

COMPARISON OF AUXOMETRIC TRAITS OF UGANDAN CHILDREN WITH THE INTERNATIONAL REFERENCE (NCHS)

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Abstract: *In the malnourished populations of the Third World, most children suffer from a growth damage which leads to low weight and short stature: so, the application of Western norms results in the overestimation of the number of the children at high risk of dying of starvation, and to the improper use of the limited resources available for nutritional intervention. In this note we compare growth norms of height, weight and MUAC (mid-upper-arm circumference) for Ugandan children up to 5 years, with NCHS (1976) and Voorvoheve (1990) standards. Between April and May 1988, a survey was carried out in the district of Mbarara in the Southwest of Uganda and a total of 4320 children aged 60 months or less were included in a cluster sample. The reference set was made up of the 3654 children (1858 girls, 1796 boys) known to be still alive after 1 year from the study. Results confirm that among the growth indicators taken into account, only weight for height ratio appeared to be roughly similar in Ugandan and NCHS children. The use of the 3rd percentile of international reference for height, weight and MUAC as a threshold would lead to include from 25 to 50% of Ugandan children into the class of subjects at risk of starvation. These percentages appear to be too high, if we consider that Ugandan norms are based on children who were still alive 1 year after the study.*

Key words: Height; Weight; MUAC; Ugandan and NCHS children.

Introduction

Lack of local references forces public health workers to resort to the NCHS (National Center for Health Statistics) standards or other Western norms to assess the nutritional status of children in different developing countries. This practice rests upon the assumption that, before the onset of puberty, growth is similar for groups of different ethnicity which share the same favourable environment. Nonetheless, in the malnourished populations of the Third World, most children suffer from a growth damage which leads to low weight and short stature. Thus, the application of Western norms results in the overestimation of the number of the children at high risk of dying of starvation, and to the improper use of the limited resources available for nutritional intervention. Also for this reason, the International Union of Nutritional Sciences committee recommended, since 1971, the use of local standards (IUNS 1971).

In this note we compare growth norms of height, weight and MUAC (mid-upper-arm circumference) for Ugandan children up to 5 years, with NCHS (1976) and Voorvoheve (1990) standards.

Subjects and Methods

Between April and May 1988, a survey was carried out in the district of Mbarara in the South-West of Uganda. Mbarara is a hilly district (about 957,000 inhabitants in 1989), the town of Mbarara is mainly an administrative and trading centre (Cortinovis, Vella and

Ndiku. 1993). Crop production consists mainly of bananas, sorghum, potatoes, beans, groundnuts, some of which are cultivated as cash-crop. A total of 4320 children aged 60 months or less were included in a cluster sample. From all the villages in the district (about 1300), 31 villages were randomly selected with probability proportional to the size. In each village selected, all families with at least one child under 5 years were taken into account. As to ethnicity, 80% of the children in the reference set were Banyancole, 11% Bakiga, 5% Baganda, and the remaining 4% belonged to other ethnic groups, such as Rwandan refugees.

Since standards are intended to the detection of high risk children, and because of the high rate of child mortality in Uganda, survival was chosen as a criterion of good health condition. Therefore the reference set was made up of the 3 654 children (1858 girls, 1796 boys) known to be still alive after 1 year from the study.

Length of babies under 24 months, or height of children over 24 months, was measured with a length board built according to the guidelines of the *National Household Survey Capability Programme* (1986). Weight was recorded to the nearest 100 g with a spring scale, the accuracy of which was checked daily. MUAC was measured to the nearest millimetre with an insertion tape provided by UNICEF. Measures were taken by a team of 20 assessors *ad hoc* trained. As to age, children of either sex were rather uniformly distributed between 1 and 60 months. In nearly all cases, each 1-month-wide age class included 20 to 50 subjects. To estimate children's age a local calendar was drawn up with the help of the village chief. When available, birth and vaccination certificates were also used.

Raw non-parametric estimates of percentiles (3rd, 10th, 25th, 50th, 75th, 90th, 97th) were obtained in each age class. Raw estimates were smoothed by weighted linear models (Healy, Rasbash and Min Yang 1988) including sex, age, percentile's normit, powers and logarithm of age, powers of normit, and selected interactions. The *weight* was proportional to the reciprocal of the variance of the raw estimates, which is higher for extreme percentiles and in age classes with a lower number of children.

Results

A severe growth delay is apparent in Ugandan girls and boys. On the average, Ugandan children attain 100 cm height at the age of 4 year and 9 months, whereas NCHS children attain that height 1 year earlier. Furthermore, Ugandan children reach 15 kg weight at the age of 4 years and 4 months, whereas NCHS children reach that weight 1 year earlier.

Figure 1 shows percentiles of height and weight of Ugandan girls and boys as a function of age. Percentiles are expressed as standard deviation scores based on the means and standard deviations (conditional on age) of NCHS reference. Both height and weight of Ugandan children decrease with increasing age with respect to NCHS reference. Mean height is -1 SDS below the mean height of NCHS children at 6 months and about -2 SDS at 5 years: so half of Ugandan children 5 years old are below the 3rd percentile of NCHS norms. In Ugandan norms the difference between the 97th and the 3rd percentile is 1.5 times wider than in NCHS norms, likely because of heterogeneity of the sample as regards ethnicity and nutritional status.

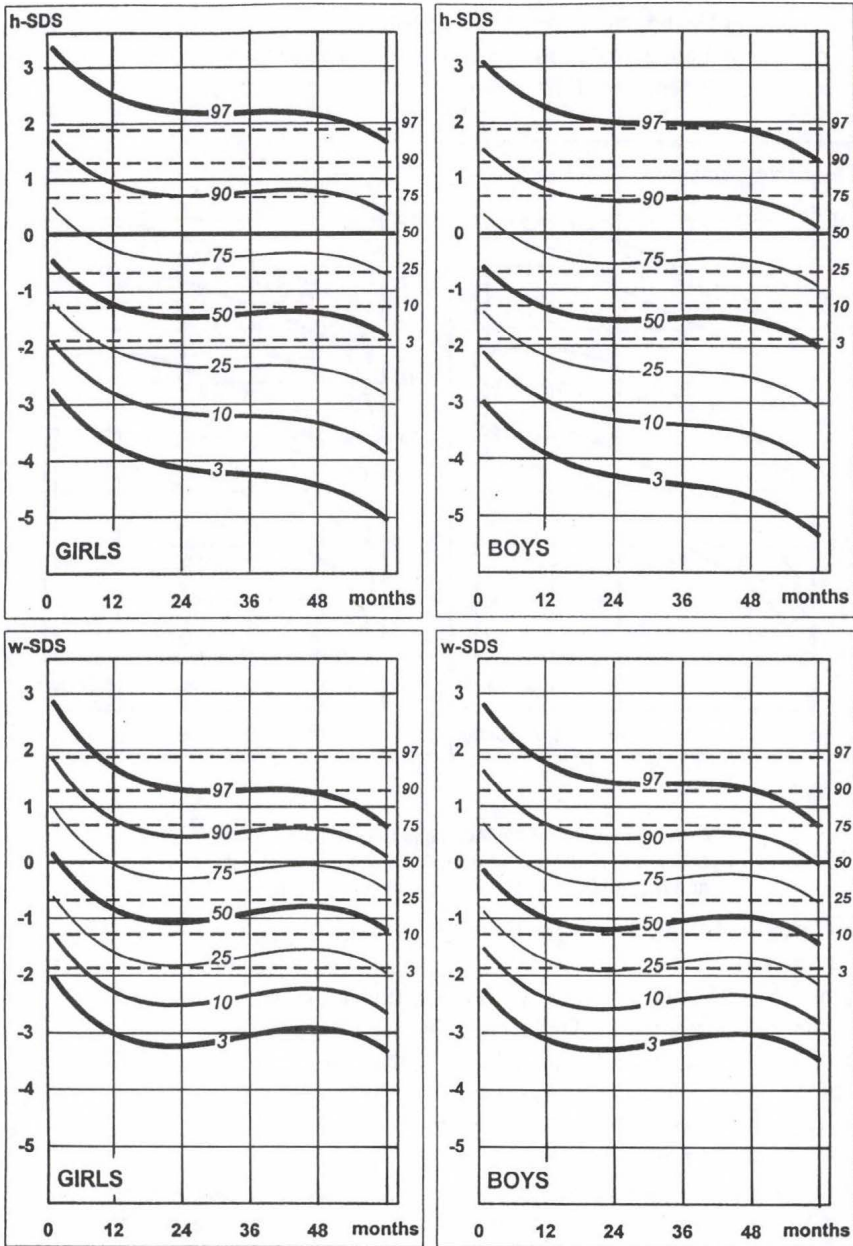


Fig. 1: Percentiles of height (top) and weight (bottom) as a function of age in Ugandan girls

The curves (solid lines) represent the percentiles of Ugandan norms expressed as standard deviation scores (h-SDS and w-SDS) based upon the means and standard deviations (conditional on age) of NCHS reference. Dashed horizontal lines represent the percentiles of NCHS reference.

Mean weight of Ugandan children is -0.5 SDS below the median height of NCHS at the age of 6 months and about -1.3 SDS at 5 years: 25 to 30% of Ugandan children 5 years old are below the 3rd percentile of NHCS norms.

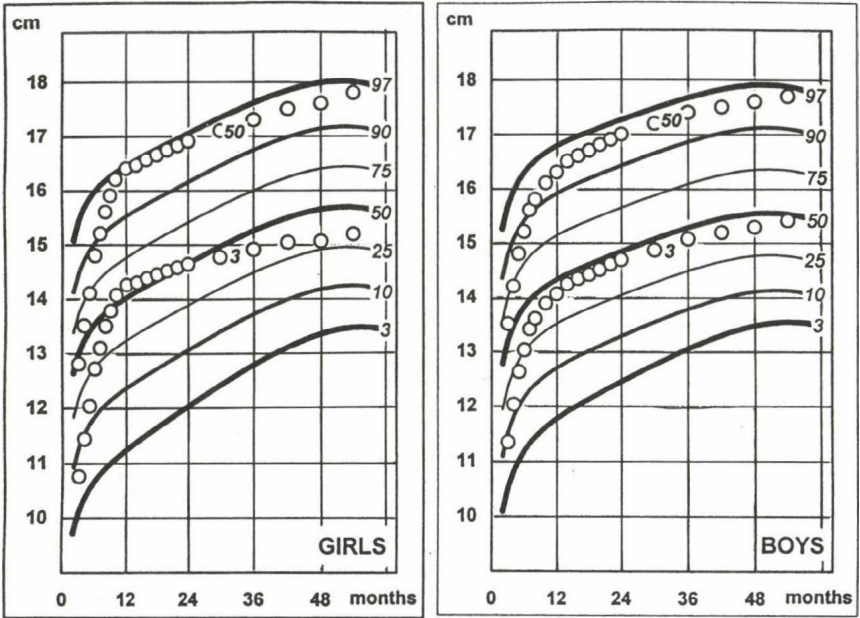


Fig. 2: Percentiles of MUAC (solid lines) as a function of age in Ugandan girls (left) and boys (right). Open circles represent the 5th and the 50th percentile of Dutch norms (Voorhoeve 1990)

Figure 2 shows MUAC norms for Ugandan girls and boys up to 5 years of age together with the 5th and the 50th percentile of Dutch norms (Voorhoeve 1990). In the first 4 months of life MUAC values are very similar in the two growth norms. After the age of 9 months, the 50th percentile for Dutch children roughly corresponds to the 97th percentile for Ugandan children. The 3rd percentile of Dutch children corresponds to the 50th percentile of Ugandan children between 9 and 24 months, and tends to the 25th percentile subsequently: so, 50 to 30% of Ugandan children aged 9 to 60 months are below the 3rd percentile of the international reference.

Figure 3 shows percentiles of weight for height as a function of age in Ugandan girls and boys. The values of the ratio of weight to height is similar in Ugandan and NCHS children, as regards the percentiles from the 10th to the 75th. The 3rd percentile of Ugandan children is consistently below the 3rd percentile of NCHS reference. The 90th and 97th percentiles tend to be higher in Ugandan children, mainly in the first 2 years of life.

The curves (solid lines) represent the percentiles of Ugandan norms expressed as standard deviation scores (w-h-SDS) based upon the means and standard deviations (conditional on age) of NCHS reference. Dashed horizontal lines represent the percentiles of NCHS reference.

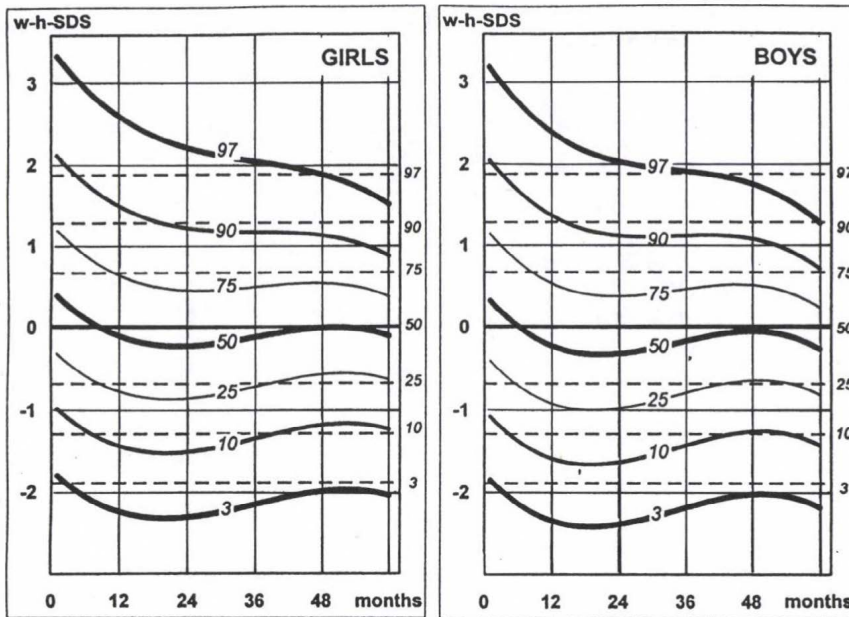


Fig. 3: Percentiles of weight for height as a function of age in Ugandan girls (left) and boys (right)

Comments

Results here outlined confirm that there are large differences in height and weight growth between children living in Western Countries and children who survive in the Third World. These differences tend to increase with increasing age, as a result of the cumulative effects of undernutrition and prolonged exposure to diseases.

Among the growth indicators taken into account, only weight for height ratio appeared to be roughly similar in Ugandan and NCHS children. The use of the 3rd percentile of NCHS norms for height and weight, and of Voorvoheve's norms for MUAC, as a threshold would lead to include from 25 to 50% of Ugandan children into the class of subjects at risk of starvation. These percentages appear to be too high, if we consider that Ugandan norms are based on children who were still alive 1 year after the study. On the contrary, local growth standards are expected to have higher predictive value in identifying the true high-risk children: this is of paramount importance in emergency situations when the selection of priorities and the lives of many children depend upon the effectiveness of mass screening.

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