Original Article

Status of iodine deficiency disorder in district Udham Singh Nagar, Uttarakhand state India

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ABSTRACT

Background: Iodine deficiency disorder (IDD) is a public health problem in Uttarakhand state. **Objective:** The present study was conducted in district Udham Singh Nagar, Uttarakhand state with an objective to assess the status of iodine deficiency amongst school age children (6-12 years). **Materials and Methods:** Thirty clusters were selected by utilizing the population proportionate to size (PPS) cluster sampling methodology. A total of 1807 children in the age group of 6-12 years were included. The clinical examination of the thyroid of each child was conducted. Urine and Salt samples were collected from children. **Results:** The Total Goiter Rate (TGR) was found to be 13.2%. The proportion of children with Urinary Iodine Excretion (UIE) level <20, 20-49, 50-99, 100-199 and ≥200 µg/l was found to be nil, 6.0, 21.2, 34.2 and 38.5 percent, respectively. The median UIE level was 150 µg/l. Only 46.7% of the salt samples had stipulated level of iodine of 15 ppm and more. **Conclusion:** The study population had mild degree of public health problem of iodine deficiency.

Key words: Excretion levels, goiter, iodine, iodised salt, thyroid

Introduction

The iodine deficiency leads to goiter and a spectrum of health consequences like stillbirth, mental retardation, deaf mutism, squint, dwarfism, goiter, neuromotor defects etc.[1] Iodine deficiency disorder (IDD) has been recognized as a major public health problem in India. In India, more than 200 million people are at risk of IDD.[2] Out of 587 districts in the country, 282 have been surveyed for IDD and 241 have been found to be goiter endemic.[3] The surveys conducted by central and state health directorates, Indian Council of Medical Research and medical institutes have demonstrated that not even a single State/UTs is free from problem of IDD.[2] India has made considerable progress towards elimination of IDD.[3] In 1983-84, the Government of India adopted a policy to achieve universal iodization of edible salt by 1992.[4]

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Iodine deficiency is a public health problem in Uttarakhand state, India. District Udham Singh Nagar in Uttarakhand state is a known endemic region for iodine deficiency. An earlier study conducted amongst children of 10-12 years reported the Total Goiter Rate (TGR) of 38.1% indicating severe public health problem of iodine deficiency in district Udham Singh Nagar.[5]

The present study was conducted in January 2013 with the objective of assessing the current status of iodine deficiency amongst school age children (6-12 years) in district Udham Singh Nagar, as there was lack of recent data on this aspect. The aim of the study was to provide scientific data to the state authorities, so that the corrective measures can be initiated to prevent IDD, if required.

Materials and Methods

A cross sectional survey was conducted in January 2013. Children in the age group of 6-12 years were included. In district Udham Singh Nagar, the school enrollment of

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primary classes was more than 90 percent and hence the school based approach was adopted. All the primary schools in rural and urban area in the district with their respective child enrollment were enlisted. Thirty schools (clusters) were selected according to population proportionate to size cluster sampling methodology.[6] In each school, the children were briefed about the objectives of the study and the informed consent was undertaken. The date and time for the survey was decided as per the convenience of the school. In each identified school (cluster), 60 children were included using Random Number Table (RNT). In each school, children was serially arranged according to their age groups 6≤8, 8≤10 and 10-12 years. With the help of RNT, a total of 20 children were selected from each of the age group. If the desired sample of children could not be covered from the selected school, the nearest adjoining school was included to complete the sample size. The clinical examination of thyroid of each child was conducted. The grading of the goiter was done according to the criteria recommended jointly by WHO/UNICEF/ICCIDD (a) Grade 0 - not palpable and not visible (b) Grade I - palpable but not visible (c) Grade II - palpable and visible).[6] When in doubt, all the investigators recorded the immediate lower grade. The intra and inter observer variation was controlled by repeated training and random examinations of goiter grades by first author. The sum of Grade I and II provided the TGR of the study population.[6] From each cluster, "On the spot" urine samples were collected from 19 children selected randomly, with the help of RNT from the list of children enrolled for clinical thyroid examination. Plastic bottles with screw caps were provided to each child for the urine samples. The samples were stored in the refrigerator until analysis. The analysis was done within 2 months. The UIE levels were analyzed using the wet digestion method.[7] A pooled urine sample was prepared for internal quality control (IQC) assessment. The IQC sample was analysed 30 times and mean and standard deviation (SD) of this pooled was calculated. The IQC samples of known concentration of iodine content were run with every batch of study urine samples. If the results of the IQC samples were within the range (i.e., Mean ± 2SD) then the urine sample results of study subjects was deemed valid. However, if the results were outside the range of IQC sample, then the whole batch of the study subjects was repeated.[8] For collection of salt samples, 22 children were selected randomly from each cluster and were provided with auto seal polythene pouches with an identification slip. Children were requested to bring four tea spoons of salt (about 20 gm) from their family kitchen. The iodine content of the salt was analyzed by using standard Iodometric Titration (IT) method.[9]

The project was approved by ethical committee of All India Institute of Medical Sciences, New Delhi.

Sample size

Keeping in view the anticipated prevalence of 15%, confidence level 95%, absolute precision of 2.0 and a design effect of 1.5, a total sample size of 1800 was calculated. In each cluster, 60 children were to be studied. However we studied a total of 1807 children.

Results

A total of 1807 children (847 Males and 960 Females) were included. The TGR was found to be 13.2% (Grade I - 13.0% and Grade II - 0.2%), indicating mild iodine deficiency. A total of 587 random samples of urine were collected. The median UIE level was 150 μg/l. The percentage of children who had UIE levels <20, 20-49, 50-99, 100-199 and ≥200 μg/l was nil, 6.0, 21.2, 34.2 and 38.5 percent, respectively. A total of 660 salt samples were collected. It was found that 46.7% of the children were consuming salt with iodine content of 15 ppm and more.

Discussion

According to WHO/UNICEF/ICCIDD, if more than 5% school age children (6-12 years) are suffering from goiter, the region should be classified as endemic to iodine deficiency.[6] In the present study, a TGR of 13.2% was found, indicating that population had mild iodine deficiency. Earlier study conducted amongst children of 10-12 years in Udham Singh Nagar had documented the prevalence of goiter as 38.1%.[5]

The median UIE level amongst the children studied was found to be 150 μg/l indicating that there was no biochemical deficiency of iodine in the subjects studied. Earlier studies conducted in the year 1999 and 2003 from adjoining districts reported the median UIE level of 175 μg/l and 110 μg/l, respectively.[10,11] We do not have data on UIE level from earlier studies in Udham Singh Nagar district hence; we could not compare our findings with earlier studies.

In the present study, 53.3% of families were consuming salt with iodine content of less than 15 ppm, which is below the stipulated level of iodine. However; an earlier study conducted in the district reported that only 4.4% of the families were consuming salt with less than 15 ppm of iodine.[5]

In conclusion, our study revealed that the population in district Udham Singh Nagar is possibly in a transition phase from iodine deficient (as revealed by TGR) to iodine sufficient nutriture (as revealed by median UIE levels). The elimination of IDD from district Udham Singh Nagar can be achieved by continued and sustained supply of

the iodized salt with adequate quantity of iodine to the entire population. There is further need to strengthen the existing monitoring system of the quality of the iodized salt to ensure that adequately iodized salt is available in the district.

Constraints of the study

The intra and inter observer variation in goiter examination was controlled by repeated training and random examination of goiter grade by experts. However, inspite of all the precautions for the quality control, a possibility existed for misclassification of Goiter grade I. The non response rate was less than 1% as study was conducted as a part of school annual health examination.

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