

# Policy of Universal Salt Iodization in Bangladesh: Do Coastal People Benefit?

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## ABSTRACT

Iodine deficiency disorders (IDD) are a serious public-health problem in Bangladesh and in other countries. Use of iodized salt has been promoted to solve the problem. A study was conducted in eight unions of Chakaria upazila in the Cox's Bazar district of Bangladesh during 1997-1998 to determine the prevalence of use of iodized salt, explore the reasons behind non-use, and identify the socioeconomic correlates of its use. A quantitative survey was conducted to collect information from 21,190 households on socioeconomic status, demographic characteristics, and the kind of salt used. In-depth interviews and focus-group discussions were also conducted to understand the situation further. The results revealed that only 1.9% of the households used iodized salt. Strong barriers that limit their use of iodized salt included the wide availability of coarse salt, lack of knowledge about the link between iodized salt and IDD, and the high cost of iodized salt. Households in the salt-producing localities and those that are economically disadvantaged tend to use iodized salt less than others. Understanding of the prevalent situation will allow the policy-makers to take measures to improve the situation in the salt-producing areas.

**Key words:** Iodine; Iodine deficiency; Salts; Iodization; Goitre; Bangladesh

## INTRODUCTION

Iodine deficiency is considered to be the most common preventable cause of mental disorders in the world today (1). Iodine deficiency disorders (IDD) have manifestations at different stages of human life. A large proportion of people with severe iodine deficiency are women of reproductive age. These women are at a higher risk of pregnancy-related problems, including abortion, stillbirth, low-birth-weight infants, brain damage or cretinism in infants even before birth, and lower chance

of survival (2). Iodine deficiency can cause goitre and brain damage in neonates, whereas manifestations in children include goitre, loss of energy, impaired school performance, and retarded physical development. In the adults, iodine deficiency can lead to goitre and related complications, loss of energy, and impaired mental function (2). According to the 1990 WHO report, some 26 million people suffer from brain damage associated with IDD, which includes 6 million cretins (4). All these have resulted in a growing awareness of the problem all over the world. Most countries have, by this time, endorsed and supported the goal of elimination of IDD (4).

In the developed world, food fortification has been identified as the best way of providing iodine to diet, because, unlike other nutrients, iodine content is very

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low in foods that are grown in an iodine-deficient soil, and therefore, for people who are dependent on the food grown on iodine-deficient soil, changing food habits cannot eliminate iodine deficiency. Iodine deficiency can be reduced by supplying iodine from external sources. Among different foods that have been considered a vehicle for providing iodine, common salt has become the most acceptable (5). Some benefits of its use as a vehicle are the following: it is universally consumed by people; salt production is limited to fewer production centres; mixing of iodine with salt is a fairly simple and low-cost operation; and iodization does not impart any colour, taste, or odour to salt (5).

Results of surveys conducted since the 1960s show that high levels of iodine deficiency are prevalent in Bangladesh. The Nutrition Survey of East Pakistan 1962-1964 reported the goitre rate of 28.9% in former East Pakistan, now Bangladesh (6). The 1981-1982 National Goitre Prevalence Survey reported levels of IDD nationwide, with the goitre rate at 10.5% (7). This result was, however, criticized, because the health officers and workers who were assigned to identify goitre cases had little training. The National IDD Survey 1993 revealed a goitre rate of 47.1% (7). To combat the IDD, the Government of Bangladesh, in 1989, passed the Iodine Deficiency Disease Prevention Act (8). The Act proclaimed universal iodization of edible salt for human and animal consumption and included prevention, enforcement, and education efforts that were undertaken in conjunction with different government departments and organizations (8). Even if one takes the Nutrition Survey of East Pakistan as a baseline, the iodine deficiency situation has worsened over time despite the legislation. According to the 1993 survey, about 69% of people were biochemically deficient in iodine (7). This indicates that all people in Bangladesh were at risk for iodine deficiency. According to the results of the 1998 nationwide survey, 77% of households in the country consumed iodized salt, with Cox's Bazar district having a consumption rate of only 5% (9). These findings are sufficient to justify monitoring of the situation in terms of the prevalence of IDD and usage of iodized salt in Chakaria, an upazila of Cox's Bazar district.

With this concern in mind, we conducted this study in Chakaria upazila to determine the prevalence of use of iodized salt at the household level, explore the reasons behind non-use, and identify the various correlates of its use.

## MATERIALS AND METHODS

### Study area

Chakaria upazila is situated in the southeast coast of the Bay of Bengal. The eastern side of the area is hilly, while the western side is low and flattens toward the Bay of Bengal. It is also an area where there is sporadic occurrence of cyclone and tidal bores, in addition to monsoon flooding. The area can be characterized as one of the more traditional areas of Bangladesh in terms of low literacy, low acceptance of family-planning methods, and less participation in poverty-alleviation programme organized by the non-government organizations (10). Since it is situated in the coastal belt, Chakaria is one of the few areas where salt is produced by evaporating seawater during the dry season. This locally-produced coarse salt is sold at the local markets and also to the larger factories that remove the impurities, iodize, and packet the salt for distribution among the retailers.

The study was conducted under the auspices of the Chakaria Community Health Project (CCHP) of ICDDR,B: Centre for Health and Population Research in eight unions of Chakaria upazila. The unions are: Boroitoli, Kayerbeel, BM Char, Kakara, Pashchim Boro Bheola, Harbang, Shaharbil, and Purbo Boro Bheola.

### Study population

All the households in six of the eight unions were visited for data collection. These unions were the intervention unions of the CCHP. In Purba Boro Bheola and Harbang unions, information was collected through systematic random sampling of 12% of the households. These two unions are comparison areas of the CCHP. This kind of sampling was done as the data were originally collected for monitoring the impact of the CCHP. Socioeconomic and demographic information from 21,190 households was finally available for analysis.

### Data collection

The study was conducted as part of the CCHP-impact monitoring and data collection during 1997-1998. A cross-sectional survey was initially conducted in the eight unions. Subsequently, in-depth interviews with the senior female members of 35 randomly-selected households were conducted until the point of redundancy was reached. Focus-group discussions with six groups of 5-8 purposively-selected males were also conducted in the marketplace. The groups were purposively selected

to ensure the participation of men from different socioeconomic status and religious groups.

Trained interviewers collected household information either from the household heads (mostly male) or from other responsible family members. To verify the kind of salt they used in the household, the informants were asked to show the interviewer a sample of the salt used. The salt was then identified as coarse (locally-produced) or fine (iodized packet).

To verify which types of salt contained iodine, six random samples of packet-salt available in the households, 12 random samples of newly-produced raw salt, and 12 random samples of at least a year-old raw salt were tested with iodine-testing solution provided by UNICEF. The iodine-testing solution, when added to the salt samples, changes colour to detect the presence of iodine in the salt greater than 5 ppm (parts per million). However, this test cannot determine the level of iodine present.

Information on the perception of iodized salt or packet-salt and the reasons for their non-use was collected through in-depth interviews and focus-group discussions. The discussion was recorded in *bangla* (native language) into notebooks during the interviews.

### Variables

The independent variables used in quantitative analysis were: employment status, membership in poverty-alleviation programmes run by NGOs, gender of the main earner, religion of the household members, and whether salt was produced in that union. The employment status of the household members was divided into two groups according to the existence of a day-labourer (or those who work as daily wagers) in the household. For NGO membership, the households were divided into two categories, namely households where at least one family member was a member of NGO and those households having no NGO membership. According to the salt-production status of the union, the entire area was divided into two groups: unions where salt was produced and unions that did not. Information on the kind of salt was used as the dependent variable for analysis. Coarse salt was categorized as non-iodized salt, and fine salt represented iodized packet-salt.

### Data analysis

Both univariate and multivariate methods were used for analyzing the quantitative data. In the univariate analysis, the independent variables were cross-tabulated with the

kind of salt used as the dependent variable to examine the association between the dependent and the independent variables. A logistic regression was then carried out with the use of iodized salt as the dependent variable and all the independent variables as the categorical variables. Stepwise logistic regression analysis was used for determining the important variables with statistically significant relationship. SPSS was used for performing the analysis. Information from the in-depth interviews and focus-group discussions was analyzed to understand in detail the different aspects of the non-use of iodized salt.

## RESULTS

In the study population, 92.8% of the households were Muslims, 6.2% Hindus, and 1% Buddhists. About 59% of the households had at least one member who worked as a day-labourer (this indicates that they were very poor). About 29% had at least one person who had NGO membership. In Bangladesh, NGO membership is also an indicator of socioeconomic vulnerability. NGOs usually target socioeconomically vulnerable population and extend various types of support to them, such as micro-credit, healthcare, and education. Forty-four percent of the households were situated in the salt-producing unions. The findings of the survey showed that 1.9% of the households used iodized salt in daily cooking.

Regarding the presence of iodine in salt, all the 12 randomly-collected samples of packet-salt showed the presence of iodine. Of the 12 samples of freshly-produced coarse (non-iodized) salt, 50% tested iodine-positive. However, none of the nine samples of a year-old coarse salt contained iodine when tested with the field-kit. Although the number of samples selected is not representative, there is no reason to suspect that coarse salt preserved over a long period of time will retain any iodine.

### Quantitative survey

According to the results of univariate analysis (Table 1), the salt-production status of the union, religion, NGO membership, and economic conditions as measured by the presence of day-labourer in the household were significantly associated with the use of iodized salt (packet-salt) at 5% level of significance. The proportion of the use of iodized salt was higher in unions where salt was not produced than in the salt-producing unions. A significantly higher proportion of Buddhist

**Table 1.** Association between different household characteristics and use of iodized salt

Independent variable	No. of households	% iodized salt use	p value
Salt-production status of area			
Produced	9309	0.7	0.000
Not produced	11755	2.9	
Religion			
Muslim	19184	1.9	0.000
Hindu	1281	1.9	
Buddhist	196	7.5	
Sex of main earner			
Male	20072	1.9	0.089
Female	875	1.3	
Menial labour in household			
Yes	12427	0.9	0.000
No	8485	3.3	
NGO membership of household			
Member	6070	1.1	0.000
Non-member	15036	2.2	

**Table 2.** Results of logistic regression analysis of use of iodized salt and different household characteristics

Independent variable	Co-efficient	Odds ratio
Salt-production status of area $\chi^2=101.8340^*$		
Produced	RC	–
Not produced	1.40	4.06
Religion $\chi^2=16.2431^*$		
Hindu	RC	–
Muslim	-0.02	0.98
Buddhist	1.07	2.91
NGO membership $\chi^2=31.9324^*$		
Member	RC	–
Non-member	0.78	2.18
Menial labour in household $\chi^2=111.9082^*$		
Yes	RC	–
No	1.18	3.26
Constant	-6.1961*	
$\chi^2$		331.568*

\*  $p < 0.001$ ; RC=Reference category

households used packet-salt compared to the Hindu or Muslim households. The use of packet-salt was also higher in the households where no one worked as a day-labourer. The households with NGO membership were significantly less likely to use packet-salt.

Table 2 shows the results of logistic regression analysis of packet-salt use and other independent variables. All the variables that were significantly associated with packet-salt use in univariate analysis were also significantly associated with packet-salt use in stepwise logistic regression.

### In-depth interviews and focus-group discussions

Some specific barriers to packet-salt use, identified through in-depth interviews, were: local tradition of using raw/coarse salt, lack of knowledge on the link between iodized salt and IDD, and the higher cost of packet-salt compared to the coarse salt.

Results of the in-depth interviews suggest that the people living in the study area were used to consuming locally-produced coarse salt. Usually those who produced salt maintained a stock for one year. The wealthier families in the area also bought locally-produced raw salt for one year from the field during the salt-producing season. Those who could not buy salt for one year stocked as much as they could. Even those

who could not afford to buy salt during the salt-producing season usually bought coarse salt through the salt vendors or from the local market. This was done, because non-iodized raw salt was easily available and acceptable in the area, was convenient for the families to have a stock of such an essential commodity, like salt, for one year, and buying salt in bulk from the primary producer was more economical.

The people living around the salt-field collected salt from the field for use. This salt was usually stored in gunny bags. Furthermore, freshly-produced salt was readily available in the market and through the street vendors who hawked salt door-to-door. This probably makes the coarse salt easily available to the women who do not have access to the market. In contrast, the packet-salt was not available in such quantities and was only available at the market. When asked about the consumption of household salt, one respondent explained, “*We have always consumed locally-produced salt; so, we prefer to have that. We are not familiar with packet-salt. One should eat what one is used to eat.*”

The perception of the person who usually bought salt from the market was also an important factor that dictated what kind of salt was used in the household. In some households, the wide availability of salt through

the street vendors meant that the women could, on occasions, buy small amount of salt from the street vendors. However, the male members of the family usually bought salt either from the market or from the field, as they were the ones who had access to the market. Their preference, therefore, dictated the type of salt used. One of the respondents explained, *"My husband usually buys salt from the market. So, that is what we use. We use what my husband gets."*

None of the respondents was aware of the presence of iodine in packet-salt and its benefits. The majority of the respondents had never used packet-salt and, therefore, could not talk about the difference between raw and packet-salt. Those who had used packet-salt stated that they liked it because it was clean and dry. Raw salt, on the other hand, contained dirt and other impurities that can lead to illness. They could not specify the kind of illnesses that could occur if raw salt was taken either from knowledge or from experience, but the discussion clearly revealed that they related the probability of sickness to the presence of impurities in coarse salt. According to one respondent, *"If one consumes packet-salt, he/she will not be sick; but raw salt contains a lot of dirt that might make a person sick."*

The prohibitive expense of packet-salt was an important determinant of low use-rate. The respondents who thought the packet-salt (iodized salt) was better than the raw salt stated that the packet-salt in the market was sold at Tk 10 per kg (1 US\$=50 taka), whereas the raw salt was priced at Tk 3 per kg. The existing level of poverty in the area also meant that at times they were not able to afford packet-salt. One respondent explained, *"I know iodine salt is good for health, but it is very expensive. With the same money, we can get a lot more raw salt. Since we use a lot of salt, we end up buying raw salt for daily use."*

Interestingly, the informants never mentioned the presence of iodine in salt or the linkage between goitre, the most visible form of IDD, and packet-salt. Whenever they mentioned iodine salt, they usually meant packet-salt without really understanding that iodine may be an ingredient of salt. One respondent who was suffering from a very visible goitre mentioned that she used the packet-salt for a few months as advised by a physician. She stated, *"The doctor told me to use packet-salt for gola bara (extension of throat-goitre). So, I used it, but my condition did not improve. The salt was more expensive than the salt we usually use. So, I did not*

*continue using it. In Chittagong, the doctors suggested a surgery, which would cost 20,000 taka. I am an old woman, and gola bara is not bothering me. So, what is the point in spending so much money?"*

The focus-group discussions conducted with males also yielded similar results. People generally thought that the packet-salt was better than the raw salt as it is clean and dry. Otherwise, there was no difference between them. The price difference between the two types of salt and acceptability of locally-produced coarse salt was mentioned as the main reasons for choosing to buy coarse salt. Only one person could tell us about the presence of iodine in salt, but he did not have any clear idea about the benefits of using iodized salt.

Some respondents mentioned radio programmes as their source of information about packet-salt being good for health. However, they could not remember the details of the message. None of them had any idea about why goitre occurs. Only one person said, he heard that someone in his village was prescribed packet-salt for goitre, but he had stopped taking packet-salt after a couple of months when the status of goitre did not improve.

The Buddhist men in the group reported that they used packet-salt at home, because it was affordable, clean, and dry and, therefore, much better than the locally-produced salt. They did not mention the presence of iodine or any other beneficial effects of packet-salt. It was clearly revealed from the discussion within the group that the Buddhists were not usually involved in salt production. Therefore, they did not have the option of stocking up salt for one year. Further, they were economically better-off compared to the general population and were more health conscious. So, they tend to buy packet-salt more often than the members of the Hindu or Muslim communities.

## DISCUSSION

It is a matter of concern that almost 10 years after the enactment of Iodine Deficiency Disease Prevention Act, the prevalence of packet-salt use was only 1.9% in Chakaria. High acceptability and wide availability of locally-produced coarse salt, lack of knowledge on presence of iodine in salt and its relationship to IDD, and the high cost were the reasons for such a low use of packet-salt.

In Chakaria, the Iodine Deficiency Disease Prevention Act comes into conflict with the local

tradition of salt use. In this area, the salt fields have provided salt to people for years. During the salt-producing season, raw salt, usually stored for the whole year for household consumption, is easily accessible and widely available through the street sellers and in the local market. This has been reflected in the results of our study, which have shown that the use of iodized salt was significantly lower in the salt-producing areas. The availability of locally-produced salt was not only an indicator of lack of regulation of the sale of coarse salt, but could also be an indicator of the availability of coarse salt in other parts of the country where low-cost coarse salt is likely to be available in the market.

The results of the quantitative analysis revealed that the households where at least one household member was a day-labourer and NGO member were significantly less likely to use packet-salt. In the context of Bangladesh, menial labour and NGO membership usually indicate low socioeconomic status of a household. We originally thought that NGO membership might expose the households to knowledge on IDD and its prevention, but this was not the case. Results of the qualitative analysis also showed that the economic status of households was related to the use of packet-salt. The respondents who thought that packet-salt was better for health were not able to buy it, because it was more expensive than locally-produced coarse salt. The differences in the consumption of packet-salt among the households of various religious groups could also be a reflection of socioeconomic status. This could create difficulties in promoting the use of iodized salt in Chakaria. In this regard, other innovative methods of iodization of salt could also be explored. For example, until 1993, small-scale salt producers located in the coastal lagoon areas of Ghana were producing a large amount of coarse salt (11). Coarse salt was widely available in the local market. Iodization of this salt was made possible by reorganizing the primary producers into cooperatives (11).

The information gathered from the qualitative data suggests that, although the male members of the households were primarily responsible for buying salt, they were not aware of the presence or beneficial effects of iodine. None of the women interviewed was aware of the existence of iodine in salt and its relationship to IDD. Those who made some connection between iodized salt and goitre thought that the iodized salt could be used as a curative agent for goitre. The lack of knowledge was also evident in another study conducted in the same

area during 1994 where only 5.2% of the mothers of children aged less than five years were aware of the link between goitre and iodine (10). This lack of knowledge and, therefore, lack of risk perception could also have contributed to such a low usage of iodized salt. In a study conducted in Assam of India, a similar lack of risk perception was associated with high prevalence of IDD (12).

The sustainability of the programmatic goal of universal salt iodization requires a multi-sectoral effort, involving a systematic study of production, distribution, packaging, quality, and consumer preferences for iodized salt (1,13). The presence of iodine in all the packet-salt samples was the result of existing regulations on universal iodization of salt at the factory level. A similar result was found in a study conducted in Bangladesh in 1996, where 99% of packet-salt collected from the factories around the country contained iodine (14). However, the important issue of inadequate iodization of salt has to receive the attention it deserves.

The widespread availability of coarse salt in Chakaria was an indication of weak enforcement of law by the Government to regulate the sale of coarse salt. This could be a reason why low-cost coarse salt was also available along with the packet-salt in other parts of the country, especially in the rural areas (14). The lack of linkage made between iodine in salt and symptoms of IDD and the misconception about iodized salt being a curative measure for reduction of goitre show that the public-health messages offered by the Government regarding iodized salt could not make any impact in Chakaria. A similar situation can also prevail in other rural areas of Bangladesh. Studies in other parts of the world have demonstrated the important influence of knowledge on willingness of people to buy and consume iodized salt (15-17). Hence, there is an urgent need to evaluate the effectiveness of existing public-health messages that are used for promoting iodized salt.

Based on the findings of this study, we may conclude that, despite the existing law of universal iodization of salt at the factory level, the country is far from achieving the universal use of iodized salt, especially in the salt-producing areas. In Chakaria, the local tradition, lack of information, and the price of iodized salt were important factors contributing to the low use of iodized salt. It is important to address all these factors simultaneously. Without attempting to change the people's perception of using raw salt, addressing the price issue may be

ineffective. Therefore, special measures should be taken to inform people in the salt-producing areas about the beneficial effects of iodized salt. Further, efforts should also be made to iodize all salts available to the population to correct the situation and prevent IDD-related health problems further.

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