Iodine Deficiency Disorder in Rural Population: A Community based Observational Study on Prevalence in Coastal Area of Tamil Nadu State, South India

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Iodine Deficiency Disorder in Rural Population: A Community Based Observational Study on Prevalence in Coastal Area of Tamil Nadu State, South India.

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ABSTRACT

Background and Objectives: Iodine is an essential micronutrient needed for normal human growth and brain development.

Methods and Study Design: A community based observational study was done in Anichakuppam, Villupuram district, Tamil Nadu in the year of 2012 with a sample of 2830 individuals from 1233 households. Eight villages were randomly selected and data were collected by house-to-house survey. All age groups were included with an exclusion of <2 years in this present study.

Results: In the present study, overall goiter prevalence was 8% of which the visible goiter rate was 2.6%. The prevalence of goiter is more in the lower socio-economic group, higher prevalence was found in females as compared to males’ population.

Conclusion: We have concluded that the prevalence of goiter would be reduced by consuming mineral water for drinking purpose and by a program of distribution of iodized salt has been initiated to eliminate goiter problem.

Keywords: iodine deficiency disorder, rural population, prevalence, goiter, source of water

INTRODUCTION

Iodine is an essential micronutrient needed for normal human nutrition, health, growth and brain development1,2. The higher prevalence of mental retardation was found in 73 – 120 months of aged children3. Iodine deficiency disorders are a major public health problem in both developed and developing countries. Human beings from age groups 9–13 and above 70 years are need iodine ranging from 120 to 150 micrograms every day4. Iodine deficiency is the most common preventable cause of brain damage with more than 2 billion people from 130 countries at risk. They are a threat to the social and economic development of these countries5. Out of 587 districts in the country in the year, 241 of the 282 districts surveyed for IDD were found to be endemic. These 241 districts covered all the states and Union Territories in India6. IDD would be controlled by the coordination of the stakeholders in India, making policy and by some Food Safety and Standards Act, 2006 and by some other activities7,8. Iodine deficiency is the prominent and most important preventable cause of brain damage in all over the world9,10. In 1990 less than one in five households in the world used iodized salt. By 2007, more than 70% of households had access
to iodized salt. This means that every year, 90 million newborn’s brains are protected against a significant loss of learning ability. Around the world every year, 40 million newborns are not yet protected against IDD\textsuperscript{14}.

The present study aims to assess the prevalence of goitre in the study population and to find the association of goitre grade with gender, economic status, drinking water sources and religion.

**MATERIALS AND METHOD**

The community-based observational study was conducted in the field practice area of the Pondicherry Institute of Medical Sciences Rural Health Centre, Anichankuppam which administrated under the Marakkanam Panchayat Union of Villupuram district, Tamil Nadu. The study extended for a period of one month, from 1\textsuperscript{st} February – 26\textsuperscript{th} February 2012. Totally sixteen villages are under the field practice area of PIMS. Out of sixteen villages, we have selected eight (Kil Puthupattu, Koonimedu, Chettikuppam, Anumandai, Kil Pettai, Parichamedu, Alapakkam, Ora Nai) villages for this present study. These villages were shown in the figure – 1. The study population consisted of all individuals residing more than one year with an exclusion of children less than 2 years in the selected villages. Before started this study, we have got the prior and proper permission from the concerned village administrative officers/Panchayat leaders. From these selected 8 villages, totally 1233 households were visited and 2830 individuals were included by face to face interview method by using pre-designed and pre-tested questionnaire in which residents were available during house-to-house survey were included in this study. Who were available at the time of interview in these households were examined for goiter. Data collection was done by with the help of seventh semester UG medical students those who were properly trained in all aspects and under the supervision by Community Medicine faculties and interns.

**Goitre grading: Simplified classification of goiter by palpation\textsuperscript{15}**

**Grade 0:** No palpable or visible goiter; **Grade 1:** A goiter that is palpable but not visible. Thyroid nodules in a thyroid which is otherwise not enlarged fall into this category; **Grade 2:** A swelling in the neck that is clearly visible when the neck is in a normal position.

**Socio-economic status:** It was determined by using the Modified B G Prasad classification\textsuperscript{17} of socio-economic status by using by P. Kumar’s conversion factor, which is based on taking the rural all India consumer price index for January 2011 was taken for calculation and the formula was following\textsuperscript{18}.

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**Figure 1:** Map of Tamil Nadu and Distribution of villages in Marakkanam Block

![Map of Tamil Nadu Distribution of villages in Marakkanam Block](image-url)
Social Class = \( \frac{\text{Value of CPI}}{100} \times 4.93 \)

The socio economic classes for the year of 2011 as shown below in Table – 1.

### Table 1: Distribution of Socio economic class as per Prasad’s Classification for the year of 1961 and the updated modified classification

<table>
<thead>
<tr>
<th>Socio Economic Class</th>
<th>Prasad’s Classification 1961</th>
<th>Modified Prasad’s Classification 1997</th>
<th>Updated Modified Prasad’s Classification 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>100 and above</td>
<td>1900 and above</td>
<td>3600 and above</td>
</tr>
<tr>
<td>II</td>
<td>50–99</td>
<td>950–1899</td>
<td>1800–3599</td>
</tr>
<tr>
<td>III</td>
<td>30–40</td>
<td>570–949</td>
<td>1100–1799</td>
</tr>
<tr>
<td>IV</td>
<td>15–29</td>
<td>285–569</td>
<td>550–1099</td>
</tr>
<tr>
<td>V</td>
<td>Below 15</td>
<td>Below 285</td>
<td>Below 550</td>
</tr>
</tbody>
</table>

Data were compiled and analyzed by using Microsoft Excel 2007 and SPSS 16.0. Mean, standard deviation, proportion, Chi-square test and significant was taken as \( p < 0.05 \).

**FINDINGS**

In this present study, 2830 were interviewed in 8 villages. Out of 2830, 793 (28.0%) were males and 2037 (72.0%) were females. Among 1233 surveyed households, Hinduism was the major religion followed by 85%, Muslims 13%, and only 2% were Christian. Source of drinking water are bore well, piped water, hand pump and mineral water in the study area. The major source of drinking water were bore well 46%, piped water from the panchayat water tank 42.6% and was found hand pumps 9.6%. It is interesting to know that 23 households, comprising 1.8% of the surveyed houses used the 20 liters mineral water cans for drinking purposes. Sixty one percent of the households belonged to middle class, including 32% in upper middle and 29% in lower middle classes. 22% households were in the lower classes, with 17% in upper lower and 5% in lower classes. 17% of the households were in upper class strata as per the Modified BG Prasad Classification used in this study. Among 2830 individuals maximum 891 (31.5%) belong to 21 – 30 years and only 64 (2.5%) are in above 60 years. The difference in age composition among male and females is statistically very highly significant \( (p < 0.001) \) as shown above in Table – 2. Over all goiter prevalence was found as 226 (8.0%) (Grades 1 & 2 together). The prevalence is more in female 179 (8.8%) as compared with male 47 (5.9%).

### Table 2: Distribution of Age and Gender among the study participants (N = 2830)

<table>
<thead>
<tr>
<th>Age – Group (in Years)</th>
<th>Male n (%)</th>
<th>Female n (%)</th>
<th>Total N (%)</th>
<th>( p–\text{Value} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–10</td>
<td>24 (3.0)</td>
<td>113 (5.5)</td>
<td>137 (4.8)</td>
<td>57.900 d.f = 6 0.0001*</td>
</tr>
<tr>
<td>11–20</td>
<td>76 (9.6)</td>
<td>201 (9.9)</td>
<td>277 (9.8)</td>
<td></td>
</tr>
<tr>
<td>21–30</td>
<td>218 (27.5)</td>
<td>673 (33.0)</td>
<td>891 (31.5)</td>
<td></td>
</tr>
<tr>
<td>31–40</td>
<td>234 (29.5)</td>
<td>588 (28.9)</td>
<td>822 (29.0)</td>
<td></td>
</tr>
<tr>
<td>41–50</td>
<td>115 (14.5)</td>
<td>292 (14.3)</td>
<td>407 (14.4)</td>
<td></td>
</tr>
<tr>
<td>51–60</td>
<td>87 (11.0)</td>
<td>145 (7.1)</td>
<td>232 (8.2)</td>
<td></td>
</tr>
<tr>
<td>&gt; 60</td>
<td>39 (4.9)</td>
<td>25 (1.2)</td>
<td>64 (2.5)</td>
<td></td>
</tr>
<tr>
<td>Total (N)</td>
<td>793 (28.0)</td>
<td>2037 (72.0)</td>
<td>2830 (100)</td>
<td></td>
</tr>
</tbody>
</table>

\*\( p – \text{value} < 0.001 \) Very Highly Statistically Significant.

Table 3 shows that the age and gender wise prevalence of goiter. The association of goiter between the gender wasn’t statistically significant. The prevalence of goiter was more among Christians 8.8%, followed by 8.1% among Hindus and 6.7% among the Muslims. However, this difference was statistically not significant.

**Table 3**
**DISCUSSION**

The overall percentage of prevalence of goiter of our present study was found as 8.0% of which the visible goiter rate was 2.6%. Whereas a study was done by Hazarika and Mahanta have reported in their retrospective analysis study that the overall high prevalence of goiter was 33.8% of which visible goiter rate was mentioned as 5.82%. The percentage of prevalence differs from area to area, place to place and between state to state in India. The percentage of prevalence differs from interstate in India. Gakkhar et al. found a low prevalence of 2.4% among six to fifteen years among school going children in Jabalpur city of Madhya Pradesh. We have also found a very low prevalence 1.33% in up to ten years aged children. Similarly study by Sundaram et al. showed a low prevalence of 2.5% in their study in Belgaum district of Karnataka in India. But, Chandra et al. showed a high prevalence of 38.8% in Kolkata of West Bengal. Qian et al. have done a meta analysis study in China that the iodine deficiency effects on the intelligence of the children. Very few studies have been carried out about IDD status among the rural population in Tamil Nadu, despite the importance of this major easily preventable public health problem. 61% of the households belonged to middle class and less number of the households were in upper class strata. The major sources of drinking water in the study area were bore well as compared to NFHS – 3 data.

Kamath et al. have found that the prevalence of goiter was 16.6% among rural population in Belgaum district in Karnataka and found to be more in female than male population. Similar types of results have been found in our present study. Hayat et al. in a house to house survey and was reported a more goiter prevalence and it was more in females (25.3%) as compared to males (15.3%). In some studies, similar kinds of results were found a significant increase in the percentage of prevalence in females over male population. A study by Sanker et al. revealed that the overall goiter prevalence was mentioned as 54% and more over the Goiter prevalence was higher in females as compared to males. Age, gender and the socio-economic class showed a significant relationship with goiter. The prevalence is higher as the age increased, higher in females and in the lower socio-economic classes as compared to the middle and upper classes. Religion and source of drinking water wasn’t significant difference in the prevalence of goiter.

**CONCLUSION**

From this study we have concluded that the prevalence of goiter is more in the lower socio-economic group. The prevalence of goiter was a higher prevalence among females as compared to males’ population.
Through IEC program educate public to use the iodized rich salt, selling iodized salt by all stakeholders as well as by the retail shopkeepers to eliminate or to control the IDD problem effectively in rural population.

Conflict of Interest: None

Source of Funding: No funding from any agencies/financial institutions.

Ethical Clearance: Ethical approval was taken from Institutional Ethics Committee of Pondicherry Institute of Medical Sciences, Pondicherry before conducting our study. We have explained about our study and its importance in local language TAMIL and no incentives was given to them. Anonymity and confidentiality were ensured throughout the study.

REFERENCES


