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The health and nutritional status of school children in two rural communities in Sri Lanka

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Summary There is growing evidence of considerable burden of morbidity and mortality due to infectious diseases and undernutrition in school children. This study describes the nutritional status and parasitic infections of school children in two areas of rural Sri Lanka. All children in four primary schools in the Moneragala district of Sri Lanka were included in the study. The height and weight of children were measured and anthropometric indices calculated. Stool and blood samples were examined for evidence of intestinal helminthiasis, malaria and anaemia. A greater proportion of boys than girls were underweight, wasted and stunted. Over 80% of the children were anaemic but did not apparently have iron deficiency anaemia according to their blood picture. The prevalence of parasitic infections such as hookworm and *Plasmodium* spp that may contribute to anaemia was low.

keywords school child, nutritional status, anaemia

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Introduction

Little is known about the health of school age children, but there is growing evidence of a considerable burden of morbidity due to infectious diseases and undernutrition (Partnership for Child Development 1998). Poor health and nutrition may impair both the growth and intellectual development of schoolchildren (Spurr *et al*. 1977; McGuire & Austin 1987; Pollitt *et al*. 1993). Our aim was to describe the nutritional status and parasitic infections of school children in two areas of rural Sri Lanka.

Subjects and methods

The sample consisted of all children in grades 1–5 in four primary schools in the Moneragala district in the dry zone of Sri Lanka. Permission to conduct the work was received from local health and education authorities and school principals. Informed written consent was obtained from the parent or guardian of each child who was present on the day of the survey. The study was conducted in September 1997. A brief questionnaire was administered to the parent or guardian which recorded monthly reported household income and parents' educational level.

The age of each subject was recorded from the birth certificate held by the school. The height of each child was measured to a precision of 0.1 cm using a stadiometer and the weight was measured to a precision of 0.1 kg using a spring scale. The scale was checked with a 20-kg weight after every tenth measurement and 10% of measurements were rechecked. A fresh stool specimen was collected from each child and was examined using the Kato–Katz method. Every child was given a single dose of 500 mg mebendazole.

A sample of 2 ml venous blood was drawn from each child and transported at 4 °C to a laboratory in Colombo, where haemoglobin concentration and packed cell volume were measured and the mean corpuscular volume (MCV) as well as mean corpuscular haemoglobin (MCH) calculated. A child with a haemoglobin concentration < 12 mg/dl was classified as anaemic. A thin blood film was stained with Giemsa and examined for human *Plasmodium* spp. Any child found to be infected with *Plasmodium* spp. was given chloroquine phosphate (25 mg/kg) and primaquine (1.25 mg/kg) for 5 days. Children infected with *P. falciparum* were followed-up

Table 1 Characteristics of children by sex

Variable	Males	Females	*t*-value§	p-value
Age (months)				
Mean	93.58	88.20	2.513	0.012
SD*	30.30	27.23		
n†	412	331		
Weight for age (z-score)				
Mean	− 2.350	− 2.056	5.509	<0.001
SD*	0.710	0.740		
n†	412	331		
% moderately UW‡	54	52		
% severely UW‡	18	7		
Height for age (z-score)				
Mean	− 1.522	− 1.266	3.923	<0.001
SD*	0.944	0.807		
n†	412	331		
% moderately stunted	23	18		
% severely stunted	6	1		
Weight for height (z-score)				
Mean	− 2.177	− 1.990	2.961	0.004
SD*	0.811	0.907		
n†	412	331		
% moderately wasted	50	45		
% severely wasted	13	11		
Haemoglobin status				
Mean	11.13	11.03	1.412	0.154
SD*	0.923	0.913		
n†	412	331		
% moderately anaemic	83	86		
% severely anaemic	0.2	0.3		

*SD, standard deviation; †*n*, number of children; ‡UW, underweight; §*t*-value is the t statistic.

after 14 days with a blood film examination and treated with sulphadoxine/pyrimethamine, if patent parasitaemia existed.

Anthropometric indices were calculated using EpiInfo software (Centres for Disease Control and Prevention, Atlanta, GA, USA) and children were classified as moderately stunted, underweight or wasted if their z-score of height for age, weight for age or weight for height was ≤ -2 standard deviations below the NCHS median, and severely stunted, underweight or wasted if their z-score was ≤ -3 standard deviations below the NCHS median. Z-scores of weight for height were not calculated for girls > 10.0 years and boys > 11.5 years.

Results

Table 1 shows the mean age of children by sex and the mean z-score of weight for age, height for age and weight for height. Around half were moderately underweight or wasted, and one-fifth were moderately stunted. A greater proportion of boys than girls were underweight, wasted and stunted.

Figure 1 shows the distribution of height for age for both sexes and Fig. 2 shows weight for age. There was no association between age and the degree of stunting. Only weight for age was associated with the education of parents: mothers who had been educated above grade 6 were less likely to have underweight children (62% *vs*. 72%, p = 0.007). Eighty-five

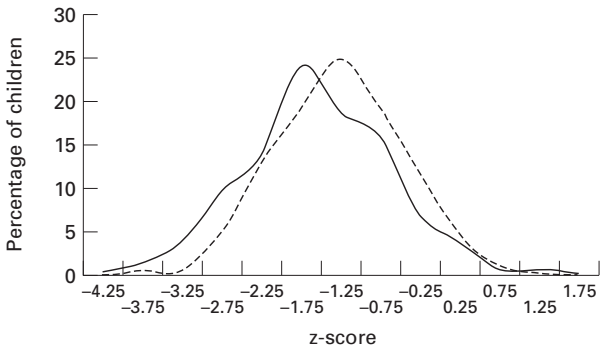

Figure 1 Height for age in study population. Solid line, male; broken line, female.

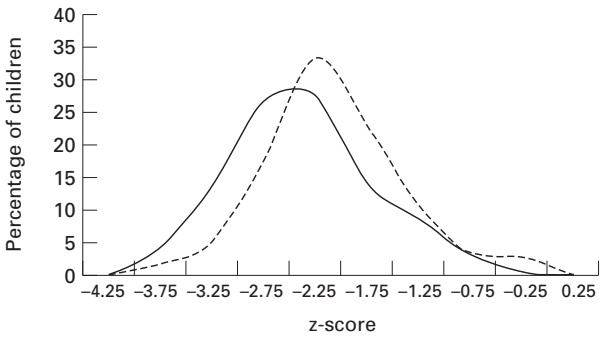

Figure 2 Weight for age in study population. Solid line, male; broken line, female.

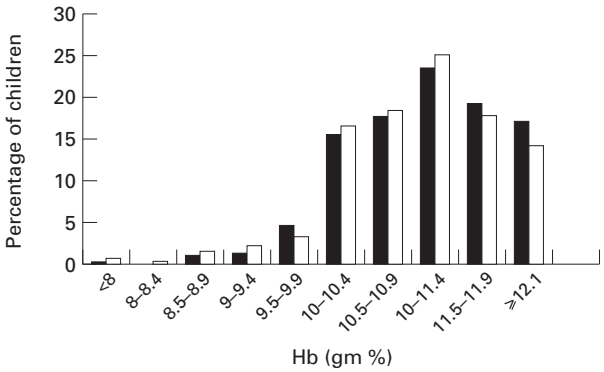

Figure 3 Haemoglobin status of the children. ■, male; □, female.

per cent of parents reported a household income of < 2000 Sri Lankan rupees per month (around US$ 28).

Figure 3 shows the haemoglobin status of the children. Although 84% were classified as anaemic, only 7% of children had a MCV < 76 fl and an MCH of < 27 pg, which indicates that the anaemia was mostly not due to iron deficiency. There was no difference in the proportion of boys and girls who were anaemic.

Five children were infected with *P. vivax* (0.5%) and 13 with *P. falciparum* (1.4%).The prevalence of infection with *Ascaris lumbricoides, Necator americanus* and *Trichuris trichiura* was 2%, 5% and 0.7%, respectively, and the mean concentration of eggs was 2826, 400 and 167 eggs per gram of faeces, respectively.

Discussion

Around two-thirds of children were found to have a low body weight for age or height against NCHS reference values, and one-fifth were moderately stunted. Anthropometric surveys of schoolchildren in Africa, India and Asia have reported a prevalence of moderate stunting of around 50% and a prevalence of wasting of around 25% in India compared with 50% in Sri Lanka (Partnership for Child Development 1998). Schoolchildren in Sri Lanka seem to be less stunted but more wasted, which suggests that they experience acute but seasonal undernutrition. The study was done during a season between harvests and immediately after the failure of crops because of drought.

Two other observations were noteworthy. First, boys were significantly more likely to be undernourished than girls (Table 1). Second, more than 80% of children were classified as anaemic but apparently did not have iron deficiency anaemia according to their blood picture. Parasitic infections such as hookworm and *Plasmodium* spp. may contribute to anaemia but the prevalence of both was low, which suggests that the anaemia is mostly the result of dietary deficiency, although malaria may be seasonal.

This survey suggests that efforts to provide nutritional supplements to school children during periods of poor food intake may benefit children and help to prevent acute undernutrition. Longitudinal studies of the growth of schoolchildren are needed.

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