

## Original Research Article

# Assessment of iodine deficiency disorders among population of district Chamba, Himachal Pradesh

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## ABSTRACT

**Background:** Iodine insufficiency is prevalent throughout the world, and is rated as one of the most significant public health concerns in more than 125 countries. Secondary to the insufficient dietary consumption of iodine, almost two billion individuals are prone to suffer from iodine deficiency disorders worldwide. The present survey was conducted in district Chamba of Himachal Pradesh in order to assess the extent of iodine deficiency disorders, 55 years after the initiation of salt iodisation programme.

**Methods:** A cross sectional survey was conducted in district Chamba of Himachal Pradesh. A close ended pretested questionnaire was used to collect the socio-demographic information of the participants. Iodine content of salt and water was assessed with the use of I-Check and AQUA test kits in the households.

**Results:** A total of 230 households were surveyed for the consumption of iodised salt which showed that 100% of the study population was using packet iodised salt for consumption. Majority of the population (92.6%) were placing their salt container near chulah in their kitchen and 73.5% were adding the salt in the beginning of the cooking followed by 16.1% in the middle of the cooking. Iodine content of salt sample collected revealed that 95.7% contain only 7 ppm iodine and 99.6% of the water sample contains less than 0.1 level iodine in water testing.

**Conclusions:** The results of study indicated that population of district Chamba is using iodised salt but there is still need of strengthening of monitoring system as well as health education regarding the cooking practices in the households.

**Keywords:** Iodine deficiency disorders, Iodine content, Monitoring

## INTRODUCTION

Iodine deficiency disorders (IDDs) have been recognized as one of the major nutritional disorders throughout the world. More than 1.5 billion people in the world are at risk of developing IDDs. In India 200 million people are at risk of Iodine efficiency disorders and another 71 million suffering from goitre and other IDDs.<sup>1</sup> Iodine insufficiency is prevalent throughout the world, and is rated as one of the most significant public health concerns in more than 125 countries. Secondary to the insufficient dietary

consumption of iodine, almost two billion individuals are prone to suffer from IDDs worldwide.<sup>2,3</sup> The mountains and plains of northern India, Nepal and Bhutan have long been infamous in medical circles as the "Himalayan goiter belt." The district Chamba of Himachal Pradesh also comes under Himalayan Goiter belt. The district has an estimated area of 6522 square kilometers and is surrounded on all sides by lofty hill ranges. The territory is wholly mountainous with altitude ranging from 2,000 to 21,000 feet. The soils and waters of the Himalayas are so lacking in natural iodine that even the goats develop goiters, the

enlargement of the thyroid gland that is the body's adaptation to the deficiency.<sup>4</sup>

The most obvious consequence of iodine deficiency is goiter, recent studies have revealed that there is a much wider spectrum of disorders commencing with the intrauterine life and extending through childhood into adult life with serious health and social consequences, collectively known as IDD. This spectrum includes disorders such as goitre, suboptimal intelligence, cretinism, hypothyroidism, abortion, stillbirth, brain damage, learning disabilities, mental retardation, psychomotor defects, hearing and speech impairment.<sup>5</sup> Universal salt iodization (USI) is recognized as the most promising, sustainable, and cost-effective solution to address iodine deficiency at the country level. A country is said to have achieved USI when at least 90% of households consumed adequately iodised salt (15 ppm).<sup>6</sup>

Rationale of the study was that despite the impressive progress with regards to the provision of iodised salt, the entire population of the country is still prone to IDDs due to lack to knowledge and practice of salt consumption. The present survey was conducted in district Chamba of Himachal Pradesh in order to assess the extent of Iodine deficiency disorders, 55 years after the initiation of salt iodisation programme.

### Objective

The objectives of the study were to assessment of the determinants of IDDs in district Chamba of Himacahal Pradesh, to find out the proportion of households consuming adequately iodized salt in district Chamba of Himachal Pradesh and to assess the knowledge and practices with respect to the current use of iodized salt.

## METHODS

A cross-sectional study was conducted in district Chamba of Himachal Pradesh. Study area was Municipal Committee area of Chamba town and rural areas adjacent to Municipal Committee area of Chamba town. The study was conducted during period from 1st February 2019 to 31st July 2019.

### Sample size

The population of district Chamba is 5,19,080 as per census 2011. Taking expecting 92.7 percent of households in India consuming iodised salt, margin of error as 5 percent, and at 99 percent confidence level the sample size comes out to be 104. A total sample size of 230 from 23 clusters with cluster size of 10 was taken.

### Sampling

Cluster sampling using PPS (probability proportional to size) was used to select the households from the selected wards and villages. There were 11 wards in Chamba town and 115 households from each ward were selected

randomly. For rural area, we purposely chose the 11 rural villages adjacent to municipal committee area Chamba and 115 households from each village were selected randomly.

### Sampling tools

A close ended pretested questionnaire was used to collect information about the demographic profile of house hold, knowledge of people regarding iodine, diseases caused due to deficiency of iodine and practices of people to store and use of Iodized salt. I-check kits were used to check the iodine content in household salt. AQUA Test kit was used to see the iodine content in household water used by the sample population for drinking.

### Data collection

Before collecting data, training regarding the questionnaire and testing kits was given to the survey team. Members of survey team went house to house with assistance of accredited social health activist (ASHA), anganwadi workers and health workers to collect the information.

### Data analysis

Data was entered into Microsoft excel sheets. Data was measured in proportions and percentages. Chi-square test was applied to find out the association between iodine deficiency disorder with knowledge and practices of people regarding use of iodized salt. P value of less than 0.05 was taken as significant.

## RESULTS

In the present survey, a total of 230 households were surveyed for the consumption of iodized salt and to assess their knowledge and practices related to the storage and cooking process. 100% of the study population was using packet iodized salt for consumption of which 99% were consuming iodized salt for more than 10 years. In terms of knowledge, 99.1% of study population has heard of iodized salt and main source of information was television in 72.2% followed by radio in 17.8 percent (Figure 1).

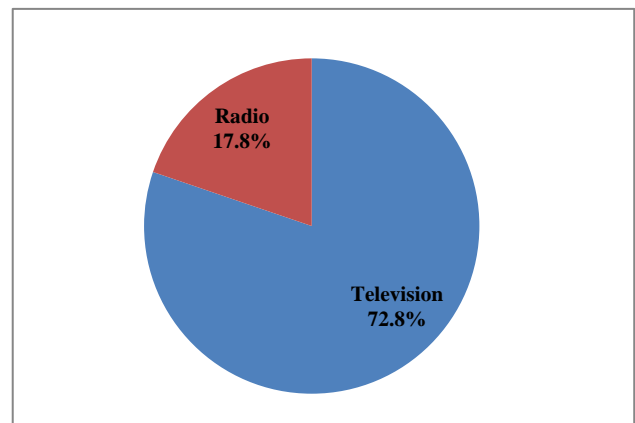
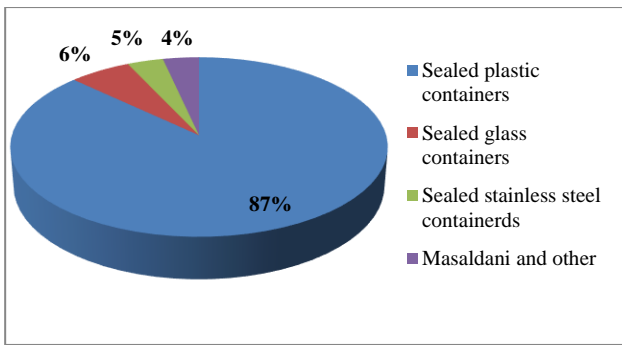
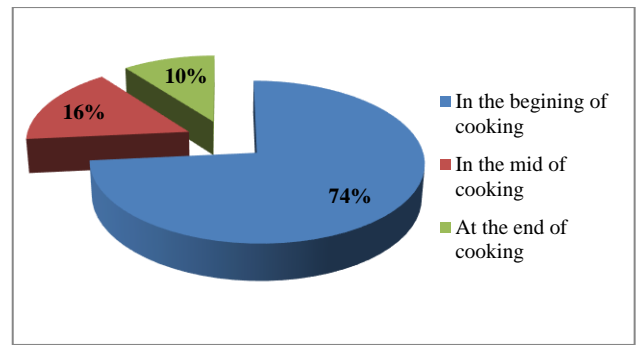


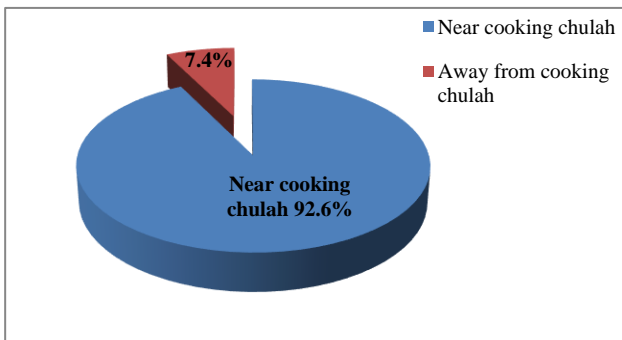
Figure 1: Source of information about iodized salt.



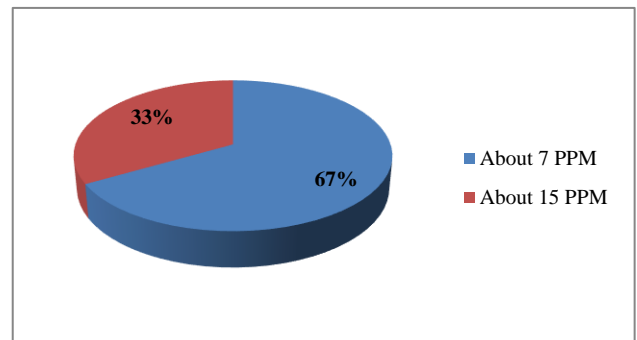
**Figure 2: Storage of salt in households.**



**Figure 4: Practice of adding salt in food.**



**Figure 3: Place of keeping salt container in kitchen.**



**Figure 5: Iodine content in salt.**

98.7% were aware of importance of iodine in the salt and 96.1% knows that iodine is important to prevent the iodine deficiency disorders. However, only 36% of the study subjects were aware of the fact that iodine is not present in every salt. In terms of the storage and cooking practices in the households, 87% of study population was storing the salt in sealed plastic container followed by 6% in sealed glass container followed by 3.5% in stainless steel containers. Remaining had kept salt in “masaldani” and other containers etc (Figure 2).

Majority of the population (92.6%) were placing their salt container near cooking chullah in their kitchen and only 7.4% place the container away from the cooking Chullah (Figure 3).

Most of the household (74%) use to put the salt at the beginning of cooking followed by 16% and 10% in the mid and end of cooking respectively (Figure 4).

After opening a packet of salt for consumption, 58.3% of people were consuming the salt after 30 days and 42.2% have noticed moisture in their salt. 67% of household salt samples contain about 7 ppm iodine content and 33% samples contain about 15 ppm of iodine content (Figure 5).

The 99.6% of the drinking water samples contains less than 0.1 µg iodine per liter of water. During survey it was found that one or two members in 5.7% households were taking the treatment for thyroid disorders.

## DISCUSSION

District Chamba of Himachal Pradesh comes under Himalayan goiter belt. It was found that 100 percent study population of district was using packed iodized salt with any iodine in salt. The National iodine and salt Intake survey 2014-15 shows that 92% households in India consume Iodized salt. Adequately iodised salt (iodine  $\geq 15$  ppm) was consumed in 77.5% of households.<sup>7</sup> The survey findings also showed that iodine content in most of the household salt was found around 7 ppm which was quite low as per USI standards. A country is said to have achieved USI when at least 90% of households consumed adequately iodized salt that is 15 ppm.<sup>6</sup> Since the iodine content in water and soil is negligible in this area, so the only source of iodine remain is packet of iodized salt. The iodine content is 7 ppm in salt consumed by most of households. This could be due to number of reasons, firstly, the iodine content may not be sufficient in the salt at manufacturing level, secondly, the iodine content may decrease during transportation and due to long storage in local retail shops or local stores. Lastly, loss of iodine due to faulty cooking practices. There was a unique observation that, in most of salt packet named “Amulya” which comes in the supply of Government depots of district Chamba has iodine content of about 15 ppm.

In terms of cooking practices, most of the households used to keep salt near the chullah which leads to the rapid evaporation of iodine content in salt due to high temperature and humidity. Various studies showed that, the loss of iodine during cooking varies considerably from

14% to 66%.<sup>8</sup> Another practice was that, the salt was kept in “masaladani” mostly and during the cooking process when other ingredients of masaladani were added to food, the masaladani remain open for the longer time and salt continuously exposed to air which leads to further loss of iodine. Salt should be stored in sealed glass containers in order to prevent the loss of iodine content. As per the findings of study done by Jayashree et al the iodine retains more in the glass container as compared to plastic containers.<sup>9</sup> Another finding of the survey showed, most of the women used to put the salt in the beginning of cooking which is a faulty practice. To retain iodine in food the salt should be added during serving.<sup>8</sup>

## CONCLUSION

The district Chamba comes under Himalayan goitre belt so as per results there is negligible iodine in water and soil of this area. The only source remain is iodized salt but to retain iodine content in food there is need to follow the standard storage and cooking practices. Health personnel should educate the people at community level regarding methods to retain iodine content in food and consequences of iodine deficiency. The district administration should also monitor the manufacturing industries for required iodine content at this level and wholesale stores and retail shops for long storage.

## Recommendations

Every household should ensure that salt purchased from retail shops or Government depots should be moisture free and within the expiry date. Strict monitoring of iodine content in salt at the level of manufacturing, transportation and in the retail shops by the designated government officials. Inspection of places where the salt packets are stored in the shops/depots. Awareness of people especially women who are engaged in cooking food about the practices which helps to retain iodine content in food. Organise the workshops emphasising the importance of iodine and its harmful effects due to iodine deficiency at the level of Panchayats/Municipal areas. Iodine deficiency disorder survey should be conducted annually by the local government authorities. Community should be encouraged to use the healthy practices of cooking, salt should not place in masaladani, and it should be placed in separate glass container and away from gas chulah to retain the iodine content in salt.

## Limitations of study

The intra and inter observer variation in salt testing for the presence or absence of iodine content could be still there.

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## REFERENCES

1. Global iodine deficiency disorder prevention day. Available at: [https://www.nhp.gov.in/global-iodine-deficiency-disorders-prevention-day\\_pg](https://www.nhp.gov.in/global-iodine-deficiency-disorders-prevention-day_pg). Accessed on 04 September 2019.
2. De Benoist B, McLean E, Andersson M, Rogers L. Iodine deficiency in 2007: Global progress since 2003. *Food Nutr Bull*. 2008;29:195-202.
3. Swanson CA, Pearce EN. Iodine insufficiency: A global health problem? *Adv Nutr*. 2013;4:533-5.
4. Eckholm E. Iodine Deficiency in Himalayas is believed to disable millions. Available at: <https://www.nytimes.com/1985/04/02/science/iodine-deficiency-in-himalayas-is-believed-to-disable-millions.html>. Accessed on 04 September 2019.
5. Himachal Survey. Available at: <http://medind.nic.in/haa/t04/i1/haat04i1p33.pdf>. Accessed on 1 October 2019.
6. National Institute of Health and Family Welfare. National iodine deficiency disorders control programme. Available at: <http://www.nihfw.org/NDC/DocumentationServices/NationalHealthProgramme/Nationaliodinedeficiencydisorders.html>. Accessed on 02 September 2019.
7. Pandav CS, Yadav K, Salve HR, Kumar R, Goel AD, Chakrabarty A. High national and sub-national coverage of iodised salt in India: evidence from the first National Iodine and Salt Intake Survey (NISI) 2014-2015. *Public Health Nutr*. 2018;21(16):3027-36.
8. Rana R, Raghuvanshi RS. Effect of different cooking methods on iodine losses. *J Food Sci Technol*. 2013;50(6):1212-6.
9. Jayashree S, Naik RK. Iodine losses in iodised salt following different storage methods. *Indian J Pediatr*. 2000;67(8):559-61.

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