - chemical factors :

In water where due to the Bacterial pollution, in presence of micro - organism, like E. coli may destroy the iodine from the water and due to the presence of organic chemicals, like Sulphur, may cause goitrogenic effects in the body and people may lost their iodine from their body and developed a goitre (Hetzel, 1988).

In presence of cyanogenic goitrogens of plant food get detoxified to thiocyanate in the body. Thiocyanate effectively blocks iodine concentration by the thyroid gland and thus causes thyroid dysfunction (Kochupillai, 1997). In hilly and

mountainous areas of the country where consumption of goitre - containing foods is an important factor, additional measures for reducing their consumption also may be necessary.

But there is no alternative foods grown on that region and also difficult to supply other food items from the Terai, if sufficient supply reached but due to poverty people did not afford to buy those food items due to the high cost.

Protein Calorie Malnutrition is also diminished the thyroid function. Then goitre may developed or cretin or other IDD related consequences may be developed. 86 millions of under 5 malnutrition in South Asia and 49 % under 3 years children malnourished in Nepal (UNICEF, 1996).

“Due to the modern practice of intensive agricultural technology could have resulted in the diminished bioavailability of soil iodine and the unsequent diminished content of iodine in food and water. The possible role of an excessive use of fertilisers, pesticides, and food additive has also been suspected” (Gopalan,1995).

2.6.2. Geo - physical factors :

Nepal is ecologically divided into Terai (the plain) in the south, Hilly and Mountainous areas in the north. Mostly in hilly and mountainous districts where maximum chances of loss of iodine in the soil is due to the glaciers, deforestation or erosion and in Terai due to the flooding iodine can be lost from the soil.

Salt Trading Corporation is the only one producer and supplier of salt in the country, is not succeed to sufficient supply in 15 districts among 40 high risk districts in the country due to the lack of transportation facilities. In Nepal 60 - 80 % of annual rainfall falls during the monsoon season (June to Sept.). The highest mean annual rainfall was 4216.9 mm in Pokhara in 1993 (Statistical pocket book, 1996). So that iodine from the soil has been washed out by the heavy rainfall.

2.6.3. Socio - cultural factors:

In some districts some areas people belief that goitre is not a disease it is the god gift, nobody can eliminate it. In other areas people belief that small goitre in neck is a sign of beauty in the girls. Among the total 1836 patient were examined by physician in Jumla district Hospital, out of them 137 goitre, 31 cretins, and 1 suspected hypothyroidism. Only 3 patients complained of their neck swelling i.e. goitre. Some time they reply that their swelling are from God and can not be free from it as their parents and grand parent's had that type of swellings (Shah, 1986). In some parts of Nepal, goitre is so widespread that it is considered a beauty mark (UNICEF, 1995).

Due to the smoking habits those who smoked have a high goitre prevalence than the non smokers (Foo, 1994). In Nepal 70 % women smoking in hilly and mountainous areas (MOH, 1994).

Traditionally most of the people in the country used Crystal (Phoda / Bargara) salt due to their grand parents and parents were using those type of salt before. The consumption habits of people who prefer cleaner looking uncrossed Tibetan and

smuggled non iodised Indian salt to the less clean looking iodised salt from India (Stanbury, 1985).

2.6.4. Econo - political factors :

Due to the 49 % below poverty line (NMIS, 1996) people could not afford to buy costly iodised salt as well as different kinds of iodine riched foods.

Due to the open border with India where non iodised salt were illegally entered into the country then people may buy non iodised salt for the livestock purpose as well as for their own purpose due to the cheaper and clean than the iodised salt.

Similarly some parts of the country refined packed salt also found in non - iodised form. Which is illegally entered from the Indian border with looks like similar to Tata but name written in the packet is iodised refined Taza salt, but this is found in non iodised form after testing it.

Iodised crystal salt is brownish in colour, but people think it is dusty, dirty and black. It is due to the nature of iodine which is in violet in colour and also due to storing practices in the shops with Jute bags. Jute bags itself brownish and due to rain and moisture, some portion of Jute's thread will adhere to the salt. Most of the retailers keep their salt in outside due to the cheaper and moisturising nature of salt. Due to the heat, moisture and direct sunlight salt will lose iodine.

If iodised salt is protected in well packaged in Polyethylene plastic and properly stored, salt can retain iodine for at least a year and perhaps as long as 3

years. However removed from the original container, left out doors or exposed to moisture, salt loses iodine rapidly, sometimes in as little as half an hour.

Similarly in Northern border in Tibet, people may buy non iodised crystal salt due to those mentioned reason and also due to the unavailability of iodised salt in those districts where iodised salt is distributed by Chief District Office only in one kilogram per one family in a month due to the lack of resources.

2.6.5. Informational - technological factors :

Most of the women were preparing foods in every household in the country. Among them majority (60 %) are illiterate, (Total literacy rate 40 %, Female literacy is only 21% - UNICEF, 1996) therefore they were using crystal salt after washing until the salt is clean due to the dusty, dirty, and black. Then the black portion of iodine is washed away from the salt. NMIS 1995 survey shows that most of the mothers in focus group discussion told that they were washing salt before using in foods.

More people in the country keep their salt near and over the Oven, due to the moisturising nature of salt, people do not keep it in other places. Then due to the heat almost iodine from the salt is escaped out and people did not get iodine in their diet. A few of them keep their salt in Clay pot, Bamboo and Wooden pot to prevent moisture.

Similarly in Pokhara which is the main tourist area in the country, where restaurants were used iodised salt by drying in sun light, or drying in frying pan for easy to used in mixing chips, or other food items, due to lack of knowledge about iodine and

its importance. After drying iodised salt, iodine will be escaped out by vaporizing. Then people may not get iodine in their food.

People very few have the opportunity to eat eggs, chicken, and peas, which is relatively high levels of iodine than the milk and meat. The large populations diet is mainly meat (beef, mutton) and milk based (Yong et al., 1992).

Similarly 50 - 80 % of the people never consumed Seaweed's such as Kelp or Laver which is highly iodine content food, and one third also did not take dried seafood which is also high iodine content. But the most favourite item is Chinese flowering cabbage, Chinese white cabbage, which is less iodine content and having goitrogenic affects. IDD is not only exist in Mountainous, remote, rural areas but it also exist in urban, coastal and seaport like in Hongkong (Kung, et al., 1996).

2.7. Situation of iodised salt in Nepal :

Nepal imports salt from India virtually all of its 120,000 required tons each year from 1996, of which about 80 % comes supposed to arrive iodated at 30 PPM, to prevent further loses of iodine during storage and distribution, STC requested to the Indian government to increase the PPM level from 30 PPM to 50 PPM. In Nepal only 6 metric ton of iodised salt produced a year in Mustang district. "The average per capita consumption of salt is supposed to be 10 gm per day and salt with iodine content of 15 mg per kg (15 PPM) would therefore satisfy the recommended daily requirement of 150 microgram of iodine" Kochupilli (1997).

Among those requirements half of this requirement is imported as refined or crushed salt that is iodised in India. The remaining half is imported as large crystal “Phoda salt”. There are only 3 iodination units in the Terai, and one more unit is going to be established in Dhangardhi (Kailali district) near future.

From the Indian border iodised salt may take 2 weeks to arrive in Nepal, and may be stored for up to six months before distribution. Due to the long transit time iodine will be escaped out from the crystal salt by exposing rain and direct Sunlight. At present, the storage capacity of iodised salt in the STC is only about 35,000 Metric Ton. This is inadequate, especially in the warehouses located outside the entry points.

Iodine may be lost from excessive heat, moisture and direct sunlight. In most retailer or shops, salt is stored in open spaces and as a result the iodine content is lost by being exposed to sun and rain. Many persons from the small villages come once a year in the summer to the Terai, and buy salt there to last them for the next year. Then they will keep it near and over the oven, due to heat iodine will be escaped out from the salt in those who keep their salt at that place. After that, at the time of preparing food, women washed their salt due to looks like dusty, dirty, then they will put salt in their food, then iodine will be washed out and people may not get iodine in their diet. If the retailers purchase salt in Terai and then transport it to remote areas, the price of the salt made available to consumers may be increased by as much as 10 times. The lack of proper packaging of iodised salt may result in losses up to 90 % in nine months (Demaeyer et al., 1979).

The Salt Trading Corporation was producing and distributing of Tata (Indianbrand) and Ayonoon in powdered form, Shakti and Bhanu (supplied in subsidised rate in remote districts) is semi grain form, and Phoda - Bargara is in large crystal form.

2.8. Types of salt : There are mainly three types of salt found in the markets, such as Bargara / Phoda salt, Crushed salt, Refined salt.

2.8.1. Bargara / Phoda salt : This type of salt also called rock salt and commonly known as Dhike nun. This type of salt is not a compatible salt product for the iodization programme. This is because the large crystals can not be uniformly iodised. Only the outer surface is coated by the iodine compound. Moreover it is not feasible to pack this variety of salt in polyethylene pouches because its sharp edges cut the bags. As Bargara salt is brownish in colour, people think it is dirty and dusty and wash it . This leads to the loss of whatever little iodine is left in the salt. Cost is much more cheaper than the other type of salt, is 3 - 4 rupees.

2.8.2. Kurkutch (crushed salt) : This is non - refined crushed iodised salt, marketed under the brand name of Bhanu and Shakti. They are packed in one kg. plastic pouches and one kg. polyethylene pouches. Crushed salt is also sold in loose. Bhanu salt is supplied in 15 remote districts in subsidised rate by the government. Cost range is 5 - 15 rupees.

2.8.3. Refined salt : This type of salt is marketed in Ayonoon and Tata (Indian brand), which is totally refined salt. They are also packed in one kg. plastic pouches and one kg.

polyethylene pouches. Cost is 7 rupees, which is little bit higher than the other type of salt.

Percentage of adequately iodised salt (30 + PPM) found in local stores was 49.8 (NMIS, 1995). In 1992, Dahal B.R. collected 90 samples of salt in Ilam and Nuwakot districts, only 26 contained more than 15 PPM of iodine, and 64 samples contained below the recommended level of consumption (Gorstein & Houston, 1996).

The safety of Universal iodisation have been carefully examined by WHO which recommends that daily intakes of up to 1 milligram (1000 microgram) appear to be entirely safe. All those who are living in iodine deficient areas with iodine deficient, all they are benefited by the Universal Salt Iodisation and those who are living in same areas but not in iodine deficient, they are not getting adverse affects of excess intake of iodine. which is minimal or rarely found.

There are some indicators given in the table 2.9 show the progress of the virtual elimilnation of IDD and table 2.10 show the current status of IDD elimination programmes. Nepal is shown in the second highest IDD prominent country among the WHO SEARO countries. The table 2.11 show the current status of IDD elimination programmes and Nepal is found only 50 % adequetely iodised salt consumption in the country.

Table 2.9. Indicators for Tracking progress towards the virtual elimination of Iodine Deficiency Disorders :

Indicator	Goal
IDD control programmes Salt iodine percentage of population in iodine deficient areas conforming adequately iodised salt	95 %
Status of iodine deficiency Thyroid size in school age children with any grade of goitre by palpation TGR	< 5 %
Proportion of school age children whose thyroid volume (measured by ultrasonography) > 97 Th. centile	< 5 %
Biochemical TSH - percent new born (Cord blood or aged 3 days) having serum TSH levels > 5 ml U / l.	< 3%
Urinary iodine - percent population school age children or general population with urinary iodine < 10 microgram per decilitre.	< 5%

Source : WHO, (1993).

Table 2.10. Current status of IDD elimination programmes in WHO - SEARO Countries (goitre prevalence (survey / resurvey) and current intervention strategy)

No.	Country	Goitre prevalence (Year of survey / resurvey)	Current intervention strategy for IDDEP
1.	Bangladesh	47 % (1993)	Iodised salt / Iodised oil
2.	Bhutan	14 % (1996)	Iodised salt
3.	DPR Korea	14 % (1996)	Iodised salt
4.	Indonesia	33 % (1993)	Iodised salt / Iodised oil capsules
5.	India	2.3 - 68.6 % (1996)	Iodised salt
6.	Maldives	24 % (1995)	Iodised salt introduced
7.	Myanmar	33 % (1994)	Iodised salt / Iodised oil
8.	Nepal	44 % (1992)	Iodised salt / Iodised oil
9.	Sri Lanka	19 % (1989)	Iodised salt
10.	Thailand	8 % (1994)	Iodised salt, water / Iodised oil capsules

Source : Pandav et al., (1997).

Table 2.11. Current status of IDD elimination programmes in WHO - SEARO**Countries :**

S. No.	Country	Recommended iodine content of salt in PPM P = production C = consumer	Estimated production / availability of iodised salt as a proportion of total requirement	Estimated proportion of households consuming adequately iodised salt
1.	Bangladesh	P = 50, C = N.A.	62 % (1995)	34 % (1995)
2.	Bhutan	P = 60, C = 30 - 50	100 % (1996)	82 % (1996)
3.	DPR Korea	P = 30, C = 15	I. A.	I. A.
4.	Indonesia	P = 30 - 80 C = 30	85 % (1996)	58 % (1996)
5.	India	P = 30 C = 15	60 - 70 % (1996)	17 % - 100 % (1996)
6.	Maldives	P = Not yet C = Not yet	I.A.	8 % (1996)
7.	Myanmar	P = I.A. C = I.A	I.A.	I.A.
8.	Nepal	P = 30 C = N.A.	87 % (1996)	50 % (1996)
9	Sri Lanka	P = > 50 C = 25	63 % (1996)	48 % (1996)
10	Thailand	P = 30 - 50, C = 15	100 % (1996)	58 % (1993)

Source : Pandav et al., (1997).

2.9. Possible alternative solutions :

To control the iodine deficiency disorders there are mainly following alternatives which are mostly used by the several countries in the world. They are Iodination of Salt, Iodination of water, Iodination of foods, iodised oil Injections and capsules, may be described in detail below.

2.9.1. Iodised oil injections program : This method was first established in Papua New Guinea to prevent endemic goitre and endemic cretinism. In Nepal it is introduced in 1971 to the 40 high endemic districts among the 75 districts in the country. The lack of skilled manpower, lack of sufficient equipments like syringes, needles, and lack of resources, as well as denied by the people to inject his or her arm, this program was phased out in 1993.

2.9.2. Iodised oil capsules program : It was started from 1994 and up to now the program is running. But due to the high cost, lack of proper monitoring and supervision and lack of proper information this program will be going to be phase out in 1999. There are two days IDD orientation training has been conducted to the high endemic districts village health workers, after the training they will get iodised oil capsules for distribution to those target population in the districts. But still there is no proper distribution information or any supervision and monitoring was found (Annual report 1995 /1996).

2.9.3. Iodination of food : This method is mainly used by the developed country like America, Australia, Britain, Holland, Mexico etc. The main iodination of food item is bread, milk, chocolates, baby foods, etc. But those country who have had below poverty line like in Nepal 49% below poverty line, it is difficult to afford to buy those iodised foods by the people and it is also difficult to establish the production of iodised food too by the government. Because still those high endemic districts people are struggling to get their food. In those areas where they depends on sweet potato, bamboo shoot, millet, maize, and other forest foods. In Nepal where bread, milk, babyfoods and chocolates are only produced and distributed in city areas and in some Terai areas, in Hilly areas there is no distribution of those food items. Because in Hilly areas people usually prepare their own food and they do not like to take those food items due to the cultural factors. In those hilly areas people may not take any food, and water from lower cast, as well as other religions too. Specially from Muslim's only.

2.9.4. Iodination of water : It is effective, cheap, safe and practically applicable in rural areas in developing countries, which may be appropriate at village level, especially if a specific sources of drinking water can be identified. (Elnagar, et al., 1997). In Sarawak, Ohio, Sudan, and Thailand water iodination is used, where it is feasible due to the plain area, specific sources of drinking water at village level, and central supply of water. But in Nepal there is still lack of water supply to those hilly and mountainous districts, where people brings water from different sources, it takes not less than one hour. Similarly due

to the scattered villages and different sources of drinking water, it is difficult to put iodine in the water because there is no central supply of water in those high risk IDD endemic districts. Due to the change of test people do not like to drink iodised water (Saowakhontha, 1994).

2.9.5. Salt iodisation program : The salt iodisation program was initiated in 1973 by the Salt Trading Corporation in Nepal. It is the one of the most effective method, since 70 years before, it started from Switzerland in 1920, which is reached in every persons daily diet. Which is equally accepted by the poorest to the richest people. So that it is feasible in every where, accessible to distribution, easily available, equally acceptable, and affordable. Due to the cost effective than the other methods. Which is shown in the table 2.12.

Table 2.12. Costs of IDD control measures :

Particulars	US \$ and Cents
Iodised salt	2 - 4 cents per person per year
Iodised oil injections	2. 00 \$
Iodised oil capsules	40 cents for half coverage period comparison to injection.
Water iodination	0. 04 \$ per person per year

Source : Hetzel (1988).

Table 2.13. Cost of Iodised salt in Nepal.:

Types of salt	Brand name	Price (per kilogram)
Phoda salt	Dhike (loose)	3 - 4 Rupees (7 US Cents)
Crushed salt	Shakti (non subsidised)	4 - 5 Rupees
Crushed salt	Bhanu (subsidised)	5 - 15 Rupees (only remote districts)
Refined salt	Ayoonon, Tata (Indian brand)	7 Rupees (13 US Cents)

One US \$ = 57.30.

Source : Gorstein & Houston, (1996).

“In Asia, the cost of iodised salt production and distribution at present is of the order of US 3-5 cents per person per year” (WHO, 1996).

But due to the peoples present salt storing and salt washing behaviour people do not get sufficient iodine in their diet and their body. To reaching those at risk populations, for reducing iodine deficiency disorders by improving their salt storing and salt washing behaviour, I am purposing following models and approach.

2.10. Behaviour change and health education promotion models :

To change the people’s behavior there are several models and approaches are described in several books. One of the oldest and most widely used model is the health belief model. The HBM model is described and explained by the Kaplan, Sallis, &

Patterson (1993) in health and human behavior, Glanz, Lewis, & Rimer (1997) in health behavior and health education, McKenzie & Smeltzer (1997) in planning implementing and evaluating health promotion programs A primer, Dignan & Carr (1992) in program planning for health education and promotion.

Those HBM model has been applied to all types of health behavior stated by some writers, and some writers stated that HBM is the one of the most widely used conceptual frameworks in health behavior for over four decades. The writers also mentioned that HBM has been used both to explain change and maintenance of health behavior and as a guiding framework for health behavior interventions. Some of the writers stated that this model is successful on tuberculosis screening program, AIDS protection behavior, but it is not fit for cigarette smoking behavior.

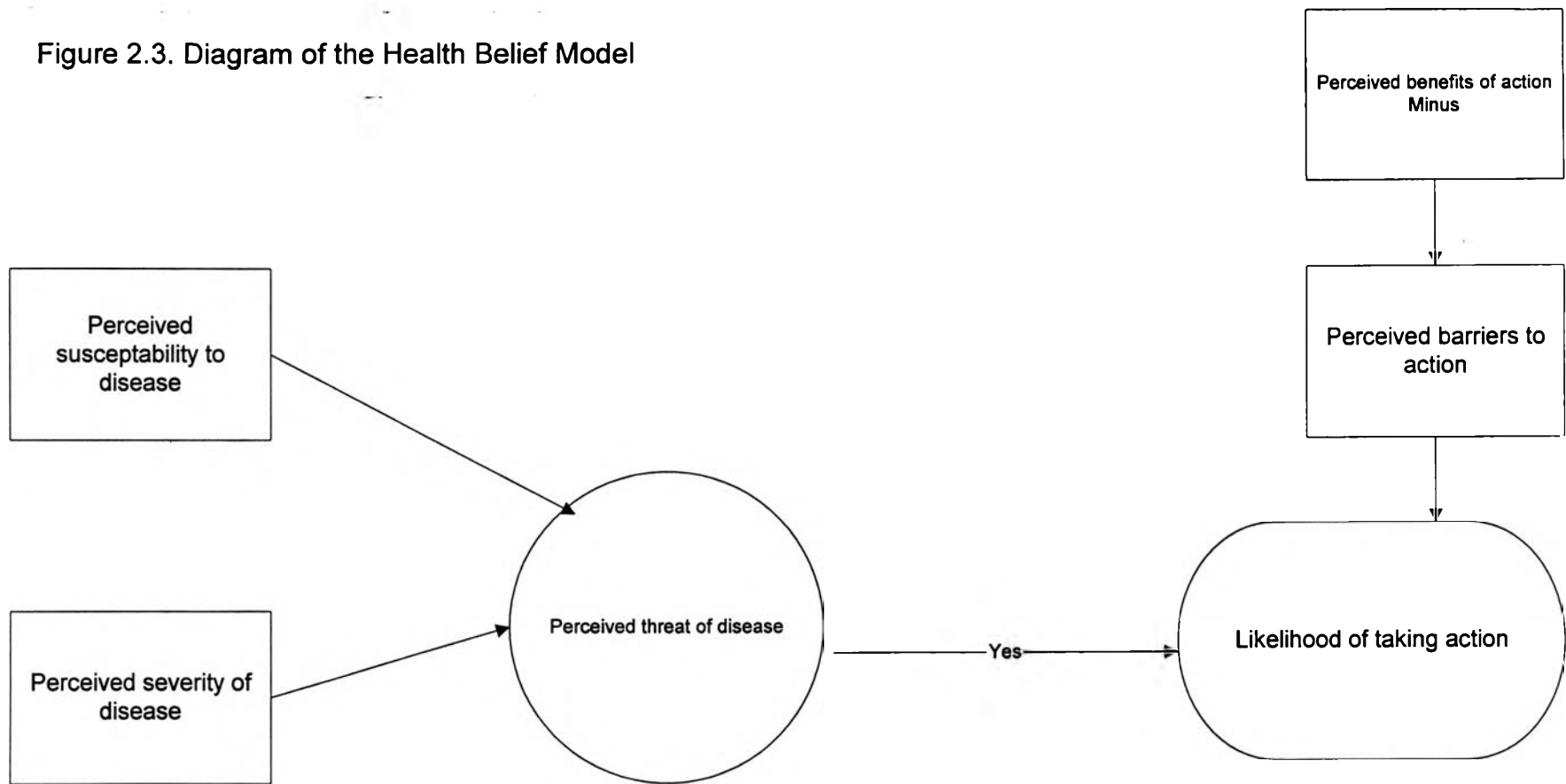
There are four major types of beliefs that influence the likelihood of taking action that is relevant to a given disease or condition. They are perceived susceptibility of disease x, perceived seriousness of disease x, perceived threat of disease x, and perceived benefits of action minus perceived barriers to action. The writers mentioned that the highest likelihood of action occurs when the perceived threat of the disease is high and the perceived benefits of the health behavior outweigh the barriers.

The McKenzie & Smeltzer (1997) explain the behaviour of the people's. Due to people's modifying factors, such as age, sex, race, ethnicity, personality, socio - economic status, knowledge about the disease, peer and reference group pressure, prior contact with the disease, behaviour is difficult to change. But it could be change if they perceived

seriousness of disease, perceived susceptibility to disease, then they will perceived threat of disease by influencing media information, education, advice from others, illness of family members or friends. For this program by providing IDD knowledge in school from people's children will influenced their perceptions and threat of disease. After that they perceived benefits of preventive action verses perceived barriers to preventive action. Then they will be liklihood of behaviour change.

Similarly to change behaviour of the people, the communication is also the important part. Which is described by Dignan & Carr (1992) in Communication / persuasion matrix. The matrix provides a various types of communication on that process. The communication characteristics are source, message, channel, receiver, destination. The elements of the process of behaviour change are exposure to education, attention to education, interest in new information, comprehension of education, acquisition of new skills, attitude change, memory of skills, recall of skills, decision to change, action (behaviour change), reinforcement, re - affirmation of change.

Figure 2.3. Diagram of the Health Belief Model



2.10.1. The CBC Framework :

Those Health belief model and communication / persuasion matrix will be jointly formed in communication / behaviour change (CBC) Framework (Dignan & Carr, 1992).

Table 2.14. Framework of CBC :

Functions of sender of communication	Objectives for behavioural change in receiver
Gain attention / set agenda	Become aware
Provide information	Increase knowledge
Clarify incentives	Increase motivation
Model behaviours	Learn skills
Provide training	Use skills to change
Cues to action	Incorporate change into lifestyle
Provide support	Maintain changed behaviours.

This approach will be useful to develop realistic objectives for behaviour change in the study of the target population which is the washing and storing salt behavior of people and it also help to developing specific educational strategies to reach the objectives. The following planning need for functions :

I. Agenda setting : The programmes agenda will be addressed to attract target group attention, such as lack of iodine may developed permanent brain damage, deaf mutism, cretin and goitre. Then the result will be loss of oppertunity to go school, low school performance etc. Those consequences can not be eliminated but it could be prevented before, by taking iodised salt.

II. Information : Presently 23 % prevalence of goitre shows existing iodine deficiency in the community. Which may results low school performance, prevent to schooling, then pupil may not get any educational oppertunities. Then they will be isolated from any activity of the community.

III. Incentives : If sufficient iodine will take by the people in their daily diet, it will be improve their children's school performance, schooling , and as well as their socio - economic status, prevent spontaneous abortions, cretins, deaf mutism etc. For the specific incentives 250 gram of iodised refined packed salt distributed to the target population's household.

IV. Models : By demonstrating salt test in the class, demonstrating some posters, some pictures, and Video show about IDD may developed positive impression to the pupils.

V. Training : Providing lecture with discussion and demonstration, drawing pictures, essay competition among the class, pupils may developed drawing, role playing, and other skills.

VI. Cues to action : If they changed their salt washing, and storing behaviour then they might be improve their health, and give healthy baby, better school performance of children, better economic status, higher work output, etc.

If not do so then day by day deteriorate of your health, developed spontaneous abortions, still births, maternal mortality, infant mortality, and may developed cretins by which your burdain will be increased.

VII. Support : If you will not wash your salt and not store salt in hot place then you will be get so many oppertunities, such as increase of talent, school performance, after that you might be get first class in the study, then you can developed your career in your own choice what you want to be in a near future.

2.10.2. Teacher - child - to - parents (TCP) approach :

Teacher - Child - Parents approach is used in various health behaviour change aspects in the world. Hagland et.al. (1996) mentioned that in Indonesia, where 23,000 children coloured the posters in school and answered a questions, then were asked to take the posters home and explain the pictures to their parents. Which is about importance of dehydration with water and oral rehydratiion salts. The posters had to be returned with a parents signature. An evaluation done after six months showed a increase in parents knowledge about the importance of combating dehydration with water and oral rehydration salts. By this method children were important communicator those who teach parents the information about dehydration that they lerned in school. So that similarly

children will take back posters, IDD knowledge to their home and teach their parents, what they learned, what they seen, what they perceived in school.

Similarly in Philippines, TCP approach is used in basic health and nutrition education promotion program. An evaluation of the TCP approach in pilot phase in 1990, indicates its effectiveness, improve health status of the participants and it is to be used an effective tool for health and health related problems. In 1991, the TCP approach was implemented by the department of education, culture, and sports as a nation - wide concept of basic education in all 34,570 elementary schools in Philippines (Chu & Simpson, 1994).

The Ministry of Health China (1985), stated about quitting smoking habits. There are 75% smoking prevalence in Hanzhou, Zhejiang Province, China. The 23 primary schools 20395 school children (9 -12 yrs age) exposed to a curriculum for cessation of smoking behavior of their father. 10367 quit chart distributed and 9953 were completed and returned. The following table 2.15 show the cessation of smoking habits.

Table 2.15. Parent's self - report quit rates :

Length of cesation (days)	No. of persons who quit	Percentage
1 - 10	6,191	90.5
11 - 20	4,411	64.5
21 - 30	3,339	48.8
31 - 60	2,017	30.3
61 - 80	800	11.7
210	800	11.7

Source : Green and Kreuter (1991).

The improvement in the scores of teachers after the in - service orientation in nutrition and health education programme in Balsevikas, India showed increase knowledge 2.74 times and another study conducted by Isely and Candy had also shown improved knowledge scores after in - service training (Puri & Mehata, 1988).

In Thailand, 84.8 % school children were know about the causes of goiter, and 96.7 % were know about possible prevention and treatment of goiter, 74.5 % continue to drinking iodinated water, and 74.1 % continue to taken to date iodated salt (IDD control and prevention section, Division of Nutrition, Department of Health, Ministry of Public Health. Thailand (1993).

So that this TCP approach will be useful to this study. Because the children will learned IDD knowledge, learned iodised salt importance, to know the iodised salt by

demonstration of salt test in class, learned from the posters, learned from the Video show about IDD at school.

2.10.3. Criteria of TCP approach :

To apply this CBC Framework in the study I will proposing Teacher - Child - Parents (TCP) approach. This TCP approach is selected by the following criteria (Dignan & Carr, 1992):

a. Acceptable : It is acceptable by the target population. Because the teachers are respected and believable sources of information and involving their children those who get IDD knowledge at the school and teach to their parents.

b. Literacy : Literacy of the target population in the country is 21 %. So that those population could not understand by the other mass media like, News paper, pumplets, booklets, magazines, and electronic media like, Radio is the expensive method than the TCP approach, TV is not still reached in those high endemic districts.

c. Degree of auditory as visual stimulation : Degree of auditory as visual stimulation in the every day lives of the target population. Which is possible by the posters, their children will take at their home and teach their parents what they learned at the school. Video show about IDD also impressed the child and transfer those message in their parents.

d. Custom : Due to their custom, target population will receive information by the respected and believable sources of information which is by the teacher to their children. The teacher will equally respected by the people every where in the country. In our

country we are celebrating teachers day in Nepali called “Guru Purnima”. Guru means teacher and Purnima means full Moon. That means teachers education is as a light of full moon, which equally accepted by the children as well as parents too.

e. Cost : Cost of the method is lower than the other mass medias. Because to reaching at those vast number of population, the established teacher to children relationship by the school is cheapest and feasible in every where in the country. But other methods needs extra manpower, extra budget, extra time and space. But in TCP approach no need to extra manpower, extra budget for manpower, time, and space.

f. Convenient : This method is convenient because it is the established institutions by which people may get knowledge day by day about iodine its importance by their children. There is no need to extra time, extra place etc.

g. Feasible : It is the feasible method, no need to extra manpower, because there is existing teacher will be used for this study and children will come to the school day by day get knowledge and carry this message to their parents at home. This is the continuous method from generation to generation in every community in the country. 78.53% children will enrolled in the school in the country. By which average 78 % of the population will get message by this method.

h. Effective : This method is more effective than the others. The growing age children will get direct knowledge about iodine its importance with developing demonstration skills, impression in mind by the Video show about IDD. Parents were benefitted by their children will know the new knowledge and information about iodine and its

consequences those information they do not know before. So that they were happy to know the knowledge of IDD. Then they were utilising those perceived knowledge to the perceived threat of disease.

2.10.4. Health education about iodine :

Health education about iodine should provides knowledge and information to the children and then parents. Which is I modified by the Naidoo & Wills (1994) Health education and promotion book.

Health education about iodine should :

1. provide information about how the iodine reached to the body and how can it prevent goitre,
2. teach young generation to keep iodised salt away from the heat and direct sun light,
3. equip young generation with the skills to make informed and responsible decisions by demonstrating salt test in the class and Video show about IDD consequences,
4. teach young generation about the dangers of IDD consequences,
5. help young generation to encourage their views, feelings and emotions about consequences of iodine,
6. show young generation the importance of the human body so they do not damage it, such as lack of iodine may developed cretins, and results low school performance, as well as too slow to learn things.
7. put young generation off unhealthy behaviour by showing them cretin peoples or their pictures what can happen if not get sufficient iodine in the diet.

By those key points IDD knowledge will be reached to the children and children may help to change salt washing behaviour to their parents.

Through this channel people may rely on respected and believable sources of information and these routes from teachers through the school child - to the mothers. Knowledge gained should certainly be put to use as much as possible because teachers are trusted and well known in our communities.

Therefore, teacher's knowledge about the importance of iodine, become the central focus of this proposed IDD program. So that school teachers can play the role of communicator through the child - to - parents channel in the community to reduce the IDD problem in the country. Hence people may improve their salt consumption practices and they might be get sufficient iodine in their diet and body.

2.11. Possible constraints :

There are some possible constraints which may be influence on implementing teachers training program in Rautbesi village of Nuwakot district. Teacher's may feels over work load, because they have not get incentives at the time of teaching IDD messages. Some small age children may be forget to convey whole message to their parents, and confusion may be arisen to their parents about salt consumption behavior. Teacher as well as students may not be feel to new things and new environments, because they are always teaching in similar methods. Due to the lack of resources teacher's will not prepare good learning materials. Teacher's may feels that to make learning materials take too much time. Some of the teacher's may be transferred in other places, and new

teachers will be replaced. Lack of proper skills and experience in palpation of examination among school teachers. Some of the teachers may be not sincere to this program, for his / her personal problems. Children can tell the teachers their mother will not wash salt, but in reality they may be washing salt. Because pupils want to get some prizes from the teachers. Some of the family may discard the message, because they have not had this type of problem until now.

2.12. Conclusion :

Iodine Deficiency Disorders is not only the problem of an individual country like, Nepal, but it is the serious public health problem in the developed and developing country too. The recent and second national IDD survey (1985 / 86) showed an overall total goiter rate of 39.6 % and 0.4 % cretinism in Nepal. But in the Nuwakot district recent survey (1992) showed that 23 % prevalence of goiter. Similarly it is the problem of other Terai districts such as Dang district goiter survey (1994) showed 75 - 97 % prevalence of goiter. Which indicates that the IDD problem was not reducing but it is increasing in some districts in Nepal:

There are several consequences of iodine deficiency which are mainly affect on the pregnant mother and below 15 years children. By which pregnant mothers will suffer from spontaneous abortions, still births, increased perinatal and infant mortality rate, and children suffered from irreversible mental retardation, goiter, cretinism, and retarded physical development etc.

There are several factors by which these problems are prominent in the country. But the major existing problem is people's salt washing and storing behavior in those specific areas in the country. The prevention of iodine deficiency disorders depends mainly on increasing iodine intake in the population that lives in the iodine deficient areas. When the required amount of iodine reaches in that iodine deficient population, there is a noticeable reduction in the prevalence of IDD. Without iodine, the Brain and Nervous system, the Heart, Liver, Kidney, Muscles, and Endocrine system of children and adults are adversely affected

To reaching those at risk population iodination of salt is the more effective, feasible, equally acceptable, accessible and also cost effective than the others methods. To improve people's salt washing and storing behavior, the health belief model is appropriate to change the people's attitude and behavior, which is most widely used in the world. For this purpose I have mentioned here Communication and Behavior Change framework by which I am proposing to improve the salt washing and storing behavior through the teacher - child - to - parents approach. The TCP approach is also widely used mainly in the health education and health promotion by the several countries, such as Indonesia, Phillippines, India, Sudan, and other African and some American countries too.

Therefore I am proposing a TCP approach to implement the teacher's training program for reducing iodine deficiency disorders by improving people's salt consumption behavior.

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