Original Article

Assessment of iodine deficiency in Kottayam district, Kerala State: a pilot study

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Iodine is one of the essential micro-elements required for normal human growth and development. Iodine Deficiency Disorders (IDD) are an important public health problem in India. There has been no data on the prevalence of IDD from the Kottayam district, India and hence, the present pilot study was conducted in the year 1999 to assess whether iodine deficiency existed in the district or not and to estimate the iodine content of salt consumed by the population. A total of 1872 children in the age group of 6–12 years were included in the study and were clinically examined. On the spot urine samples were collected from 251 children. A total of 420 salt samples were collected randomly from the families of the children. The total goitre prevalence was found to be 7.05% in the subjects studied. It was found that the percentage of children with urinary iodine excretions of < 2, 2– < 5, 5–9 and 10 μg/dL and above were 6.4%, 6.0%, 20.7%, and 66.9%, respectively. Assessment of the iodine content of salt by the iodometric titration method revealed that 60.6% of the children were consuming salt with an iodine content of 15 p.p.m. and more, which was the stipulated level of salt iodisation. The findings of the present study indicated that the population is in a transitional phase from iodine deficient, as revealed by total goitre rate, to iodine sufficient nutriture, as revealed by the median urinary iodine excretion level of 17.5 μg/dL.

Key words: iodine deficiency disorders, goitre, India, iodised salt, Kerala, urinary iodine excretion levels.

Introduction

Iodine is one of the essential micro elements required for normal human growth and development. The daily requirement of iodine is 150 μg. Until recently, iodine deficiency was recognised only by the presence of goitre, which is caused by hyperplasia of the thyroid gland due to unavailability of iodine for synthesis of thyroid hormones. It is now known that iodine deficiency causes not only endemic goitre and cretinism, but also a wide spectrum of disabilities including deaf mutism, mental and physical retardation and various degrees of neuromotor dysfunction.[1]

Iodine Deficiency Disorders (IDD) are a major public health problem in India. The results of sample surveys conducted by different agencies in 275 districts of 25 states and 4 union territories have identified 235 districts as endemic for IDD.[2,3] Recently, WHO/UNICEF/ICCIDD have recommended that for assessing iodine deficiency in an area, children in the age group of 6–12 years should be surveyed because of their combined high vulnerability and representativeness.[4]

There has been no data on the prevalence of IDD from the Kottayam district, India and hence, the present pilot study was conducted in the year 1999 to assess whether iodine deficiency existed in the district or not.

Methods

The study was conducted in the Kottayam district, Kerala. School children in the age group of 6–12 years were selected. The Kottayam district has a total population of 2 000 000.[5] The expected total population of children of 6–12 years was 177 679. The total number of upper primary schools in the district was 682. All the primary schools in the district were enlisted. The district was further divided into six regions and one school was randomly selected from each region by a table of random numbers. The total number of children in the age group of 6–12 years in all the schools was 162 889. The school enrolment in the district was more than 91%. A total of 1872 children in the age group of 6–12 years, who attended the primary school on the day of the survey, were studied. The children selected were representative of those in the age group of 6–12 years in the district. In each class, children were assembled and briefed about the IDD survey

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methodology. All the children were clinically examined for goitre using the palpation method by the second author. Goitre size was graded according to the criteria recommended by the WHO/UNICEF/ICCIDD.[4] The sum of grade I and grade II goitre provided the total goitre prevalence in the study population.

Autoseal polyethylene pouches were given to every fourth child and they were requested to bring 20 g of the salt that was routinely consumed by their family. A total of 420 salt samples were collected. The iodine content of the salt samples was analysed using the standard iodometric titration method.[6] Casual urine samples were collected from 251 children (every seventh child from those who were clinically examined). Plastic bottles with screw caps were used to collect the urine samples. The samples were stored in the refrigerator at 4°C until analysis. The urinary iodine excretion (UIE) level was analysed using the standard laboratory method.[7]

Results

A total of 1872 school children in the age group of 6–12 years were included in this study. The total goitre rate was found to be 7.05%.

Table 1 depicts the iodine content of salt samples collected from the families of school children. The iodine content of 420 salt samples was assessed by the iodometric titration method and it was revealed that 0.4% of the salt samples had nil and 39.0% had less than 15 p.p.m. of iodine.

Table 2 depicts the UIE levels of the school children studied. Of the 251 urine samples, the proportion of children with < 2 µg/dL, 2–4.9 µg/dL, 5–9.9 µg/dL and 10 µg/dL UIE levels were 6.4, 6.0, 20.7 and 66.9%, respectively. The median UIE level was 17.5 µg/dL.

Table 1. Iodine content of salt samples, Kottayam district, Kerala State, India, 1999 (n = 420)

Iodine content (p.p.m.)	Number	Percentage
Nil	1	0.4
< 15	164	39.0
≥ 15	225	60.6
Total	420	100.0

Table 2. Urinary iodine excretion levels (UIE) in the study subjects in Kottayam district, Kerala State, India, 1999 (n = 251)

UIE level (µg/dL)	Number	Percentage
≥ 10.0	168	66.9
5.0–9.9	52	20.7
2.0–4.9	15	6.0
< 2.0	16	6.4
Total	251	100.0

Median UIE level = 17.5 µg/dL.

Discussion

According to WHO/UNICEF/ICCIDD, if more than 5% of school age children (aged 6–12 years) have goitre then the area should be classified as endemic for iodine deficiency.[4] In the present study, the goitre prevalence in school children was found to be 7.05%, signifying that iodine deficiency existed in district Kottayam, Kerala.

WHO/UNICEF/ICCIDD have also recommended that no iodine deficiency is indicated in a population when the median UIE level is 10 µg/dL, that is, when more than 50% of the urine samples have UIE levels of 10 µg/dL, and not more than 20% of samples have UIE levels of 5 µg/dL.[7] The median UIE level in the present study was found to be 17.5 µg/dL indicating adequate iodine nutriture of the population. In a population, the goitre prevalence reveals past iodine status and the UIE levels indicate present iodine status. Results of the present study indicate that the population of the Kottayam district is in a transitional phase from iodine deficient, as revealed by total goitre rate (TGR), to iodine sufficient, as revealed by the median UIE of 17.5 µg/dL.

It was found that 60.6% of the subjects were consuming iodised salt with an adequate quantity of iodine, as assessed by the iodometric titration method. This could be the reason that the population studied had adequate iodine nutriture. Earlier studies conducted in the coastal regions of Ernakulam and Pondicherry, India, have reported a low prevalence of goitre in school children, being 1.0 and 2.6%, respectively.[8,9] However, studies from Portblair, Panaji and Bombay have reported a high goitre prevalence of 9.5, 16.6 and 43%, respectively.[10,11,12] These studies have postulated that the iodine deficiency observed was possibly due to goitrogens in the food consumed by the coastal population.

The findings of the present study indicate that the population is in a transitional phase from iodine deficient (as revealed by TGR) to iodine sufficient (as revealed by the median UIE of 17.5 µg/dL). There is a further need to undertake more detailed study using large sample sizes to establish the current status of IDD.

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