SALT IODINE MONITORING IN THE ARMED FORCES

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ABSTRACT

Iodine deficiency is the most commonly implicated nutritional factor responsible for preventable mental deficiency in India and the world. The Government of India aims to control this through the supply of Iodised salt as the primary intervention strategy. Monitoring of the salt supplied, therefore becomes essential to ensure quality control. This study undertaken to assess the status of Iodised salt in the Armed Forces in the Pune-Kirkee complex found a great variation in the iodine content ranging from 10.6 ppm to 150.1 ppm. High levels of Iodine are potentially harmful. This calls for stringent quality assurance and monitoring as a cost effective long term measure in the Armed Forces.

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KEY WORDS: Iodised Salt; Iodisation of Salt; Salt Iodine monitoring.

Introduction

Iodine is an essential micronutrient required for the synthesis of thyroid hormones. Consequently, it forms an important component for the regulation of the metabolic activities of cells, for growth and for brain development. It is the most commonly implicated nutritional factor responsible for preventable mental deficiency which accounts for over 2.2 million cretins and another 6.6 million having mild neurological disorders in India [1]. Besides, it also remains the single most important cause of preventable brain damage and mental retardation in the world [2]. The effects of iodine deficiency on growth and development at various stages in humans, now denoted as Iodine deficiency disorders (IDDs) [3], are completely preventable, provided iodine deficiency is corrected.

One of the proven methods for preventing IDD is to fortify common salt with iodine [4], which is now the most widely used prophylactic public health measure against IDD. It is recommended that the fortified salt should provide 15 ppm of iodine at the consumer end, assuming an average daily percapita intake of 10 g of salt [5]. To achieve this the Govt of India had banned the sale, supply and stocking of non iodised salt wef 01 Jan 98 [6]. The regular monitoring of the quality of salt supplies devolves as an important public health responsibility, not only to ensure strict implementation but also to prevent any possible adverse effects that may occur because of excess or improper iodisation.

This study was conducted with the objectives of estimating the Iodisation levels of salt at consumer

level in Army units located in the Pune Kirkee complex and comparing Army ration salt with the commercially available iodised salt and thereafter make suitable recommendations based on the results of the study to ensure safe levels of iodisation.

Materials and Methods

The study was undertaken in the Pune Kirkee complex during the month of May 98. 27 Army units and sub units were selected randomly from amongst the units in the area. Two fistfuls (approx 100 g) of salt were collected from cookhouses of the selected units. Further, three commercial brands of iodised salt were obtained in sealed packets from the market for the study. Analysis was carried out at the Public Health Laboratory, Dept of PSM, AFMC, by the process of iodometric titration [7]. Quality control was ensured by following standardised procedure with 1 in 5 repeat sample testing to ensure consistency of methodology and results. The results were cross checked with the State Public Health Laboratory, Pune. After completion of the tests a randomly selected subset was retested in a single blind setting and the results were again confirmed by the State Public Health Laboratory.

Results

The salt tested from the ration supply was iodised, with a wide variation of iodine content (Table 1). The range extended from a low of 10.6 ppm to 150.1 ppm.

Of the ration supply salt 19 (70.37%) samples had iodine content above 30 ppm, of which 11 (57.89%) samples were above 50 ppm. Of the samples of salt having iodine content over 50 ppm, 4 (36.36%) samples had iodine in excess of 90 ppm. One (3.70%) sample of the ration supply salt had iodine content less than 15 ppm.

The commercial brands tested had iodine content ranging from 33.9 ppm to 43.4 ppm (Table 2).

Discussion

The study revealed that of the ration supply salt 70.37% samples had iodine content above 30 ppm, of

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TABLE 1
Iodine content of Salt : Army ration supply

Iodine Content	No. of Samples	Percentage
Less than 15 ppm	01	3.70%
15 ppm to 30 ppm	07	25.93%
30 ppm to 50 ppm	08	29.63%
More than 50 ppm	11	40.74%

TABLE 2
Iodine content of Salt : Commercial

Sample Code	Iodine Content
Sample A	43.4 ppm
Sample B	36.5 ppm
Sample C	33.9 ppm

which 57.89% samples had Iodine above 50 ppm, while 3.70% samples of the ration supply salt had iodine content below 15 ppm (Tables 1 and 2).

Based on an average consumption of 13.68 g/day of salt [8], the average iodine intake will be 690 mcg/day which is almost four times more than the average daily recommended requirement of Iodine of 150 mcg/day [9]. There can be an additional intake of upto 40% more from other sources [8].

Though the mean value of 49.98 ppm is below the toxicity levels of 1000 ppm [10], the great variation from 10.6 ppm to 150.1 ppm in the salt tested, will supply Iodine varying from 146 mcg to 2100 mcg per day, at an average consumption of 13.8 g of salt per day. The higher levels could be potentially harmful to those above 40 years of age with nodular goitre [11]. These effects would be more manifest in areas with background environmental Iodine deficiency [10].

In comparison, the commercial brands of salt obtained from the open market had iodine content ranging from 33.9 ppm to 43.4 ppm which is within the accepted norms of iodisation. This calls for stricter monitoring of iodised salt being supplied to the Army to prevent iodine induced hyperthyroidism among those at high risk, as was found in the Seven Countries Study [12].

In conclusion, it is observed that the Iodine levels in the iodised salt supplied to the personnel of the Armed Forces in the Pune-Kirkee complex had great variation, with a large percentage of samples exceeding the 1000 mcg threshold for toxicity, while the commercially available iodised salt had a smaller acceptable variation of available iodine. This underscores the need for adequate quality control of salt iodisation [8] both at the manufacturers levels and at the Supply

Depot to ensure satisfactory iodisation, so as to overcome harmful side effects that can almost entirely be avoided by adequate and sustained quality assurance and monitoring. In the Armed Forces, routine consumer level testing could be entrusted to the existing health infrastructure, with salt testing laboratories being incorporated within existing MHs/SHOs. The recurring financial outlay for such a laboratory would be a mere Rs.16,040 per annum [13]. When measured against the burden of disease being reduced by the proven preventive method of salt fortification, it would be very cost effective and prove of immense benefit to the Armed Forces in the long term [13]

REFERENCES

1. Pandav CS, Karmakar MG, Nath LM. National Goitre Control Programme, National Health Program Series 5, New Delhi; National Institute of Health and Family Welfare 1988:11.
2. Hetzel BS. Iodine Deficiency. *Lancet* 1983 (ii): 1126.
3. Hetzel BS. The story of iodine deficiency: an international challenge in nutrition. Oxford University Press 1989.
4. Sooch SS, Deo MG, Karmakar MG, Kochupillai N, Ramachandran K, Ramalingaswami V. Prevention of endemic goitre with iodised salt. *Bull WHO* (1973); 49:307-12.
5. Venkatesh Mannar MG. Control of Iodine deficiency disorders by iodination of salt: Strategy for developing countries. In: Hetzel BS, Dunn JT, Stanbury JB (eds). *The Prevention and Control of Iodine Deficiency Disorders*. New York, Elsevier 1987:111-25.
6. Times of India. 30 Dec 97.
7. Karmakar MG, Pandav CS, Krishnamachari KAVR. Principles and procedure for iodine estimation. A laboratory manual. ICMR, New Delhi 1986.
8. Indian Council of Medical Research. Report of task Force on salt consumption pattern in India. ICMR, New Delhi 1996.
9. Pandav CS, Mohan R, Karmakar MG, Subramaniam P, Nath LM. Iodine deficiency in India, *Natl Med J India* 1980;2(1): 18-21.
10. Matovinic J. Complications of Goitre Prophylaxis. In: Stanbury JB, Hetzel BS (eds) *Endemic Goitre and Endemic Cretinism*, New York: Wiley Med J Publications 1980:533-49.
11. Wolff J. Iodide goitre and the pharmacologic effects of excess iodide, *Am J Med* 1969;47:101-24.
12. WHO/UNICEF/ICIDD. Joint Consultation. Review of findings from Seven Country Study in Africa on levels of salt iodisation in relation to iodine deficiency disorders, including iodine induced hyperthyroidism. WHO/Afro/NUT/97.2. World Health Organisation, Geneva 1998.
13. Pandav CS, Anand K, Karmakar MG. Costing of a salt iodine monitoring laboratory in India. *Natl Med J India* 1994; 75: 12-4.