Original Research Paper

VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

Growth performance of Indian under five children with endocrine disorders on WHO 2006 growth standards

Paediatrics

KEYWORDS: WHO 2006 charts, Endocrine disorders, Growth

Dr Ruma Deshpande Department of Paediatrics, Bharati Vidyapeeth University Medical College , Pune.

Dr Rahul Jahagirdar Department of Paediatrics, Bharati Vidyapeeth University Medical College , Pune.

ABSTRACT

With the objective to assess height parameters of Indian under five children with endocrine growth disorders attending a specialty paediatric clinic with respect to WHO2006 Growth Standards .the study was conducted retrospectively.

768 children less than 5 years, who presented with either abnormal stature due to an endocrine cause or specific clinical features, were selected for the study. Healthy age and sex matched children were recruited as controls (n=824). Height measurements were converted to SD scores (WHO Anthro 2005).

Results: Significant co-relation was present between the Z-scores for height based on IAP references and WHO standards. Mean height of overgrowth disorders (precocious puberty (PP), constitutional tall stature (TS) and nutritional obesity), controls, other endocrinopathies (premature thelarche, congenital Adrenal Hyperplasia (CAH) & Type 1 diabetes mellitus (T1DM)) and hypothyroid children were on the 50$^{th.}$ 25th, 5th and 1st percentiles respectively. Children with familial short stature (FSS), syndromic short stature and growth hormone deficient (GHD) children positioned themselves in the same order below the 1st percentile. Mean height for age Z-scores in TS, nutritional obesity, premature thelarche, CAH, T1DM, hypothyroidism, FSS, Syndromic short stature and GHD were 0.14, 0.41, -1.6, -2.2, -1.5, -2.4, -3.1, -4.5 and -5.02 respectively. The percentage of children with severe stunting (height for age Z-score < -3) in the above groups were 0%, 0%, 5.9%, 32.5%, 7.8%, 38.9%, 51.5%, 77% and 92% respectively.

Introduction:

Normal growth is considered to be a barometer of wellbeing during childhood. Growth charts are used for monitoring of growth, nutritional screening and surveillance, for nutrition related research and as a clinical tool to aid in the diagnosis of malnutrition and growth related disorders.[1]

Usage of appropriate growth standards to recognise abnormal stature is pivotal in the avoidance of unwarranted investigations in normal children. Further, use of a global platform, rather than local references, would allow easier comparison of worldwide under 5 statistics.

In April 2006 [2,3] the WHO published Growth Standards, which were put forth as an international tool for growth monitoring and as a clinical tool to identify children with growth failure. The standards have used a prescriptive approach and WHO has encouraged all countries and regions throughout the world to adopt the new WHO growth standards.

Indian adopted the WHO standards in 2007 however studies have indicated that mean heights and weights of healthy Indian children are below the WHO 2006 standard median.[4] Further, studies have also reported discrepancies in prevalence of underweight and stunting estimates when using local charts, or the previous WHO charts versus the WHO growth standards.[5] This variation in the identification of children with growth failure has huge implications in public health programs as well as in routine clinical practice.

Thus the aim of present study was to assess the performance of WHO standards on height measurements of Indian under five children with endocrine disorders presenting to a speciality clinic.

Materials and methods:

Data presented in this study were collected retrospectively from case records of children from birth to 60 months (n=768) who presented with abnormal stature identified to be due to an endocrine cause to a tertiary care centre in Pune (India)over a period of 48 months. Healthy age and sex matched controls (n=824) were recruited prospectively from school surveys and well-baby clinics from Pune city, India.

Selection criteria included children who were found to be either below 3rd percentile or above 97th percentile for height as per IAP standards and identified to be due to an endocrine cause or had specific clinical features of any other pathology.

Height and weight were measured and relevant investigations were performed as per standard protocols to arrive at a diagnosis[6].

Based on Agarwal references and endocrine tests the children were classified using an adaptation of the European Society for Paediatric Endocrinology (ESPE)[12] classification of growth disorders [7] into six different groups: i) growth hormone deficiency, ii) syndromic short stature (Turners syndrome, Downs syndrome and other syndromes), iii) familial short stature, iv) hypothyroidism, v) other endocrinopathies (type 1 diabetes, congenital adrenal hyperplasia and premature thelarche) and vi) overgrowth syndromes (isolated tall stature, nutritional obesity and precocious puberty). Anthropometric parameters for all study subjects were reanalyzed using the WHO 2006 growth standards.

Statistical Analysis:

Analysis of anthropometric and clinical data was carried out using SPSS 16.0 (for windows), 2001. All anthropometric indicators were converted into their corresponding standard deviation (SD) scores using the WHO Anthro 2005. All prevalence estimates were summarized in 6-month age groups. Percentage of children who were severely stunted (height for age SD score< -3), stunted (height for age SD score <-2) as per the WHO 2006 growth standards, [8,9] were estimated.

Results :

During the 4 year period, 768 children (358 boys) (2.9 0.8 yrs.) presented with abnormal stature due to an endocrine cause, whose case records were reviewed (Table 1). The clinical diagnoses for the growth related disorders were classified in 6 groups as shown in Table 1. Mean age of 824 healthy control children (boys and girls) was 2.81.2 yr. Mean age of boys and girls in the control group was not statistically different from that of children in the other categories ($p>0.1$). Mean height SD scores of children of each group who had presented with short stature (groups 2 to 6) were significantly lower than that of the controls, while that of the children with overgrowth (group7) were significantly higher ($p<0.05$). Z-score was computed for height as per the IAP standards. Significant co-relation was present between the Z-scores for height ($r = 0.885$, $p < 0.05$) as per IAP references and the new WHO standards.

Table 1: Demographic and Anthropometric characteristics of the Study population

No.	Diagnosis	Sex n (%)	Age (years) mean± SE	Weight (kg) mean± SE	Height (cm) mean± SE	Height for Age Z-score (mean)
1.	Normal children	M 404(49)	3.0±0.07	12.8±0.1	90.4±0.74	-0.90
		F 420(51)	2.7±0.05	12.1±0.1	89.4±0.6	-0.45
2.	Growth Hormone Deficiency	M 55(57.3)	2.9±0.1	8.4±0.3*	76.5±1.4*	-5.1*
		F 41(42.7)	2.7±0.2	7.9±0.39*	73.9±1.7*	-4.8*
3	Syndromic Short stature	M 25(46.3)	2.5±0.2	9.1±0.5*	77.2±2.5*	-4.1*
		F 29(53.7)	2.7±0.2	8.8±0.4*	77±2.2*	-3.9*
4	Familial Short Stature	M 70(51.5)	3.8±0.1	11.6±0.2	88.5±1.0	-3.2*
		F 66(48.5)	3.2±0.1	10.5±0.2*	84.4±1.2	-3*
5	Hypothyroidism	M 53(42.1)	2.9±0.1	11.6±0.2	84.5±1.2*	-2.8*
		F 73(57.9)	2.4±0.1	10.5±0.3*	80.5±1.5*	-2.1*
6	Other Endocrinopathy	M 49(34.5)	2.8±0.1	11.2±0.4	86.6±1.7	-1.9*
		F 93(65.5)	2.3±10.1	10.3±0.2*	81.7±1.1*	-1.6*
7	Overgrowth disorders	M 106(49.5)	2.3±0.1	17.3±0.5*	88.7±1.3	0.3*
		F 108(50.5)	3.0±0.1	18.2±0.5*	94.9±1.2*	0.4*

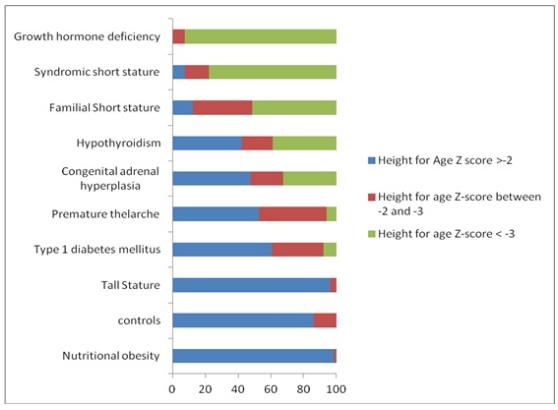
*p<0.05 – statistically significant different between the height, or weight or BMI of the group of children with specific growth related disorder and normal children

To assess how the children performed on the WHO standards as per the diagnostic categories, mean heights of children at each age-sex group were plotted with the 1st, 3rd and 50th percentiles of the WHO standards for boys and girls. For both boys and girls the mean heights at different ages for children with tall stature coincided largely with 50th percentile of WHO Standards (range 25th -99th percentile), while that of the control were on the 25th percentile (range 15th-50th percentile). Mean height of children with other endocrinopathies was on the 5th percentile (range <1st to 5th percentile), where as hypothyroid children were found to position themselves on the first percentile (range <1st to 75th percentile). Children with familial short stature (range <1 to 15th percentile), syndromic short stature (range <1 to 3rd percentile), and growth hormone deficient children (range <1 to 1st percentile) were found to arrange themselves in the same order below the 1st percentile.

Mean height for age Z-scores noted were as follows- tall stature (0.14), nutritional obesity (0.41), controls (-0.62), premature thelarche (-1.6), CAH (-2.2), T1DM (-1.5), hypothyroidism (-2.4), FSS (-3.1), Syndromic short stature (-4.5) and GHD (-5.02). Thus, children with growth hormone deficiency had the lowest mean SD scores while children with overgrowth syndromes had the highest.

To further analyze the degree of short stature, all (Group 1-7) children were classified into normal (height for age Z>-2, stunted (height for age Z-score ≤ -2) and severely stunted (height for age Z-score ≤ -3). Children were classified into these three categories as per their diagnoses.(Chart 1) A gradual increase in percentage of children with severe stunting (height for age Z-score < -3) was noted from tall stature (0 %),nutritional obesity (0%), controls (0%), premature thelarche(5.9%), CAH(32.5%), T1DM(7.8%), hypothyroidism (38.9%), familial short stature (51.5%), syndromic short stature (77%), and growth hormone deficient children (92%).

Chart 1- Severity of Short Stature in various groups



Discussion

Mean height SD scores of all children with growth related disorders who were clinically short and identified to be due to an endocrine cause, were significantly lower than that of the controls, while that of the children with overgrowth syndromes were significantly higher ($p<0.05$). Mean height of tall children was on 50th percentile (almost no children <-2SD), normal were on the 25th percentile (no children <-3SD) and other children were on or below the 1st percentile. None of the tall or control children were classified as stunted, while 85% of children who were clinically classified as short were classified as severely stunted as per the WHO standards. Children who were classified as having overgrowth were tallest and at the 50th percentile, children who were controls were classified between the tall and the short, and children who were clinically short were classified under the 3rd or 1st percentile

In a study on hospitalized children by Colaco et al[5] and S K Bhadada et al[10] authors found that the commonest endocrine cause of short stature was hypothyroidism similar to our study. In a study examining the etiology of short stature on children coming to an endocrine clinic, the mean SD scores for growth hormone deficient children were – 5.9, using Tanner charts [11] which is similar to our mean SD score of -5 for growth hormone deficient children. Similarly, a mean SD score of -4 in children with syndromic short stature agrees with other studies reporting SD scores of -5 in children with Turner syndrome.[11]

In our study, position of controls on the 25% percentile suggests an overall small size of Indian children. Position of children with overgrowth disorders on the 50th percentile on WHO charts puts them at a risk of being missed.

Even so, our results suggest that the WHO 2006 growth standards classify children with growth disorders especially short stature appropriately and the classification is in line with the clinical assessment. The WHO standards thus provide health practitioners in a clinical setting with an effective tool to assess growth of children in their care, particularly short stature.

References

1. Van den Broeck J, Willie D, Younger N. The World Health Organization child growth standards: expected implications for clinical and epidemiological research. Eur J Pediatr. 2009 Feb;168(2):247-51.
2. WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards: Length/height-for-age, weight-for age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. World Health Organization, Geneva, 2006.
3. WHO Child Growth Standards. Acta Pediatrica Supplement 2006; 450:5-101
4. Khadilkar V, Khadilkar A, Choudhury P, Agarwal K, Ugra D, Shah N. IAP growth monitoring guidelines for children from birth to 18 years. Indian Pediatr. 2007 Mar; 44(3):187-97
5. Colaco P, Desai M, Choksi C. Short stature in Indian children: the extent of the problem. Indian J Pediatr. 1991 Sep-Oct; 58(1):57-8
6. Tarozzi A. Growth reference charts and the nutritional status of Indian children. Economics and Human Biology 2008; 6: 455–468.
7. Agarwal D, Agarwal K. Physical growth in Indian affluent children (birth - 6 years). Indian Pediatr. 1994 Apr; 31(4):377-413

VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

8. Prinja S, Thakur J, Bhatia S. Pilot testing of WHO Child Growth Standards in Chandigarh: implications for India's child health programmes. Bull World Health Organ. 2009 Feb; 87(2):116-22.
9. Alasfoor D, Mohammed A. Implications of the use of the new WHO growth charts on the interpretation of malnutrition and obesity in infants and young children in Oman. East Mediterr Health J. 2009 Jul-Aug; 15(4):890-8
10. Schwarz1 NG, Grobusch1 MP, Decker ML, Goesch J, Poetschke M, Oyakhirome S, et al. WHO 2006 child growth standards: implications for the prevalence of stunting and underweight-for-age in a birth cohort of Gabonese children in comparison to the Centers for Disease Control and Prevention 2000 growth charts and the National Center for Health Statistics 1978 growth references. Public Health Nutrition: 11(7), 714–719.
11. Wright C, Lakshman R, Emmett P, Ong KK. Implications of adopting the WHO 2006 Child Growth Standard in the UK: two prospective cohort studies. Arch Dis Child. 2008 Jul;93(7):566-9. Epub 2007 Oct 1.
12. Wit JM, Ranke M, Kelnar CJH: ESPE Classification of Paediatric Endocrine Diagnoses. Horm Res 2007;68(suppl 2):1–120