ANNEX Research Outputs

“Prevalence of anemia and the dietary intake of children ages 5-9 in Trinidad and Tobago Caribbean Health Research Council (CHRC) call for papers

All authors have approved the publication of the abstract in the West Indian Medical Journal.

ABSTRACT

Prevalence of Anemia and the Dietary Intake of Children ages 5-9 in Trinidad and Tobago

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Objective To examine the prevalence of anemia among children aged 5-9 years and examine their dietary intake in relation to anemia.

Design and Methods: A survey of 5-9 y old children (n=315) in Trinidad schools with a large proportion of children receiving the school lunch program was undertaken in 2012. Hemoglobin level was measured by Hemocue using a cut-off for anemia of <11.5 g/dL. One 24 hour recall was done with the child and caregiver. Nutrient analysis was done using CANDAT software. Hemoglobin values were obtained for 242 children.

Results: Prevalence of anemia was 15%. The average total energy intake among all children was 1958 kcal/d. Macronutrient distribution was 56% carbohydrates, 13% protein and 31%. Energy from sugar was 21%. The mean intake levels for iron, folate and vitamin C were adequate but calcium levels were low. There were no nutrient differences between the anemic and non-anemic children.

Conclusion: Anemia is still present in school children but the dietary correlates are difficult to discern.
**Prevalence of Anemia and the Dietary Intake of Children ages 5-9 in Trinidad and Tobago**

**Introduction**

Anemia has been and is still a public health concern in both developed and developing countries. The main causes of anemia are dietary iron deficiency including a low intake of iron, poor absorption of iron from diets high in phytate or phenolic compounds, and periods of life when iron requirements are especially high, such as in pregnancy and growth; infectious diseases, such as malaria, hookworm infections, and schistosomiasis; deficiencies of other key micronutrients including folate, vitamin B$_{12}$ and vitamin A; and inherited conditions that affect red blood cells (RBCs), such as thalassaemia (1). Of these causes, nutritional anemia in the form of iron deficiency anemia is the most common and is assumed to account for 50% of anemia worldwide (1). Nutritional anemia includes those associated with prolonged inadequate intake of folate, vitamin B$_{12}$, iron, protein and vitamin C (2, 3).

In the English-speaking Caribbean, the problem of iron deficiency anemia is no different from that of the rest of the world (4, 5). Iron deficiency anemia affects mostly children (6, 7). Further, in developing countries, such as those in the Caribbean region, the WHO has stated that an estimated 40% of children are anemic (8). For children, an iron poor diet is the most frequent cause of iron deficiency anemia among rapid growth and inability of the body to absorb iron (9). Anemia, defined by a blood hemoglobin concentration below 8 g/dl, was found in 15-80% of young children and in Trinidad and Tobago among 12% of male children 5 to 9 years old (10). A recent study conducted to determine the prevalence of anemia in antenatal clinic attendees in Trinidad and Tobago between the years 2000 and 2005 revealed that the prevalence of anemia in this population was 15.3% (11). In developing countries, such as those in the Caribbean, specific statistics regarding the prevalence of iron deficiency anemia in children are unknown, outdated or limited and as such the hidden impacts of this condition cannot be adequately addressed. In
this context, this study examines the prevalence of anemia among children aged 5-9 years in Trinidad and Tobago and examines their dietary intake in relation to anemia.

**Methods**

The participants were children aged 5 to 9 years and their primary caregivers who were recruited from the Government Primary Schools in the East and East-West of Trinidad. Selection of schools were based on the high proportion of children who consumed the school lunch, which is offered free of charge. Trained professionals collected data from a total of 315 children from 8 schools between January and April of 2012 after obtaining consent from the children’s caregivers.

In order to be included in this study, caregivers agreed to a home interview as well as the child testing at school. For the purposes of this analysis, children without a hemoglobin measure were excluded. Hemoglobin data were missing for 73 of the student participants for various reasons, including being absent on two separate days of data collection or refusal by the child or caregiver. A total of 242 children were included in this study.

Anthropometric measures (height and weight), blood pressure and a finger prick blood test to measure hemoglobin level by Hemocue were taken at the schools by a project nurse. The cut-off point for hemoglobin to identify anemia was <11.5 g/dL (12). Dietary data were collected via a 24-hour recall with the child and primary caregiver at a home interview. The software CANDAT 10 was used to analyze the data collected through the 24-hour recall and to validate the data entry. The nutrient values of foods were derived from the Canadian Nutrients file, version 2007b. Foods were added to this file based on local food labeling, as well as calculated nutrient values for foods used in the school lunch program.
Statistical analyses were conducted using SAS v. 9.2 software. The univariate procedure was conducted to test for data normality and square root function was used to normalize the data for statistical testing. T-tests were performed to test differences in the mean dietary intakes of several nutrients between the anemic and non-anemic groups.

Results

The prevalence of anemia (hemoglobin level <11.5 g/dL) in this school population was 15% (36 children). Hemoglobin values were normally distributed as shown in Figure 1.

Figure 1: Distribution of Hemoglobin Values among Children in Trinidad (n=242)

The average total energy intake among all children was 1958 kcal per day. Overall, 21% of energy intake came from sugar. Approximately 56% of the children’s dietary intake came from carbohydrates, 13% from protein and 31% from fat. These macronutrient values were within the range of the dietary reference intakes and the dietary guidelines for the population in the Caribbean (13). The mean intake levels for iron, folate and vitamin C were adequate, while the intake for calcium was below the recommendation. There were no nutrient differences between the anemic and non-anemic children.
Table 1: Mean nutrient intake from 24-hour recalls for children aged 5-9 y in Trinidad (n=242)

<table>
<thead>
<tr>
<th></th>
<th>Anemic n=36</th>
<th>Not Anemic n=206</th>
<th>Total n=242</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Kcal</td>
<td>1949</td>
<td>1960</td>
<td>1958</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>279</td>
<td>274</td>
<td>275</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>64</td>
<td>66</td>
<td>65</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>66</td>
<td>69</td>
<td>68</td>
</tr>
<tr>
<td>Total Sugar (g)</td>
<td>110</td>
<td>103</td>
<td>104</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>569</td>
<td>723</td>
<td>700</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>12</td>
<td>13.5</td>
<td>13</td>
</tr>
<tr>
<td>Folate (μg)</td>
<td>350</td>
<td>401</td>
<td>394</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>162</td>
<td>152</td>
<td>154</td>
</tr>
</tbody>
</table>

Discussion

The prevalence of anemia among the children tested from these schools in Trinidad indicates 15% had hemoglobin levels below a cutoff of 11.5 g/dL. Data regarding the prevalence of anemia among children aged 5-9 years in Trinidad in 1968 showed 40% below 12 g/dL, our comparative figure using this cut off is 28% (6, 14). A very small portion of the children in this study was severely anemic, but a number of them were below the cutoff currently used for this age group which is 11.5g/dL. Further testing to examine other iron deficiency indicators was not performed.

There were no differences in nutrient intake for macronutrients or micronutrients for children classified as anemic compared to those with adequate hemoglobin values. There may be a misclassification bias, as only one day of food recall was collected for each child and the 24-hour recall does not provide a very precise estimate of usual intake for an individual child. The dietary intake data showed adequate energy intake and an appropriate macronutrient distribution, but lower carbohydrate intake and higher protein and fat intakes than the FAO 2003 macronutrient distribution data based on food disappearance data (15). Sugar consumption was high at approximately 100 g per day. This includes all sugar sources, such as fruit and milk.
Further analysis will be done to capture total added sugar. An analysis of dietary intake’s contribution to the intake of nutrients not examined in this study remains to be conducted for these children.

In sum, this study helps fill in a gap in our knowledge regarding current levels of anemia in Trinidad among the children from these schools. Dietary intake data indicate that anemia is not associated with a poorer quality diet in these children. The total energy intake for the anemia children was similar to the non-anemic children so the quality of food is also not associated with anemia. Further study of these children is warranted to help understanding the reasons for anemia.
References


