

Comparison of 2006 WHO and Indian Academy of Pediatrics Recommended Growth Charts of Under Five Indian Children

MR SAVITHA AND NITHIN KONDAPURAM

From Department of Pediatrics, Mysore Medical College and Research Institute, Mysore, Karnataka, India.

Correspondence to:

Dr MR Savitha,

No. 79/A, 4th Main, Maruthi Temple Road,
Saraswathipuram, Mysore 570 009, India.
drsavithamr@yahoo.co.in

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This cross-sectional study was undertaken to compare WHO and Indian Academy of Pediatrics (IAP) recommended growth charts compiled by Agarwal. 2105 children aged less than 5 years, attending 132 Anganwadi centres in Mysore city, were included by simple random sampling method. Weight and height of all children were recorded and plotted on both WHO and IAP charts. WHO charts detected more boys as underweight compared to IAP charts ($P < 0.0001$). When weight charts of girls were compared there was no difference between the two charts. WHO charts detected more children with stunting than IAP charts, which was true for both boys and girls ($P = 0.001$).

Key words: Growth charts, WHO charts, IAP charts.

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Many studies have compared 2006 WHO charts [1] with various other charts. Comparison of WHO charts with UK 1990 growth charts proved that WHO charts would set a markedly lower standard of weight gain beyond 4 months of age for UK infants [2]. Comparison of WHO charts with CDC charts proved that CDC charts reflect a heavier and shorter sample [3]. Comparison of Canadian growth charts with WHO charts showed that breast fed infants followed WHO standards and hence, WHO growth charts could be used for the Canadian infants [4]. The growth monitoring guidelines meeting of the Indian Academy of Pediatrics (IAP) recommended growth charts compiled by Agarwal, *et al.* [5,6] for Indian children. These charts shall be referred to as IAP charts throughout this paper. As the pediatricians in our country frequently use either WHO charts or IAP charts, the present study was undertaken to compare the two charts in terms of the percentage of children who were detected as underweight or stunted according to WHO and IAP weight and height charts, respectively.

METHODS

This cross-sectional study was conducted from July 2009 to July 2010. Children under 5 year of age attending Anganwadi centres in and around Mysore city in Karnataka state of Southern India were selected by simple random sampling. The study was approved by the Institutional ethical committee and informed consent was taken from

parents of all children included in the study. Any child with obvious skeletal or neurological problem hindering evaluation of physical growth was excluded from the study. Age was obtained from the anganwadi records. Weight of the child was recorded in kilograms with minimal clothing using Salter weighing scale provided by UNICEF (model 235 6S) with accuracy of 100 g and maximum reading of 25 kg. Length was measured in children less than 2 years using Infantometer with an accuracy of 0.5 cm. Height was measured in children more than 2 years of age with accuracy of 0.5 cm. Height in centimeters was marked on the wall with the help of measuring tape. Children were made to stand bare feet with heels, back and occiput against the wall with Frankfurt plane being parallel to the ground. A scale was brought to the topmost point of head and reading was taken avoiding parallax. Two readings were averaged for analysis. Measurements were done by final year medical students under the supervision of a Pediatrician. Throughout the present paper, height refers to either recumbent length/height. Anthropometric data were plotted separately on both WHO and IAP charts. Those below 3rd percentile in weight charts were classified as underweight, between 3rd and 97th percentile as normal and more than 97th percentile as overweight. Those below 3rd percentile in height charts were classified as stunted, and more than 97th percentile as tall. Socioeconomic status was determined by modified Kuppaswamy's classification [7].

A minimum sample size calculation of 661 was done assuming a population of 10 lakhs with 30% children and

5% prevalence of severe underweight (with worst acceptable result of 3.5%) and a 0.05 significance level. All statistical methods were carried out through SPSS for windows (version 16.0). Chi square test was employed to get an association between WHO and IAP charts. P value <0.05 was taken as statistically significant.

RESULTS

The study group consisted of 2126 children below the age of five years from 132 anganwadi centres. 21 children were excluded due to lack of proper confirmation of age. A total of 2105 children were finally included in the study. All of them belonged to class IV and V socioeconomic class according to modified Kuppaswamy's classification. The baseline characteristics of children included in the study is shown in **Table I**. Comparison of IAP and WHO growth charts with respect to weight and height is shown in **Table II**. WHO charts detected more boys as underweight compared to IAP charts ($P<0.0001$). When weight charts for girls was compared, there was no difference between the two charts. WHO charts were detecting more children with stunting than IAP charts, which was true for both boys and girls ($P=0.001$).

DISCUSSION

In the present study, it was found that except for weight charts for girls, the WHO and IAP weight and height charts for boys and girls were not comparable with each other. The strength of the present study is the large sample size. The limitations were that the study was conducted in a single urban city in southern India and also all the children were from low socioeconomic class. Hence, our results are not representative of the entire country. Prinja, *et al.* [8] compared WHO chart with the growth chart used in ICDS (Integrated child development services) program which is based on Harvard growth standards and concluded that the prevalence of underweight was 1.4 times higher with Harvard standards, except in first 6 months of life where it was 1.6 times higher with WHO standards. Deshmukh, *et*

TABLE I BASELINE CHARACTERISTICS OF CHILDREN

Parameter	Boys (n=1137)	Girls (n=968)
Age 0-12 mo	19	12
Age 13-24 mo	85	60
Age 25-36 mo	316	272
Age 37-48 mo	419	374
Age 49-60 mo	298	250
Mean (SD) age (mo)	39.7 (11.2)	40.3 (10.2)
Mean (SD) weight (kg)	12.2 (1.9)	12 (1.9)
Mean (SD) height (cm)	90 (7.2)	88.8 (7.2)

al. [9] compared WHO charts with NCHS charts and concluded that the prevalence of underweight by WHO standards was significantly lower (47%) compared to NCHS references (53%). Another study on use of WHO standards on 2-5 year old affluent urban Indian children concluded that the growth performance of these children was suboptimal compared with WHO standard [10]. When the 3rd percentile curves of WHO and IAP weight and height charts were overlapped, it was found that WHO curves were higher than IAP curves, especially the height curves, as shown in **Fig 1**. Hence use of multiple charts may lead to confusion amongst Pediatricians and also it may have impact on National statistics. Therefore, we suggest uniformity of growth charts usage amongst pediatricians in India. Hence, further multicentric studies from all over India are required to decide on the single appropriate chart to be used for Indian children.

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TABLE II COMPARISON OF WHO AND IAP CHARTS

Parameter	Sex	Classification	WHO	IAP	P
Weight	Boys (N=1137)	Underweight	791 (69.6%)	676(59.4%)	<0.0001
		Normal	346 (30.4%)	461(40.6%)	
	Girls (N=968)	Underweight	606 (62.6%)	601 (62.1%)	0.935
		Normal	362 (37.4%)	367 (37.9%)	
Height	Boys (N=1137)	Stunted	897 (78.8%)	709 (62.3%)	0.001
		Normal	240 (21.2%)	428 (37.7%)	
	Girls (N=968)	Stunted	789 (81.5%)	613 (63.3%)	0.001
		Normal	179 (18.5%)	355 (36.7%)	

WHAT THIS STUDY ADDS?

- Except for weight charts for girls, the WHO and IAP weight and height charts for boys and girls are not comparable with each other.

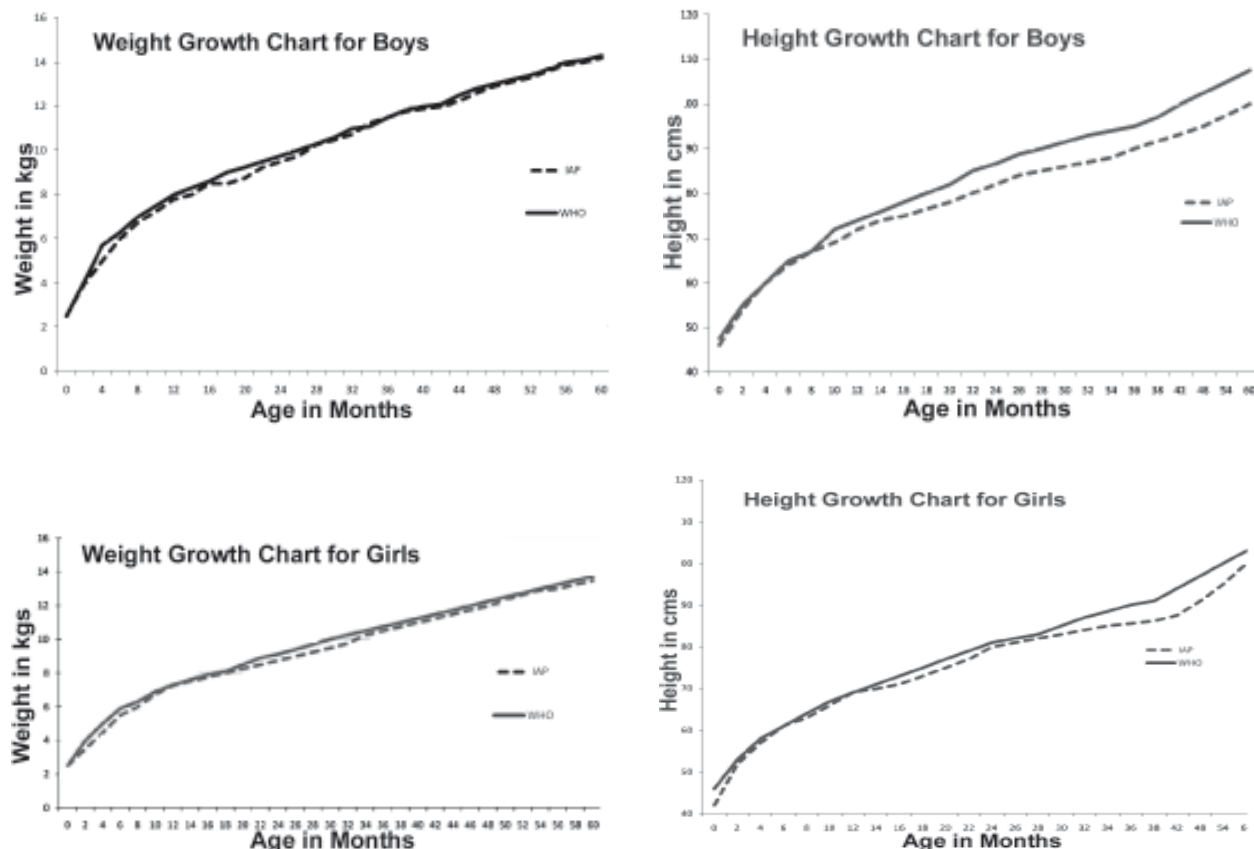


FIG. 1 Comparison of third percentile curves of height and weight charts of IAP and WHO for boys and girls.

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