A role for nongovernmental organizations in monitoring the iodine content of salt in northern India

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The feasibility of using nongovernmental organizations (NGOs) to monitor the iodine content of salt was studied in Uttar Pradesh, northern India, where iodine-deficiency disorders (IDDs) are endemic. Three NGOs already involved in health and development activities in the Gorakhpur, Varanasi, and Dehradun regions collected salt samples monthly from households and shops in selected villages over a 6-month period. A total of 4001 samples were analysed at regional laboratories by trained personnel using a standard protocol; 10% of the samples were sent to a central laboratory for external quality control. The iodine content lay in the range 0–95 mg/kg of salt; it was particularly low in the Gorakhpur and Varanasi regions, where over 80% of samples contained less than the minimum recommended level of 15 mg/kg; 37% of samples were in this category in the Dehradun region. Regular monitoring of the iodine content of salt at the consumer level is essential for the elimination of IDDs, and there is a need to improve awareness of this at all levels. NGOs can play a valuable role in both of these respects.

Introduction

Iodine-deficiency disorders (IDDs) are a major public health problem in India; about 150 million people are at risk, of whom 54 million have goitre, 2.2 million are cretins, and 6.6 million have milder neurological deficits (1). Irrespective of whether the cause of IDDs is environmental deficiency or the presence of goitrogens in the diet, the easiest way of eliminating the problem is to fortify dietary salt with iodine (2).

The National Iodine Deficiency Disorders Control Programme, which is organized by the Ministry of Health and Family Welfare, has the following important components:

— carrying out initial surveys to identify areas where goitre is endemic;
— production and supply of iodinated salt; and
— carrying out resurveys after 5 years of continuous supply of iodinated salt to assess its impact.

The Salt Commissioner’s Office at Jaipur (Rajasthan State) is responsible for ensuring the supply of iodinated salt.

The iodination of salt is a simple process that can be carried out by salt manufacturers and small-scale entrepreneurs. The manufacturers control the level of iodination by adjusting a nozzle, which sprays a solution of potassium iodate, and the amount of salt travelling on a conveyor belt below it. Government regulations require salt to be iodinated to a level of at least 50 mg of iodine per kg of salt (50 ppm) so that, after making allowance for losses of iodine during storage and distribution, the salt contains not less than 15 mg/kg of iodine (3). In India the average per capita consumption of salt is 10 g per day and salt with an iodine content of 15 mg/kg would therefore satisfy the recommended daily requirement of 150 μg of iodine.

Consistent monitoring of the iodine content of salt at the production, storage, sale and consumption levels, and prevention of the sale of uniodinated salt, are vital components of salt iodination programmes, which should be adjusted to meet local conditions and requirements. The information generated by the monitoring mechanism should be directly linked to

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decision-making, and there should be a feedback system allowing necessary changes to be made.

In India, salt iodination is primarily carried out in approximately 350 production centres, over 90% of which are in Gujarat, Rajasthan, and Maharashtra in the west of the country, and in Tamil Nadu and Andhra Pradesh in the south. Iodinated salt is largely transported by rail to the areas where IDD's are endemic, mainly in northern, north-eastern, and central India.

At present the Salt Commissioner's Office periodically checks the iodine content of salt at the production level. At the consumer level the Prevention of Food Adulteration Act is applicable to salt intended for human consumption in districts where IDD's are endemic, i.e., where the prevalence of goitre exceeds 10%; however, the monitoring system at this level still requires to be streamlined. The Act prohibits the sale of uniodinated salt in areas where IDD's are endemic.

Since there is no effective implementation mechanism and because uniodinated salt, which is cheaper than the iodinated product, is available for animals, consumer awareness about IDD's is important at the household level. It is also important for nongovernmental organizations (NGOs) to be actively involved in the monitoring process.

The objectives of the present study were as follows:

- to assess the iodine content of salt at the household and retail levels in selected districts in the Dehradun, Gorakhpur and Varanasi regions of Uttar Pradesh, where IDD's are endemic; and
- to study the feasibility of using NGOs in selected districts to monitor the iodine content of salt at the household and retail levels.

Methods

The feasibility of using NGOs to monitor the iodine content of salt was studied in five districts in Gorakhpur, five in Varanasi, and six in Dehradun regions. One agency was identified in each of the three regions to liaise with and coordinate the work of NGOs at the village level. The selection of districts, villages, and NGOs depended on their willingness to participate in the study. All the NGOs had already been active in the health, development, and environmental fields over the previous 20 years.

In June 1992 a detailed protocol of activities and methodology was worked out on the basis of discussion held between the Centre for Community Medicine at the All India Institute of Medical Sciences, a university hospital in Delhi, and the coordinators of the NGOs. Laboratory technicians and others were then trained in the collection, transportation, and analysis of salt samples. Regional iodine-monitoring laboratories were established by the three coordinating agencies. Progress was reviewed in March 1993, 6 months after the start of the scheme. The sequence of activities is shown in Fig. 1.

The aim in each village was to collect a sample every month for 6 months from a particular household in the poorer section and from a particular shop. In general this was achieved, but in some areas it was impossible to complete the protocol exactly for the following reasons:

- in many instances one shop catered for 5–10 villages; and
- many households refused to give samples regularly, perhaps because of a fear that salt, which in Indian culture is associated with loyalty and prestige, might be used for black magic purposes; in such cases, nearby households that were willing to participate were chosen and followed up.

All the samples collected were sent to the regional laboratories, in accordance with a uniform transportation protocol. The iodine content of the samples was determined by titration (4). Of the samples received, 10% were selected at random and sent by post to the central laboratory at the All India Institute of Medical Sciences, New Delhi, for external quality control; regular feedback on this was provided to the regional laboratories. Information on the iodine content of the salt was sent from the regional laboratories to the participating NGOs on a regular basis, and also to the district, state, and national authorities (Fig. 1).

![Fig. 1. Flow chart for monitoring the iodine level of salt in the study area. (AIIMS = All India Institute of Medical Sciences; NIDDCP = National Iodine Deficiency Disorders Control Programme).](image-url)
Results

The numbers of samples obtained in the Gorakhpur, Varanasi, and Dehradun regions were 992, 1397, and 1612, respectively (Table 1). In Varanasi only 6.7% of samples were from shops, compared with 28.6% in Gorakhpur and 22.1% in Dehradun. In Dehradun all the salt collected was unpacked, whereas only 5% and 20%, respectively, was unpacked in Gorakhpur and Varanasi. Packed salt was sold under more than 15 brand names, of which Tata, Taza and Tara were the commonest.

Table 2 shows the iodine contents of the salt samples, as determined at the regional headquarters within a month of collection. In Gorakhpur, 85.9% of the samples had less than 15 mg/kg of iodine; in Varanasi, 80.7% were in this category, and in Dehradun the corresponding value was 37.4%. A few samples in Dehradun and Varanasi, and 175 (18%) in Gorakhpur, contained no iodine at all. Some samples contained more than 80 mg/kg of iodine, the maximum being 95 mg/kg in Dehradun. Iodination thus seemed to be extremely variable in the study areas. Samples taken from packets of salt had higher and more uniform iodine content than those of loose salt.

There was no significant difference in the iodine content of salt samples from households and shops. This may have arisen because in shops most samples were of loose salt stored in open sacks, with the result that significant losses of iodine occurred. Furthermore, a higher proportion of samples from shops were of loose salt than was the case with household samples. When the data were analysed by month, there was very little variation in iodine content.

A total of 381 salt samples were received at the central laboratory, and the results of analyses performed there were comparable to those carried out in the regional laboratories.

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Table 1: Sources of the salt samples in the study

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of districts</th>
<th>No. of samples</th>
<th>No. of samples from:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Households</td>
</tr>
<tr>
<td>Dehradun</td>
<td>6</td>
<td>1 612</td>
<td>1 256 (77.9)*</td>
</tr>
<tr>
<td>Gorakhpur</td>
<td>5</td>
<td>992</td>
<td>708 (71.4)*</td>
</tr>
<tr>
<td>Varanasi</td>
<td>5</td>
<td>1 397</td>
<td>1 303 (93.3)</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>4 001</td>
<td>3 267 (81.7)</td>
</tr>
</tbody>
</table>

* Figures in parentheses are percentages.

Discussion

The study villages lie in the sub-Himalayan belt, where IDD's are highly endemic. Previous surveys in this area indicated that the prevalence of goitre was 16–40%. The iodine content of the salt available in the study area is very low, despite an official ban on the entry of uniodinated salt since October 1986. Iodinated salt supplies were introduced in Dehradun in 1986 and in Gorakhpur and Varanasi in 1987.

There was a wide variation in the iodine content of the salt. Some samples had 95 mg/kg of iodine, primarily in Dehradun, while 175 samples in Gorakhpur and 10 in Varanasi had no iodine at all. There is an urgent need for proper monitoring of the iodine content at the production, distribution, storage, wholesale, and retail levels in order to ensure a minimum of 15 mg/kg of iodine in the salt used in households.

The NGOs reported poor awareness of the causes, consequences and preventive measures associated with IDD's, even among district officials. However, during the course of the study the awareness of these officials increased, as did their understanding of the problems faced by the NGOs.

Table 2: Iodine content of the salt samples in the study

<table>
<thead>
<tr>
<th>Region:</th>
<th>No. of samples</th>
<th>% of samples with iodine content of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;15 mg/kg</td>
</tr>
<tr>
<td>Dehradun</td>
<td>1 612</td>
<td>37.4</td>
</tr>
<tr>
<td>Gorakhpur</td>
<td>992</td>
<td>85.9</td>
</tr>
<tr>
<td>Varanasi</td>
<td>1 397</td>
<td>80.7</td>
</tr>
<tr>
<td>Packing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loose</td>
<td>3 627</td>
<td>69.0</td>
</tr>
<tr>
<td>Packed</td>
<td>374</td>
<td>21.4</td>
</tr>
<tr>
<td>Source:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>3 267</td>
<td>65.4</td>
</tr>
<tr>
<td>Shops</td>
<td>734</td>
<td>60.5</td>
</tr>
<tr>
<td>Total</td>
<td>4 001</td>
<td>64.5</td>
</tr>
</tbody>
</table>
The study demonstrated that it was practical and feasible to involve NGOs in monitoring the iodine content of salt, particularly in hilly and tribal regions, where government outreach was limited. However, certain difficulties need to be considered if similar schemes are to be implemented, as outlined below.

- Shopkeepers and villagers were reluctant to provide salt samples.
- Shopkeepers stored salt primarily in large open sacks, although some salt was available in packed form. Manufacturing dates could not be determined for samples from open sacks, and it was usually impossible to take samples from packed salt.
- In many places, mainly in hilly areas, bartering was used to obtain supplies of salt for a year at a time, making it difficult to determine details of price, manufacturing date, etc.
- Households were advised of the iodine content of salt and the consequences of consuming uniodinated salt, and this led shopkeepers to feel that their businesses would be adversely affected through no fault of their own.
- A demand for iodinated salt needs to be generated. Shopkeepers are willing to sell any salt, since there is very little difference in the profit margin.

For a more successful implementation of the scheme that we have described, the following recommendations should be considered by government, manufacturers, traders, universities, and NGOs:

- an information, education, and communication campaign should be conducted in villages before monitoring is undertaken, with a view to helping people to realize the importance of consuming iodinated salt and hence increasing the demand for it;
- shopkeepers should be reassured that the measures are educative and that a lack of iodine in salt does not mean that they are at fault; and
- a workshop or training module for district officers should be provided at the onset of programmes.

Our findings clearly show that the current iodination process and its monitoring in the study area leave much to be desired. More vigorous supervision is necessary. It is important that the NGOs play their part even after a government scheme has been set up. The role of the NGOs should be fostered particularly in districts where IDDds are highly endemic. India has an extensive network of NGOs whose infrastructure makes it possible for them to carry out such work, as has been amply demonstrated, for example, with immunization.

Acknowledgements
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Résumé
Un rôle pour les organisations non gouvernementales dans la surveillance de la teneur du sel en iode dans le nord de l’Inde

Les troubles dus à la carence iodée posent un important problème de santé publique en Inde. La méthode de prévention la plus courante et la mieux connue consiste à ioder le sel de cuisine. Pour qu’elle soit efficace, il est indispensable d’exercer une surveillance régulière à tous les stades, du fabricant au consommateur. En supposant un apport quotidien moyen de 10 g de sel, la concentration en iode au niveau du consommateur ne doit pas être inférieure à 15 mg par kg de sel pour apporter la dose journalière recommandée de 150 µg d’iode.

La présente étude avait pour but de vérifier que le sel de cuisine avait une teneur en iode suffisante au niveau des ménages et des commerces de détail, en faisant appel à des organisations non gouvernementales pour prélever les échantillons. L’étude a été réalisée dans 16 districts des régions de Gorakhpur, Dehradun et Varanasi de l’Uttar Pradesh, dans le nord de l’Inde, où les troubles dus à la carence iodée sont endémiques. La vente de sel non iodé est officiellement interdite dans cet État depuis 1986. Dans chacun des villages couverts par l’étude, des échantillons de sel ont été prélevés à intervalles mensuels, l’un dans un ménage du quartier le plus pauvre et l’autre dans une boutique. La plus grande partie des échantillons ont été envoyés à un laboratoire régional dans le mois qui a suivi leur collecte, pour analyse par un personnel qualifié et selon un protocole normalisé, et 10% ont été envoyés au laboratoire central, à l’All India Institute of Medical Sciences, pour contrôle externe de la qualité. Les résultats ont été communiqués aux autorités ainsi qu’aux commerçants et aux villageois.
A role for NGOs in monitoring the iodine content of salt

Sur les 4001 échantillons recueillis, 3267 (82%) provenaient des ménages, et le reste des boutiques. Dans les régions de Gorakhpur et de Varanasi, plus de 80% des échantillons avaient une teneur en iodé inférieure à la valeur recommandée de 15 mg/kg; à Dehradun, cette proportion était de 37%; 90% des échantillons provenant de sel vendu en vrac avaient une teneur en iodé sensiblement inférieure à celle du sel vendu en paquets. Les responsables locaux de la mise en œuvre du programme avaient une connaissance insuffisante des causes et des conséquences de la carence iodée ainsi que des mesures préventives. La demande en sel iodé était faible de la part des villageois, ce qui n’incitait guère les commerçants à en avoir en stock.

Pour qu’un programme d’iodation du sel de cuisine soit efficace, il est nécessaire de surveiller étroitement la teneur en iodé du sel. Les organisations non gouvernementales peuvent être utilisées à cette fin, et elles peuvent également jouer un rôle utile en améliorant la prise de conscience, à tous les niveaux, des problèmes associés à la carence iodée.

References