

## Concentration of iodine in edible salt in district Mansehra, Pakistan

Rubeena Gul, Adeela Mustafa, Kashif ur Rehman Khalil, Muhammad Saleh Faisal

Department of Community Medicine, Khyber Medical College and Department of Pharmacology, Pak International Medical College, Peshawar, Pakistan

**Objective:** To determine the status of iodization of edible salt of different brands available in the market and used at homes in district Mansehra, Pakistan.

**Methodology:** This cross-sectional study was conducted in District Mansehra between December 2016 to March 2017. Samples were selected from 8 union councils through non probability convenient sampling technique. Salt analyzing kits were used to determine amount of iodine in each sample.

**Results:** The mean iodine concentration of salt available in the market was  $23.6 \pm 10.461$  ppm;

while that of the household salt was  $22.85 \pm 10.696$  ppm. Overall, 82% of the samples had iodine concentration within recommended level i.e. 15-30ppm. No iodine was found in 13.2% of the samples and 4.8% of the samples had below recommended level.

**Conclusion:** The percentage of adequately iodized salt in the market (83.9%) was better than that of households (81.5%). Overall samples of edible salt showed adequate amount of iodine. (Rawal Med J 201;43:137-140).

**Key words:** Iodine, salt, Mansehra

## INTRODUCTION

Iodine Deficiency Disorders (IDD) is still a major public health issue in spite of marked improvement in its prevalence though salt iodization Programmes.<sup>1</sup> Universal salt iodization is the most cost-effective strategy to eliminate disorders caused due to deficiency of iodine in the body.<sup>2</sup> Iodine concentration varies in different regions and highest concentration is found in oceans; that's why regions situated on high altitudes are iodine deficient.<sup>3</sup> Iodine is the most important entity for thyroid hormone synthesis, which controls most important metabolic functions of the body.<sup>4</sup> Deficiency of iodine is the single most important cause of preventable brain damage in the childhood, which is caused due to poor consumption of diet that lacks iodine.<sup>5,6</sup> The daily requirement of iodine for human body varies and it is about 150mcg per day for adults while children require up to 120 mcg per day. During pregnancy due to increase demand, it is recommended that about 250 mcg of iodine per day should be taken.<sup>7</sup>

In Pakistan, gross iodine deficiency is still prevalent, although remarkable improvement in reducing iodine deficiency is achieved through salt iodization.<sup>8</sup> Main factors involved include lack of

political commitment and planning as well as monitoring of salt iodization programmes.<sup>9</sup>

The Present study is very important in monitoring the status of salt iodization in District Mansehra that is situated well above the sea level. Therefore, the primary objective of this study was to find the concentration of iodine in different brands of salt available in market and households of Mansehra.

## METHODOLOGY

This cross-sectional study was conducted in District Mansehra from December 2016 to March 2017. A sample size of 376 was obtained using Confidence level (z) of 95%, anticipated proportion of iodized salt 63.6% and Margin 5% margin of error. Data were collected by trained personnel, which included 4<sup>th</sup> year students of Khyber Medical College Peshawar, belonging to district Mansehra under the supervision of authors. Mansehra district is divided into 5 Tehsil. Mansehra Tehsil consist of 41 Union Councils. 8 Union councils were selected through probability-simple random sampling technique.

From each Union council 6 shops and 35 houses were selected by using non-probability convenient sampling technique. Two samples from each shop and one sample from each house were selected and

analyzed. For selecting salt from home informed consent was taken from head of family. Only those samples were collected from a particular house that uses same brand of salt in a particular container. Family using different types of salt in the same container were excluded to avoid mixed salt samples. After collection in air tight containers, samples were analyzed using salt iodine kits provided by Micronutrient Initiative Pakistan to detect quantity of iodine. Data were analyzed through SPSS version 20.

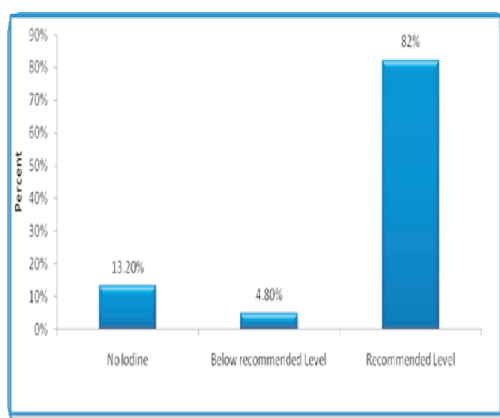
## RESULTS

The mean iodine concentration of salt available in the market was  $23.6 \pm 10.461$  ppm while that of the household salt was  $22.85 \pm 10.696$  ppm (Table 1).

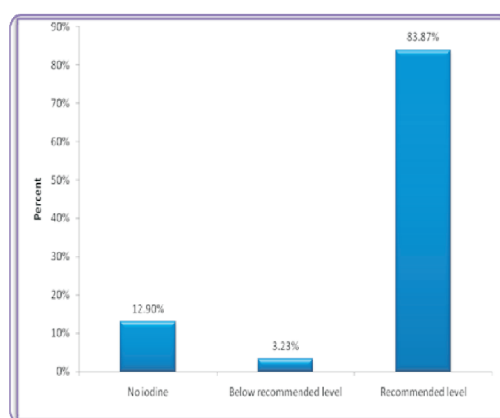
**Table 1. Iodine concentration of salt available.**

Sample	N	Mean $\pm$ SD
Shops	96	$23.60 \pm 10.461$
Households	280	$22.85 \pm 10.696$

**Fig. 1. Overall iodization status both house hold salt and market.**



**Fig. 2. Iodization status of samples available in the market.**



**Fig. 3. Iodization status of salt samples used in households.**



The overall iodization status was found to be satisfactory (82%) (Fig. 1). The iodine concentration of 83.87% samples in the market was within recommended level (Fig. 2). On testing the edible salt samples of households, 81.47% samples had iodine within the recommended level (Fig. 3).

## DISCUSSIONS

Our study showed 82 % (n=302) of the samples were adequately iodized. Zahidi et al from Morocco showed that only 25% of the samples had adequate amount of iodine when analysed by salt iodization kit. Lack of proper salt iodination by foreign companies was the stated factor behind low salt iodine.<sup>10</sup> In contrast to their findings, our study showed better results.

In our study, 81.5% of the salt sample from household showed iodine levels within the recommended range, 5.2% below recommended level while only 13% had no iodine at all.

Iodine concentration of household salt is very important as it shows the actual consumption of iodine by the community. In a study from Nepal, Kumar et al showed that among 707 samples, 534 (75.5%) were adequately iodized showing satisfactory results, as in our study.<sup>11</sup> Nicholas et al showed that only 24.2% of the household salts tested contained adequate iodine of  $\geq 15$  ppm.<sup>12</sup> In contrast, our study showed adequate iodine

concentration. Another study by Rohner et al from Sierre Leon stated 80.7% of the salt samples were adequately iodized.<sup>13</sup>

Knowledge regarding IDD is very important for salt manufactures. Increased awareness to the salt manufacturers is another important strategy for public health experts to control iodine deficiency. Jooste showed that only 30% samples were adequately iodized. The reason was lack of awareness regarding importance of iodized salt.<sup>14</sup>

Many other studies from different parts of Pakistan showed different level of iodine concentration in salt and IDD. A study by Jehangir et al showed low levels of iodine in edible salt samples taken from district Karak, Khyber Pakhtunkhwa. Among 112 household samples 72.3% samples were having no iodine. High prevalence of goiter in Karak is also reported in this study necessitating the need for strengthening salt iodization programs.<sup>15</sup>

A study from Abbottabad reported that 58.8% of the households were using iodized salt.<sup>16</sup> So, it means that the condition has improved a lot. Another study revealed that 30% of the population is using adequately iodized salt in district Charsadda.<sup>17</sup> So the iodization status of edible salt in district Mansehra is better than other district of Khyber Pakhtunkhwa. The increase in iodization status determined by this study is encouraging, which is an indication that the relevant departments are working to ensure the availability of iodized salt to the people of Mansehra.

## CONCLUSION

Iodine concentration of edible salt is better in district Mansehra. Regular monitoring of salt is necessary to keep tracking of adequacy of iodine concentration.

### Author Contributions:

Conception and design: Rubeena Gul  
Collection and assembly of data: Adeela Mustafa  
Analysis and interpretation of the data: Muhammad Saleh Faisal  
Drafting of the article: Muhammad Saleh Faisal  
Critical revision of the article for important intellectual content: Rubeena Gul  
Statistical expertise: Kashif ur Rehman Khalil  
Final approval and guarantor of the article: Rubeena Gul, Kashif ur Rehman Khalil

**Corresponding author email:** Kashif ur Rehman Khalil:  
dr.kashif.khalil@gmail.com

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## REFERENCES

1. Zimmermann MB. Assessing iodine status and monitoring progress of iodized salt programs. *J Nutri* 2004;134:1673-7.
2. Gidey B, Alemu K, Atnafe A, Kifle M, Tefera Y, Hr S. Availability of Adequate Iodized Salt at Household Level and Associated Factors in Rural Communities in Laelay Maychew District, Northern Ethiopia. *J Nutri Health Sci* 2015;2:19.
3. Hetzel BS, Clugston GA. Iodine. In: Shils M, Olson JA, Shike M, Ross AC, eds. *Modern Nutrition in Health and Disease*. 9th ed. Baltimore: Williams & Wilkins. 1999. P 253-264.
4. Buxton C, Baguune B. Knowledge and practices of people in Bia District, Ghana, with regard to iodine deficiency disorders and intake of iodized salt. *Arch Public Heal* 2012;70(1):5.
5. Gerense H, Yohannse A, Baymot B, Atsbha H, Nguse K, Gebru L, et al. Knowledge, attitude and practice (KAP) towards iodized salt utilization in Hawelti Kebele. *Axum Tigray* 2016;2:18.
6. Kapil U. Health consequences of iodine deficiency. *Sultan Qaboos Univ Med J* 2007; 7:26772.
7. Kshatri JS, Karmee N, Tripathy RM. Prevalence and Predictors of Poor Iodine Nutrition in Rural South Odisha?: A Comparative Study between Coastal and Hilly Districts. *Nat J Community Med* 2017;8:416.
8. Elahi S, Rizvi NB, Nagra SA. Iodine deficiency in pregnant women of Lahore. *J Pak Med Assoc* 2009;59:7413.
9. Khattak RM, Khattak MNK, Ittermann T, Völzke H. Factors affecting sustainable iodine deficiency elimination in Pakistan: A global perspective. *J Epidemiol* 2017;27:249-57.
10. Zahidi A, Zahidi M, Taoufik J. Assessment of iodine concentration in dietary salt at household level in Morocco. *BMC Public Health* 2016;16.
11. Shakya PR, Gelal B. Household Salt Iodine Content Estimation with the Use of Rapid Test Kits and Iodometric Titration Methods 2013;7:8925.
12. Agbozo F, Der JB, Glover NJ, Ellahi B. Household and market survey on availability of adequately iodized salt in the Volta region, Ghana. *Int J Health Promotion Educ* 2017;55:110-22.
13. Jooste PL. Assessment of the iodine concentration in table salt at the production stage in South Africa. *Bull World Health Org* 2003;81:51721.
14. Rohner F, Wirth JP, Woodruff BA, Chiwile F, Yankson H, Sesay F, et al. Iodine Status of Women of Reproductive Age in Sierra Leone and Its Association with Household Coverage with Adequately Iodized Salt. *Nutrients* 2016;74:113.

15. Jahangir M, Khattak R, Shahab M, Tauseef M. Prevalence of goiter and iodine nutritional status in school age children of District Karak, Khyber Pakhtunkhwa, Pakistan. *Acta Endocrinologica* 2015;11:33742.
16. Iqbal N, Haq M, Khan SM, Shah SA, Bano S. Assessment of iodine deficiency in school going children in Abbottabad-Pakistan. *Pak J Med Sci* 1999;15:325-9.
17. Saira S, Khattak RM, Khan AA, Rehman A, Khattak MNK. Prevalence of goiter and assessment of iodine status in 6-12 years school children and pregnant women of district Charsadda, Pakistan. *Acta Endocrinol* 2014;10:65-75.