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Common salt iodization status in urban areas of Ujjain (M.P.)

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ABSTRACT

Iodine deficiency disorders (IDD) are prevalent in all states of India. IDD continue to be high despite ban on the sale of non-iodised salt. In order to assess the effectiveness of salt iodization programme, a study was undertaken to analyse the iodine content of salt samples sold in Ujjain (M.P.). 108 salt samples, commercially available to general public, were collected at retailer level from urban areas of Ujjain. Iodine content of the samples was estimated using standard iodometric titration method. The results indicated that iodine content in 53.7% of the samples was inadequate. Iodine content was significantly lower in 94.7% of non-branded and non-packed with low cost categories. Therefore, economically poor public is at higher risk of iodine deficiency.

Key words: Salt iodisation, Iodine deficiency, Urban area, Ujjain (India).

INTRODUCTION

India is one of the major endemic iodine deficiency countries in the world with a population of 167 million at risk of developing iodine deficiency (WHO/UNICEF/ICCIDD 1993). Fifty four million Indians have goiter, 2.2 million have cretinism and 6.6 million have mild neurological disorder attributed to iodine deficiency (Sivakumar et al 1996). Iodine deficiency not only causes endemic goiter and cretinism but also a wide spectrum of disabilities like deafness, mutism, mental and physical retardation and various degree of neuro-motar dysfunction.

Iodine deficiency disorders (IDD) are prevalent in all states of India. Out of 282 districts surveyed 241 have been found to be endemic for IDD (Kapil 1989, Venkatesh *et al.,* 1991). Under the National iodine deficiency diseases control programme (NIDDCP), Govt of India has adopted the strategy of iodisation of edible salt, which is both long term corrective and sustainable preventive solution to eliminate IDD in general population, Universal iodisation of salt, as recommended by WHO, UNICEF and International committee on control of iodine deficiency disorders (WHO/UNICEF/ICCIDD 2001), is now mandatory for India.

A safe daily intake of iodine is between 50 – 1000 µg/d. Yet in India, daily intake may be as low as 100-160 µg/d compared to 3000 µg/d in Japan. The daily intake as well as availability of iodine is insufficient in several broad geographical areas (Kapil *et al.,* 1998, Patowary et al 1995, Pradhan & Choudhry 2003). A study by Kapil et al (1998) in Punjab showed that 29% families were consuming salt with iodine content of <15 ppm despite ban of the sale of non-iodised salt.

Iodine content of regional diet in India ranges from 170-300 µg/d. The loss of iodine during normal cooking practices ranges from 30-70 %. Thus considering this, the food adulteration act states that iodised salt at manufacturer level should have not less than 30 ppm and at consumer level not less than 15 ppm.

Patowry *et al.,* (1995) in Assam demonstrated at 37.26% of all salt samples sold at the retailer level had inadequate iodine. Kapil et al (1998) have reported that > 90 % of the salt samples are iodised in M.P. while the samples with nil iodine varies from 0-6 %. This study was therefore conducted to asses the current status of salt iodisation in urban areas of Ujjain (M.P.).

MATERIAL METHODS

The study was conducted in the urban area of Ujjain city (MP). Total 108 samples of different variety and brands were collected randomly from various shops within the urban areas of Ujjain city.

Sampling method

The stratified random sampling technique was applied to collect samples. A total of 21 clusters were selected from the city zone of Ujjain. Data on the price at retailer level was also collected.

For the convenience of data analysis, the salt samples were categorised as branded (marketed, commercial brands), Non-branded-packed (No commercial company, sold in sealed polythene bags) and Non-packed (coarse or loose salt stored in polythene lined gunny bags).

The iodine content of salt was estimated using the standard iodometric titration method (Karmarkar et al 1986) in the Department of Biochemistry, R.D. Gardi Medical College, Ujjain.

RESULTS

All the non-branded samples were stored in polythene lined gunny bags and were crystalline in nature. In the branded variety, 19 samples were in powder form and 12 were in crystalline form. Non-packed salt sample were kept (in big jute bags) open outside the shops.

Table 1: Iodine content of salt samples from Ujjain city (MP)

#	Category	Size (n)	Cost (Rs/Kg)	Median (ppm)	Range (ppm)	Iodine content (ppm) Inadequate		Adequate	
						<5	5-15	15-30	>30
1	Branded	30	7-9	39.0	28 - 47	0	0	14	16
2	Non-Branded packed	40	4-6	3.25	0 - 28	22	14	4	0
3	Non-packed (Coarse)	38	3-4	2.00	0 - 3.5	36	2	0	0
	Total	108	-			58	16	18	16

(PPM = Parts per million)

68.5 % of the samples contain inadequate iodine (below recommended level <15 ppm). Only 31.5 % of the samples were with adequate iodine level. In low cost variety, 94.7 % of the samples had iodine <5 ppm. In all, 53.7 % of total samples had poor (<5 ppm) iodine content (Table 1).

DISCUSSION

The result indicate that despite legislation on sale of iodised salt, iodine content of most of the samples sold in shops are inadequate. The recommended iodine content of the salt at the manufactures level is 30 ppm and at the household and at retail shops level is 15 ppm. It is observed that there are great variations in the iodine content of common salt. The variations are equally high in different categories as well as within category.

The factors responsible for the variations could be at production level such as the type of iodine compounds or the processes used in the iodisation. Many studies have shown that potassium iodate (KIO_3) is more stable than potassium iodide (KI). Addition of KI results in shorter shelf-life whereas addition of KIO_3 increases shelf-life salt much longer (Chauhan et al 1992, Ranganathan & Rao 1986, Sebotsa et al 2005). Therefore, one of the greatest obstacles to NIDDCP is poor iodine stability. The methods or processes used in iodisation play important role. Thus, if there is variability in the amount of premix or spray and uneven physical mixing, this results in non-uniformity in salt iodisation.

The proportion of salt samples with inadequate iodine content was again higher in large crystalline / coarse type than the fine powdered variety. This could be due to the fact that fine powdered salt seems to retain iodine longer than the coarse salt because of uniform crystal size and its free flowing property (Ranganthan & Rao, 1986). Another possible reason could be the higher percentage of impurities in the coarse salt than the fine variety.

In the study it is observed that higher proportion of non-branded salt samples had inadequate iodine content. This could be attributed due to the losses during storage. It is shown that small losses of 9-10% occur within 15-20 days after packaging in polythene bags. Thereafter the iodine content remained constant for about 300 days (Chauhan *et al.,* 1992). The impermeable polythene plastic bags used in packing small quantity of salt also prevented the loss of iodine considerably in packed variety compared to the non-packed variety.

In the present study, there is higher proportion of salt samples with iodine content of <5ppm in the non-packed variety. This type of salt is coarse, visibly large crystals or lumps and stored in large jute bags of 50-100 Kg capacity. The bags were kept outside the shops exposed to heat, light and air leading to depletion of iodine content. Hot weather of Ujjain together with the ignorant shopkeepers, who expose the salt directly to air and sunlight to keep salt dry, also hastened the iodine loss further. Other reasons responsible are lack of public awareness, dual marketing of both iodised and non-iodised samples (despite ban of Government on sale of non-iodised salt) are responsible for this failure in implementation of NIDDCP.

The cost analysis indicated that the iodine content in the branded salt sold at price range of Rs. 7-9/Kg, was adequate and well within the recommended limits. Whereas, the non-branded salt sold at price of Rs. 4-6 /Kg, had grossly inadequate iodine content (Median 3.25 ppm). In low cost variety sold at Rs. 3-4/Kg, had median iodine of 2.0 ppm. Almost 94.7 % of these samples have much below the recommended level. It is this variety which is affordable to the economically poor public, implying that the poor populations who go for cheaper non-branded salt are at higher risk of iodine deficiency disorders. Therefore, the incidence of IDD is obviously increases in the population.

CONCLUSION

It is found that despite the legislature on the sale of iodised salt, the iodine content of 68.5% of salt samples at retailer level contained inadequate (below 15 ppm) iodine. The economically poor populations who predominantly use cheaper variety of non-packed coarse salt are at higher risk of developing iodine deficiency disorders.

It is also observed that there are several obstacles due to which the NIDDCP suffers and is poorly implemented in the study area. It is recommended that multilevel monitoring of salt iodine content should be done periodically together with increase in public awareness especially education of the shop owners, on the use of iodised salt. In addition, control on the market prices of iodised salt should have important role in implementation of NIDDCP at grass root level.

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