Nutrition and Goiter Status of Primary School Children in Ibadan, Nigeria

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ABSTRACT: Iodine Deficiency Disorders (IDD) has continued to be of significant health problem in some communities despite universal salt iodization (USI). There is therefore a need to investigate several other factors beside iodine intake that could likely contribute to the continued prevalence of iodine deficiency in these communities. This study was therefore designed to assess the iodine deficiency status of primary school children in four schools in Ibadan, and also to answer if there is a relationship between both gender and protein energy malnutrition (PEM) with iodine deficiency. Goiter status of the subjects was determined using the WHO techniques and classifications. Heights and weights were measured using standard techniques and anthropometric indices of weight-for-age, height-for-age and weight-for-height were used to classify the children into various category of nutritional status. Four hundred and seventy one (471) school children comprising of 246 (52.2%) males and 225 (47.7%) females were assessed. The mean age (SD) was 10.9 (1.05) yrs, mean height (SD) was 1.36 (0.08) m and mean weight (SD) was 28.7 (5.3) kg. It was observed that 42.2% of the school children had palpable goiter, 21.2% were stunted, 15.1% were underweight and 3.7% were wasted. There was no significant gender difference observed for goiter, stunting, wasting and underweight. It was observed that, only goiter and stunting were significantly associated (p<0.05). Apart from goiter and stunting being chronic or long-standing, this relationship remains unclear. Since more than 40% of these children had some degree of goiter and more than 21% were stunted, iodine deficiency and malnutrition among school children in Ibadan remain public health problems.

Keywords: goiter, iodine deficiency, malnutrition.

INTRODUCTION

Enlarged thyroid gland in front of the neck (goiter) is usually not a life-threatening condition, but its presence signifies that there may be iodine deficiency disorders (IDD). The spectrum of disease called IDD may include; increased rate of still births, spontaneous abortions, infant deaths, reduced mental function, growth failure, speech and hearing defects (ACC/SCN 1992). Much has been achieved in the area of universal salt iodization (UNICEF 2003, Egbuta et al 2003, NAFDAC 2003) in the sub-Saharan Africa and Nigeria in particular. Nevertheless iodine deficiency continues to be of public health importance (UN/SCN 1993, Ojule et al 1998, SCN 2004) in some communities.

Apart from iodine intake, other factors are known to interfere with adequate iodine nutrition, these includes protein-energy malnutrition (Gaitan et al 1983, Brahmbhatt et al 2001), vitamin A deficiency (ACC/SCN 1994) and intake of goitrogens in foods (ACC/SCN 1987) which also predispose to goiter formation.

The issue of gender cuts across all area of health and living (Kishor and Neitzel 1996, Oniang‘O and Mukuledi 2002). Gender has been implicated in the prevalence of iodine deficiency and protein energy malnutrition (Gur et al 2003, Osmani and Sen 2003). Furthermore there is contrasting evidence on whether or not gender affects the nutritional well being (Kahaela et al 2002, FAO 2003) and if so, which of the gender groups are mostly affected (SCN 2002, Kimhi 2004).

The effect of both iodine deficiency and PEM may be pronounced among the school age children as they seem to be the most exposed to the fundamental risk factors; poor food consumption patterns, poor sanitation, infections, illnesses (UN/SCN 2000, Amigo et al 2000). Whether or not there is a gender bias in the prevalence of goiter among school children between 9 to 12 years in Nigeria is not clear. This study was,
therefore, carried out to investigate whether there is a
difference between boys and girls in prevalence of
goiter and PEM (as measured by indices for stunting,
wasting and underweight). Secondly, to investigate
whether there is a relationship between goiter and
PEM in these school children.

The general objective of this study was to assess
the prevalence of goiter and protein energy
malnutrition in primary school children in Ibadan. The
specific objectives included (a) To assess the
prevalence of PEM as measured by indices for
underweight, stunting and wasting among the school
children (b) To assess the prevalence of goiter using
WHO techniques of observation and palpation (WHO
2004), (c) To assess the relationship between
nutritional status and goiter status among the school
children (d) To assess the prevalence of goiter in boys
and girls in order to evaluate if there is a difference (e)
To assess if there is a difference in prevalence in
wasting, stunting and underweight between the boys
and girls.

MATERIALS AND METHODS

Study Design:
This study was descriptive and cross-sectional in
design, and was carried out in five primary schools
selected using random sampling techniques from the
five local government areas (LGA) in Ibadan. Data
collection was in November 2004 and lasted two
weeks.

The subjects for the study were primary school
children 9 to 12 years old, who were apparently
healthy and were willing to participate in the study.
Ethical clearance was obtained from the ministry of
Education. The minimum sample size as calculated
was 339, however, 471 subjects were included in this
study.

Sample Selection:
Selection of the schools from the five local
government areas and the subjects from each school
were all done using simple random sampling
techniques.

Measurements:
Tools used in collecting required data included a
Questionnaire, stadiometer and a digital weighing
scale. Information collected included those on socio-
economic status (name, age, class, sex, parent’s
occupation, family size, and type of housing),
anthropometric measurements and indices (weight,
height, weight-for-age, height-for-age and weight-for-
height), goiter status using WHO techniques. For
goiter classification or grades: Grade 0 - No visible or
palpable goiter, Grade 1 – No goitre detectable by
palpation and visible only when the neck is fully
extended while Grade 2, goitre is both palpable and
visible with the neck in its normal position.

Quality Control:
Data Collectors were trained on the various data
collection procedures and standardized instruments
were used. Immediate recording of data was ensured
by assigning each researcher to one specific aspect of
data collection.

Statistical Analysis:
Data entry and analyses were completed using the
statistical package for social sciences (SPSS version
10). Descriptive statistics including means and
standard deviations were determined. Prevalence of
goiter, weight-for-age, height-for-age and weight-for-
height were described as percentages. The student t-
test was applied for test of significance between means
in gender and goiter status and also between goiter and
nutritional status.

RESULTS
A total of four hundred and seventy one (471) school
children participated in this study, comprising of
246(52.2%) males and 225 (47.8%) females. The
subjects had a mean (SD) age of 10.9 (1.06) years.
Two hundred and eighty-four (60.3%) of the school
children had no goiter, while total goiter rate (both
visible and palpable) was 39.7% by palpation (Table
1). Only 73 (15.5%) of the children were underweight
(Table 2), while 102 (21.70%) were stunted (Table 3)
and 14 (3.7%) were wasted (Table 4).

Table 1:
Age and Gender of Subjects

<table>
<thead>
<tr>
<th>AGE yrs</th>
<th>MALES N %</th>
<th>FEMALES N %</th>
<th>TOTAL N %</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>23 9.3</td>
<td>28 12.4</td>
<td>51 10.8</td>
</tr>
<tr>
<td>10</td>
<td>62 25.2</td>
<td>65 28.9</td>
<td>127 27.0</td>
</tr>
<tr>
<td>11</td>
<td>58 23.6</td>
<td>43 19.1</td>
<td>101 21.4</td>
</tr>
<tr>
<td>12</td>
<td>103 41.9</td>
<td>89 39.6</td>
<td>192 40.8</td>
</tr>
<tr>
<td>Total</td>
<td>246 52.2</td>
<td>225 47.8</td>
<td>471 100.0</td>
</tr>
</tbody>
</table>

Gender and Goitre:
While 22.6% of the males had grade 1 goitre, only
16% of the girls are in this category. Grade 2 goitre is
found in 1.1% of boys and 0.6% of the girls. This is
significant (p<0.05) (Table 5).
### Table 2: Goitre Prevalence

<table>
<thead>
<tr>
<th>Grade</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>284</td>
<td>60.3%</td>
</tr>
<tr>
<td>Palpable</td>
<td>180</td>
<td>38.2%</td>
</tr>
<tr>
<td>Palpable and Visible</td>
<td>7</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>471</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Table 7: Gender and Underweight

<table>
<thead>
<tr>
<th>Index</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>45.2%</td>
<td>39.9%</td>
<td>84.9%</td>
</tr>
<tr>
<td>Mild to moderate</td>
<td>7.0%</td>
<td>7.9%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Severe</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52.2%</strong></td>
<td><strong>47.8%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Table 8: Gender and Stunting

<table>
<thead>
<tr>
<th>Index</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>42.3%</td>
<td>36.0%</td>
<td>78.3%</td>
</tr>
<tr>
<td>Mild to moderate</td>
<td>8.9%</td>
<td>9.8%</td>
<td>18.7%</td>
</tr>
<tr>
<td>Severe</td>
<td>0.9%</td>
<td>2.1%</td>
<td>3.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52.1%</strong></td>
<td><strong>47.9%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Table 9: Gender and Wasting

<table>
<thead>
<tr>
<th>Index</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>54.4%</td>
<td>42.0%</td>
<td>96.4%</td>
</tr>
<tr>
<td>Mild to moderate</td>
<td>1.2%</td>
<td>1.3%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Severe</td>
<td>0.3%</td>
<td>0%</td>
<td>0.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56.7%</strong></td>
<td><strong>43.3%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Table 10: Goitre and Weight for Age (Underweight)

<table>
<thead>
<tr>
<th>Index</th>
<th>Goiter Grade</th>
<th>Grade 0</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>50.9%</td>
<td>32.7%</td>
<td>1.3%</td>
<td>84.8%</td>
<td></td>
</tr>
<tr>
<td>Mild to moderate</td>
<td>8.5%</td>
<td>6.0%</td>
<td>0.4%</td>
<td>14.9%</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>59.6%</strong></td>
<td><strong>38.7%</strong></td>
<td><strong>1.7%</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

No significant association was observed between goiter and weight-for-age (p>0.05).

### Table 11: Goitre and Height-for-Age (Stunting)

<table>
<thead>
<tr>
<th>Index</th>
<th>Goiter Grade</th>
<th>Grade 0</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>47.3%</td>
<td>30.3%</td>
<td>0.6%</td>
<td>78.3%</td>
<td></td>
</tr>
<tr>
<td>Mild to moderate</td>
<td>10.9%</td>
<td>7.2%</td>
<td>0.6%</td>
<td>18.8%</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>1.5%</td>
<td>1.1%</td>
<td>0.4%</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>59.7%</strong></td>
<td><strong>38.6%</strong></td>
<td><strong>1.7%</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

(p<0.05)
DISCUSSION

The results from this study showed that 189 (40.12%) had goiter, (23.7%) from males and (16.6%) females. This high goiter rate among the primary school children agrees with the WHO declaration in 2004, that iodine deficiency was still a public health problem in most countries.

No gender differences was observed for goiter prevalence (p>0.05) in this study. This however is not consistent with findings from many studies, which had reported gender difference in iodine nutrition (Sinha et al 1999, ACC/SCN 2001 and Medda et al 2005). In a study to investigate the prevalence of goiter among school children in Iran (Bazrafshan et al 2005), more girls, were reported to have had a higher risk for developing goiter. Furthermore, Medda et al (2005) found gender to be a significant risk factor for developing congenital hypothyroidism. It is not clear whether this difference is linked to the socio-cultural attitude to the girl-child in these populations. There is no reported bias to the girl child in Ibadan, Nigeria where this study was conducted.

The study revealed a statistically-significant relationship between goiter and stunting (p<0.05), the most prevalent form of PEM as shown by the results. Evidences from studies support that PEM could be an etiological factor (among others) for iodine deficiency disorders (Gaitan et al 1983, Brahmbhatt et al 2001). The high prevalence of PEM as revealed in the study (21.7% stunting, 15.1% underweight) is in line with findings that PEM is still very much an important problem (Anwer et al 2003, Chowdhury et al 2008) in the developing countries of the world.

While some studies have reported gender differences in the prevalence of PEM, others are of contrary opinion based on their specific studies. In some studies, it has been suggested that female gender is a risk factor for malnutrition (Chowdhury et al 2008, Anwer et al 2003) while in another study to assess the prevalence of malnutrition in Saudi Arabia, Al-Hasliem (2008) reported that boys had a higher risk of being underweight and wasted. No statistically significant gender differences were found in these studies just as no gender differences in nutritional status was observed in this study.

Conclusion

Having recorded 40.2% goiter rate, 21.7% stunting and 15.1% underweight, among the school children, it was concluded that iodine deficiency and Protein-energy malnutrition are still of public health importance. The significant relationship between goiter and stunting (21.7%) could suggest that iodine deficiency may be precipitated in the presence of PEM. Since there were no gender differences in the study and no consistent gender difference recorded by other studies, it therefore means that gender differences does not necessarily characterise nutritional status and where they do, it could be as a result of socio-cultural factors in populations where gender inequality exists. The effect of IDD and PEM on learning ability and school retention underlines the importance of periodic monitoring of iodine nutrition of school children and the adequacy of dietary intake to reduce protein energy malnutrition.

REFERENCES

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