Prevalence of Iodine Deficiency Disorder Amongst Orang Asli in Hulu Selangor, Malaysia

Iodine deficiency disorder (IDD) remains a significant global public health problem. The aim of this study was to assess the prevalence of IDD amongst Orang Asli in semi-urban areas. A cross sectional study was conducted in April of 2006 in whom 346 children and adult women participated. UIC was performed in 97 (28.0%) pre-school children (PSC) aged 1-6 years old, 115 (33.2%) primary school going children (SGC) aged 7-12 years old and 134 (38.8%) adult women (≥ 15 years old). The median UIC of the studied population was 45.11 µg/L while the median UIC was 49.43 µg/L, 47.81 µg/L and 38.98 µg/L for PSC, SGC and adult women respectively. Moderate to severe IDD was present in 50% of PSC, 53.9% of SGC and 70.1% of adult women. Therefore, the Universal salt Iodization (USI) approach may have eliminate IDD in the areas.

Keywords: Iodine, Iodine Deficiency Disorder (IDD), Orang Asli

UDC: 612.392.64

Introduction

Iodine deficiency disorders (IDD) are recognized as a major public health problem for populations throughout the world, especially in children and pregnant women. Iodine deficiency is the single most preventable cause of mental retardation which can vary from mild intellectual blunting to frank cretinism and it is the single most important preventable cause of brain damage (WHO, UNICEF and ICCIDD, 2007).

According to the latest data, about 2.5 billion people worldwide have inadequate iodine intake, of which 313 million are in the South-eastern Asian region that includes Malaysia (Khairuddin et al., 2001). Following a national IDD survey in 1996, Malaysia has implemented universal salt iodization in Sabah and the majority of districts in Sarawak; however, it remains a public health problem in Peninsular Malaysia especially in a small group of indigenous Orang Asli community (Foo, 1995). They constitute a minority group making up approximately 0.6% of the total Malaysia population of 22.2 million in 2000 (Department of Statistics, 2006). There has been a gradual shift in the rural-urban distribution of Orang Asli since 1970. The 1991 census showed that the majority of Orang Asli lived in rural areas (88.7%) and small towns (2.4%) with a small percentage (9%) in urban areas (Department of Statistics, 1997; Osman et al.,1992) found a high prevalence of goitre (26.5%) of which 61.5% was Grade 1 amongst adult Orang Asli in rural area. A study carried out in a small town of Hulu Selangor (Noor Hayaati et al., 1999) also reported high prevalence of goitre ranging between 58.2 - 82.3%.

Similarly, Cuthbertson et al. (2000a) found that the median urinary iodine concentration (UIC) amongst the adult women Orang Asli in a village located 46 km far from Kuala Lumpur was 14.5 µg/L; it falls under the category of severe IDD. Over the last 2 decades, Malaysia has undergone major socio-economic changes that have led to significant improvement in the health of its general population; at the same time, the national IDD survey in 2008 revealed pockets of IDD in both rural and urban areas in Peninsular Malaysia (Wan Nazaimoon and Rusidah, 2010). The aim of this study was to determine...
the prevalence of IDD amongst Orang Asli who resides in urban fringed areas in Hulu Selangor.

Materials and methods

A cross sectional study was conducted from May 2006 to July 2006 in four selected Orang Asli villages in Hulu Selangor (Pertak, Gerachi, Kuala Kerling and Sungai Jang) as a high incidence of endemic goitre has been noted in these areas (Noor Hayaati et al., 1999). These villages have 400 children and women. These areas are located approximately 90 km from Kuala Lumpur and they have access to Kuala Kubu Baru town which is 15 km away via tarred road.

The study population comprised pre-school children aged 1-6 years old, school going children aged 7-12 years old and adult women aged ≥15 years old. The pregnant women were excluded. All children and women residing in the 4 villages were invited to join the study. Informed consent was obtained from adult women, parents of pre-school children and school going children prior to the study. General approval was obtained from the Department of Orang Asli Affairs (JHEOA), and cooperation was sought from the local health authority. The study was approved by Malaysian Research Ethic Committee, Ministry of Health.

Demographic data were collected using questionnaire. Spot casual urine samples from pre-school children, school going children and adult women were collected in screw cap test tubes, labelled and packed into polystyrene boxes containing ice, before being transported to the Institute for Medical Research (IMR) for analysis. Samples were kept at -20°C prior to analysis. The samples were analyzed for iodine concentration using spectrophotometric measurement of iodine in the Sandell-Kolthoff reaction which involved an iodine catalyzed reduction of yellow ceric (IV) ions to colourless cerous (III) ions by ammonium persulfate (Pino et al., 1996). The normal population median value of urinary iodine is 100-199 µg/L, values of ≥300 µg/L and 200–299.9 µg/L suggest excessive and more than adequate respectively , while 50–99.9 µg/L, 20–49.9 µg/L and <20 µg/L suggest mild ,moderate and severe iodine deficiency respectively (WHO, UNICEF and ICCIDD, 2007).

Statistical analysis was performed using SPSS for Windows (Version 11.5). A normality test was conducted to examine the data distribution and urinary iodine was skewed to the right. Results were summarized by frequencies, percentages and medians. Differences in median urinary iodine concentration between groups were evaluated using the Kruskal-Wallis test. Two-tailed p values less than 0.05 were taken as significant.

Results

A total of 346 Orang Asli children and women (86.5%) participated in the study, 97 respondents (28.0%) were pre-school children, 115 (33.2%) were school going children and 134 (38.8%) were adult women. The median age of the pre-school children and school going children was 4 and 9 years respectively. The median age of adult women was 30 years and ranged from 15 to 76 years. Majority (44%) has a household size of more than or equal to five. In terms of occupational status, 62% of them were self-employed and only 20% work as construction workers in private enterprises in a nearby town. Self-reported monthly household income ranged from less than 500 Ringgit (RM) to more than RM 1000.

The median UIC amongst all the Orang Asli groups are shown in Table 1. The median UIC amongst Orang Asli was 45.1 µg/L. The median UIC in pre-school children was 43.3 µg/L while the median UIC amongst school going children and adult women were 50.0 µg/L and 42.3 µg/L respectively. The adult women have significantly lower median UIC when compared to the children (p < 0.01).
Table 2. shows the international criteria for assessing the public health significance of IDD in this population using median UIC. According to this criteria, the median UIC falls within the ‘moderate iodine deficiency’ category. Moderate deficiency (UIC < 50 µg/L) affected 55.7% of preschool children, 46.1% school going children and 48.5% adult women. The prevalence of severe iodine deficiency was 13.4% in both preschool children and adult women but only 3.5% in school going children. None of the preschool children and adult women and only 1.7% of school going children have more than adequate UIC.

### Table 1. Median Urinary Iodine Concentration (µg/L) amongst Orang Asli in Hulu Selangor

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Iodine (µg/L)</th>
<th>Interquartile range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>median</td>
<td></td>
</tr>
<tr>
<td>Pre-school children (1 - 6y)</td>
<td>97</td>
<td>43.3a</td>
<td>29.7 - 57.8</td>
</tr>
<tr>
<td>School going children (7 - 12y)</td>
<td>115</td>
<td>50.0a</td>
<td>37.2 - 71.5</td>
</tr>
<tr>
<td>Adult women (≥15y)</td>
<td>134</td>
<td>42.3a</td>
<td>27.1 - 65.1</td>
</tr>
<tr>
<td>All respondents</td>
<td>346</td>
<td>45.1</td>
<td>31.2 - 64.7</td>
</tr>
</tbody>
</table>

Note: Kruskal Wallis Test - *P* < 0.01.

### Table 2. Distribution of Urinary Iodine Concentration (µg/L) amongst Orang Asli in Hulu Selangor

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Respondents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt; 20 µg/L 20 - 49 µg/L 50 - 99 µg/L 100 - 199 µg/L 200 - 299 µg/L ≥300 µg/L</td>
</tr>
<tr>
<td>Pre-school children (1 - 6y)</td>
<td>97</td>
<td>13 (13.4) 54 (55.7) 21 (21.6) 8 (8.2) 0 (0) 1 (1.0)</td>
</tr>
<tr>
<td>School going children (7 - 12y)</td>
<td>115</td>
<td>4 (3.5) 53 (46.1) 44 (38.3) 12 (10.4) 2 (1.7) 0 (0.0)</td>
</tr>
<tr>
<td>Adult women (≥15y)</td>
<td>134</td>
<td>18 (13.4) 65 (48.5) 38 (28.4) 13 (9.7) 0 (0.0) 0 (0.0)</td>
</tr>
<tr>
<td>All respondents</td>
<td>346</td>
<td>35 (10.1) 172 (49.7) 103 (29.8) 33 (9.5) 2 (0.6) 1 (0.3)</td>
</tr>
</tbody>
</table>

### Discussion

Orang Asli is the indigenous population of Malaysia who traditionally is a marginalized group that has low socio-economic status, low literacy rate and higher infant mortality. Majority does not have a fixed employment and still lead a hunter-gatherer existence. Malnutrition and communicable diseases are also common amongst them (Cuthbertson et al., 2000b).

This study revealed that despite the socio-economic development over the past 10 years, our study population is still threatened by moderate IDD problem with a median UIC of 45.1 µg/L. The median UIC of Orang Asli from the remote areas of Pahang was between 15 - 35 µg/L (Osman et al., 1994) and 16.6 µg/L (Zaleha et al., 1998) while that from the
A remote village in Kedah was 16.5 µg/L (Zaleha et al., 1995). In another study, despite the proximity of the village to Kuala Lumpur, the median UIC of Orang Asli was 14.5 µg/L (Cuthbertson et al., 2000a). Although there has been a slight improvement when compared to other studies conducted over the past 2 decades we do not think this is significant. This is because the urine iodine in previous studies was measured by the alkaline ashing method which may have resulted in loss of iodine during the process of measurement resulting in falsely low urine iodine concentration.

There are several possible explanations why this population is still plagued by IDD despite an improvement in their living standard. Majority of the houses have provision of basic infrastructure such as piped water supply, electricity and toilet facility but the water is not iodized. Furthermore, the staple food of the Orang Asli is still Cassava which is considered goitrogenic due to its thiocyanate content. Majority still rely on locally produced food sources which are low in iodine due to environmental conditions and there is also a low intake of seafood. (Cuthbertson et al., 2000a; Zaleha et al., 1998).

Orang Asli is one of the impoverished groups in the country and there is still a high incidence of poverty when compared to the general population. In this study, 53% of the adult women have a monthly income of less than RM500 which falls into the category of hardcore poverty. Majority were self employed in agricultural-based economic activities like fishing, gathering local jungle produce such as durian and bamboo. As a result, majority of them cannot afford to buy iodised salt which cost more than ordinary salt. Currently universal salt iodization has not been implemented in Peninsular Malaysia which explained the mild IDD in almost 50% of the states. It is therefore justified to implement universal salt iodization nationwide so that everyone has uniform access to iodized salt. Until the past decade, many of the Orang Asli children did not attend school but the number of children who completed primary, secondary and tertiary education levels has increased over the years. This study revealed that school going children has the highest median UIC compared to pre-school children and adult women. This could be explained by the type of food they ate in school.

**Conclusion**

Greater efforts need to be made by all relevant authorities to increase Orang Asli awareness on the importance of adequate iodine nutrition. Even mild IDD could cause intellectual impairment resulting in decreased learning ability, school performance and also income-earning potential. Therefore, more strategies and attention need to be paid to this group of indigenous population so that optimal iodine status can be reached and sustained.

To avert the burden of another generation of mentally underdeveloped communities, a universal salt iodization programme (USI) may eliminate IDD in these region. However, it need to be carefully monitored not only for quality control of the iodine content but also for early diagnosis and treatment of hyperthyroidism.

**Acknowledgement**

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