GROWTH CHARTS OF MEXICAN CHILDREN WITH DOWN SYNDROME

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Background

Down syndrome (SD) is the most frequent chromosomal disorder, a calculated incidence of 1/650 live births in Mexico. There are numerous comorbidities associated with DS, such as metabolic disorders, tissue dimorphism, internal organ abnormalities, intellectual disability, etc.

The growth of children with DS differs significantly with the rest of the population, this difference starts from the prenatal stage to adulthood. Short stature is a typical feature.
Since there is great variation in environmental, nutritional and social factors, it is important to have specific values in each region. Several countries have created their own parameters for growth evaluation.

Objective

Create growth charts of Mexican children with Down syndrome from 0 to 17 years and 11 months based on gender, weight, and height and head circumference from birth to 36 month.

Design and methods

Study design: prospective, observational, descriptive and cross-sectional study protocol.

The data used to create the growth charts were age at the time of taking measurements (in years and months), height (cm), weight (kg), body mass index and head circumference (cm).
Anthropometric measurements were taken between June 2013 and December 2018.

The I.S.A.K Manual was used as the main reference for locating anthropometric points and taking measurements.
Head circumference was measured with a measuring tape graduated in millimeters of inextensible Teflon 1 cm thick. Weight was measured on a SECA electronic digital scale in light clothes for children over 36 months and without clothes or in a diaper for babies and young children, so no weight correction was made, the weight measurement approached 0.01 kg nearest. Height was measured in a child length chart (infantometer) for children under 24 months and in children who cannot stand without support. For all others, the height was measured with a stadiometer in an upright position. The result of the size approached the nearest 0.1 cm.

To collect representative data at national level, measures were obtained from children of the north, center, and south of the country; from two third-level public Pediatric Hospital, 1 Private Children's Hospital, 1 Regional General Hospital, 17 Multiple Care Centers (CAM), 5 Special schools for children with DS, as well as private consultation. (Fig. 1 and 2).

Exclusion criteria: Patients who presented any of the following pathologies: congenital heart disease with hemodynamic repercussion, celiac disease, congenital gastrointestinal disorder without correction or with less than one year of corrective procedure, renal tubular acidosis, hematogenous disease -oncological, uncontrolled thyroid disease, institutionalized patients.

Percentiles curves were constructed for each gender using the LMS method
The LMS method summarizes the changing distribution of weight, height, head circumference, and BMI according to age by three curves representing the median (M), coefficient of variation (S), and skewness (L), the latter expressed as a c.
Were obtained from all measures; 5, 10, 25, 50, 75, 90 and 95 separated by gender and age.

Collections Sites:
- Aguascalientes, San Luis Potosí, Zacatecas 180
- Monterrey 97
- Coahuila 43
- Quintana Roo 47
- Morelos 112
- Querétaro 35
- Tabasco 66
- Ciudad de México y Estado de México 1287

Fig. 1 and 2. Origin and number of patients

Results:

We included 1867 patients, with 9968 measurements: 1,008 were boys (54%), 859 were girls (46%) from 0 to 18 years of age. Charts and tables of head circumference were created in children from 0 to 36 month and BMI in children from 3 to 18 years.

The median weight at birth was 2700 grams in boys (-1.37 SD) and 2692 grams in girls (-1.47 SD), the height of 49 cm in boys and 48 cm in girls, (-1.5 SD). The final height for boys was 148.3cm (-4.4 SD) and 141.2 cm for girls (-2.7 SD). The z scores compared to the WHO growth charts were lower in height, weight, and head circumference, unlike the normal BMI or +0.5 TO 1 SD.

Girls:
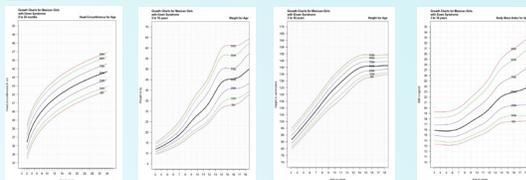
Boys:
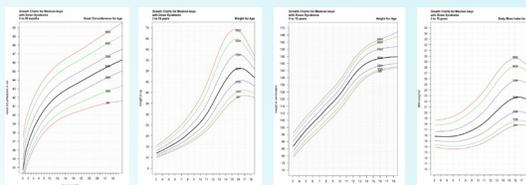
The present study shows that Mexican children have a lower height than the rest of the studies carried out in different regions, which is more marked in males. Table 1 describes and compare the differences in the median height between the population of 5 and 18 years with studies conducted in USA, Holland, Turkey, and Sweden, plus the comparison with the WHO parameters.

		México	USA	Holland	Turkey	Sweden	WHO
	n	1867	637	1596	1726	354	31,357
Sex	Age (y)						
Girls	5	98.2	98.6	101.7	102.6	101	109.4
	18	141.2	143.9	151.2	144	147.5	163
Boys	5	100	103.1	102.9	104.3	104	112.4
	18	148.3	155	163	160	161.5	176.1

Table 1. Comparison of median height in children aged 5 and 18

Conclusion

We present the first growth charts in Mexican population with DS from 0 to 17 years 11 months with adequate health status, using standardized measurements and statistical techniques to generate highly reliable smoothed percentiles.
This study provides a satisfactory representation of the population throughout the country that can be applied in daily consultation for the opportunely detection of growth anomalies.

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