## *Original Articles*

# PHYSICAL GROWTH IN INDIAN AFFLUENT CHILDREN (BIRTH - 6 YEARS)

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**ABSTRACT**

*Growth characteristics, viz., height, weight and circumferences of head, chest and mid-arm were pleasured on urban affluent children from seven centres (Bangalore, Calcutta, Delhi, Kota, Ludhiana and Varanasi—Nutrition Foundation of India study). On each age and sex point there were 200 observations except at 18 and 72 months. The percentiles on pooled data were calculated by smoothed cubic spline least square method. This pooled data showed values lower than European and NCHS (American) standards. Centrewise comparison showed that Ludhiana children approached the latter. The differences in growth seem to be possibly due to lower velocity in Indian children of present study in the first 18 months as compared to American children.*

**Keywords:** *Affluent, Growth, Preschool, Percentiles, Velocity.*

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*Received for publication: July 21, 1993; Accepted: October 26, 1993*

The WHO(l) has recognized the need for a growth chart which could be used internationally particularly by primary health care workers. Reference values for these charts examined by the WHO group were derived from data collected in Mexico, Netherlands, Sweden, Switzerland, UK and USA(2-5), in consultation with experts from various parts of the world and field-tested in 10 centres of different countries in 1974. It was later decided that the WHO chart should be based on data from the United States National Child Health Examination Survey(6) because they better fitted the criteria required. When devising these charts for international use, the WHO group recognized that countries or regions might eventually develop local standards, but the reference values presented by WHO(l) should be effective in the interim.

The objective of the present study was to investigate the growth performance of Indian children below six years of age, not subject to any obvious socio-economic constraints that could be expected to impair growth, only children (below six years) belonging to the affluent population segments (urban) in these cities were selected. The study was carried out in seven different cities of India: Bangalore, Bombay, Calcutta, Delhi, Kota, Ludhiana, and Varanasi.

### Material and Methods

The study was carried out for two years (1985-1987) as two different cohorts. Cohort-I consisted of infants from birth to one year and Cohort-II included children from - one to six years of age. The mixed longitudinal study design was adopted and the data were analysed on the basis of this format.

The two cohorts were simultaneously selected. Cohort-I included infants at birth + 15 days up to three months of age and followed at three monthly intervals till their first birthday. Cohort-II was of children from 12 to 72 months of age. Children could enter in the study at any time but the anthropometric readings of each child were recorded at fixed age points, *i.e.,* 12,18, 24, 30, 36, 42, 48, 54, 60, 66 and 72 months. Four hundred eighteen boys and 332 girls were thus included in Cohort-I. while 1011 boys and 874 girls were subjects for Cohort - II. The registration for both cohorts was contained for one full year and those children who had minimum of three follow ups at three consecutive time points alone were included for data analysis.

In *Table I* a consolidated statement indicating the number and percentage distribution of children from various centres of both cohorts has been presented. The distribution of registered children and number of observations at different age points is given in *Table II.*

Affluence in each family was identified by the income level, life style (as directly observed by the investigators), educational status, occupational status and awareness of basic principles of health, personal hygiene, sanitation and child rearing on the part of parents.

For the selection of subjects of Cohort-I, cooperation from Pediatricians and Obstetricians of leading nursing homes and private hospitals was obtained so that children born in these hospitals could be recruited for the study. Similarly, children for Cohort-II were taken from nurseries and private schools or private clinics.

*Date of Birth:* The exact date of birth of each subject was confirmed and verified from parents and from birth certificates. In case of doubt regarding the exact age, the child was excluded from the study.

*Anthropometric Measurements:* Weight, height/length, mid-arm circumference, head circumference and chest circumference measurements were taken for each subject (in both the cohorts) in the study(7,8). The investigators were centrally trained and tools used were calibrated periodically.

*Data Analysis:* After combining the data for two cohorts from seven centres, we have analysed for percentiles (3rd, 5th, 10th, 25th, 50th, 75th, 90th, 95th and 97th) at different age points according to sex for five parameters, *viz.,* weight, height and circumferences of head, chest and midarm using cubic spline method(9).

*Estimation of Norms at Specified Ages:* The estimate of norms or population mean values and their standard errors at specified ages for growth parameters were obtained from the mixed longitudinal series of observations(10,ll).

*Velocity:* Since the percentile curves show only growth from one age point to another, therefore to estimate the rate of growth velocities were calculated. It was calculated by simply taking increment between birth to six months, 3 months to 9 months and so on. This was done for each child separately and for all the 5 parameters. After calculating the velocity at two age intervals, the velocity percentiles were also calculated for each age interval.

**Pooling of Data**

*Height:* Before pooling data from six centres, Bangalore, Calcutta, Delhi, Kota, Ludhiana and Varanasi, the variation was calculated from the 50th percentile of pooled data which is under 3% for all the study

**TABLE I**–*Number and Percentage Distribution of Children from Various Centres for Both Cohorts*

| Cohort | Bangalore | | | Bombay | | | Calcutta | | | Delhi | | | Ludhiana | | | Varanasi | | | Kota | | | No. of measurements | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | G | T | B | G | T | B | G | T | B | G | T | B | G | T | B | G | T | B | G | T | | |
| I | 24 | 24 | 48 (6.4) | 39 | 39 | 78 (10.4) | 93 | 85 | 178 (23.7) | 49 | 42 | 91 (12.1) | 136 | 75 | 211 (28.11) | 77 | 67 | 144 (19.2) | - | - | - | 1977 | 1556 |
| II | 105 | 75 | 180 (9.5) | 22 | 13 | 35 (1.8) | 140 | 120 | 260 (13.7) | 143 | 104 | 247 (13.1) | 248 | 193 | 441 (23.3) | 210 | 220 | 430 (22.8) | 143 | 149 | 292 (15.4) | 3396 | 2896 |
| | 129 | 99 | 228 (8.65) | 61 | 52 | 113 (4.28) | 233 | 205 | 438 (16.62) | 192 | 146 | 338 (12.82) | 384 | 268 | 652 (24.74) | 287 | 287 | 574 (21.78) | 143 | 149 | 292 (11.04) | - | - |

B=Boys; G=Girls. Percentage distributions are given in parentheses.

**TABLE III**—*Per cent Variation Between the 50th Percentile of Pooled Height Smooth Curve with Different Centres According to Age*

| Age (mo) | | Ludhiana | Calcutta | Varanasi | Delhi | Kota |
|---|---|---|---|---|---|---|
| Bi | B | 0.238 | 1.548 | 1.945 | 0.238 | - |
| | G | 0.458 | 1.333 | 2.128 | 0.934 | - |
| 3 | B | 0.067 | 1.078 | 1.584 | 2.594 | - |
| | G | 0.338 | 1.523 | 1.523 | 1.522 | - |
| 6 | B | 3.128 | 0.061 | 0.516 | 2.490 | - |
| | G | 3.284 | 0.688 | 0.229 | 0.228 | - |
| 9 | B | 1.416 | 0.001 | 0.142 | 1.841 | - |
| | G | 2.342 | - | - | - | - |
| 12 | B | 0.296 | 0.780 | 1.050 | 1.086 | - |
| | G | 0.395 | 1.102 | 1.510 | 1.646 | - |
| 18 | B | 0.831 | 0.719 | 0.397 | 0.719 | 2.269 |
| | G | 0.226 | 0.351 | 0.100 | 3.338 | 0.651 |
| 24 | B | 1.081 | 0.581 | 1.895 | 0.000 | 1.314 |
| | G | 0.024 | 0.012 | 1.047 | 0.035 | 0.670 |
| 30 | B | 0.155 | 0.486 | 2.342 | 0.155 | 1.668 |
| | G | 0.011 | 1.056 | 2.980 | 1.745 | 2.146 |
| 36 | B | 0.032 | 0.283 | 1.484 | 0.509 | 1.272 |
| | G | 0.900 | 0.922 | 2.294 | 0.525 | 0.493 |
| 42 | B | 0.246 | 0.082 | 1.668 | 0.860 | 1.944 |
| | G | 1.138 | 0.228 | 2.513 | 0.703 | 0.455 |
| 48 | B | 0.984 | 0.050 | 1.388 | 1.091 | 0.298 |
| | G | 1.973 | 0.431 | 1.622 | 0.862 | 1.071 |
| 54 | B | 0.974 | 0.231 | 1.002 | 1.494 | 0.473 |
| | G | 2.702 | 0.000 | 0.427 | 1.001 | 0.427 |
| 60 | B | 1.724 | 0.038 | 1.349 | 1.677 | 1.087 |
| | G | 2.349 | 1.443 | 1.028 | 1.207 | 1.528 |
| 66 | B | 1.537 | 0.264 | 1.419 | 0.646 | 0.191 |
| | G | 2.213 | 2.259 | 2.591 | 1.527 | 0.301 |
| 72 | B | 1.197 | 0.079 | 1.796 | 0.000 | 0.960 |
| | G | 0.813 | 2.732 | 1.405 | 0.000 | 0.521 |

B = Boys; G = Girls; Bi = Birth.

**TABLE IV**–*Height Percentiles (cm) (Cubic Spline Least Square Method) for Boys*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 47.6 | 47.7 | 40.2 | 49.1 | 50.3 | 49.4 | 49.8 | 50.4 (50.5) | 50.7 | 50.9 | 51.2 | 51.4 | 52.2 | 52.7 | 53.2 |
| 3 | 56.3 | 56.7 | 57.4 | 58.0 | 58.2 | 58.4 | 56.9 | 59.4 (61.1) | 59.6 | 60.2 | 60.7 | 60.8 | 62.0 | 62.9 | 63.8 |
| 6 | 62.5 | 63.0 | 63.7 | 64.3 | 64.9 | 65.9 | 65.9 | 65.9 (67.8) | 66.1 | 66.4 | 67.2 | 67.5 | 68.7 | 69.9 | 70.8 |
| 9 | 66.8 | 67.4 | 68.1 | 68.9 | 69.3 | 69.6 | 70.1 | 70.6 (72.5) | 70.9 | 71.6 | 72.0 | 72.3 | 73.4 | 74.6 | 75.4 |
| 12 | 70.1 | 70.7 | 71.4 | 72.5 | 72.9 | 73.3 | 72.8 | 74.3 (76.1) | 74.7 | 75.6 | 75.3 | 76.0 | 77.0 | 79.2 | 78.8 |
| 18 | 75.6 | 76.2 | 77.0 | 78.5 | 79.0 | 79.5 | 90.1 | 80.7 (82.4) | 81.2 | 81.7 | 82.0 | 82.3 | 83.3 | 84.4 | 84.9 |
| 24 | 80.1 | 80.9 | 81.8 | 83.6 | 84.1 | 84.6 | 85.3 | 86.0 (85.6) | 86.6 | 87.1 | 87.5 | 87.8 | 88.9 | 90.1 | 90.5 |
| 30 | 84.0 | 84.9 | 86.0 | 87.8 | 88.3 | 88.9 | 99.8 | 90.5 (90.4) | 91.2 | 91.7 | 92.2 | 92.6 | 93.9 | 95.3 | 95.9 |
| 36 | 87.3 | 88.3 | 89.6 | 91.3 | 91.9 | 92.5 | 93.6 | 94.4 (94.9) | 95.1 | 95.8 | 96.3 | 96.9 | 93.5 | 100.0 | 100.8 |
| 42 | 90.2 | 91.3 | 92.8 | 94.5 | 95.1 | 95.7 | 96.9 | 97.7 (99.1) | 98.5 | 99.3 | 100.0 | 100.6 | 102.6 | 104.3 | 105.2 |
| 48 | 92.8 | 94.0 | 95.6 | 97.4 | 90.8 | 98.7 | 99.9 | 100.8 (102.9) | 101.6 | 102.6 | 103.4 | 104.1 | 106.4 | 108.2 | 109.3 |
| 54 | 95.3 | 96.5 | 98.3 | 100.2 | 100.9 | 101.5 | 102.8 | 103.7 (106.6) | 104.6 | 105.0 | 106.7 | 107.4 | 110.0 | 111.8 | 113.1 |
| 60 | 97.9 | 99.1 | 100.9 | 103.1 | 103.9 | 104.6 | 105.8 | 106.2 (109.9) | 107.7 | 109.0 | 109.9 | 110.8 | 113.4 | 115.1 | 116.4 |
| 66 | 100.7 | 101.9 | 103.6 | 106.4 | 107.2 | 108.0 | 109.0 | 110.0 (113.1) | 111.1 | 112.4 | 113.3 | 114.2 | 116.7 | 118.3 | 119.5 |
| 72 | 103.9 | 104.9 | 106.5 | 110.1 | 111.0 | 111.9 | 112.6 | 113.6 (116.1) | 114.9 | 116.2 | 117.0 | 117.9 | 120.0 | 121.3 | 122.2 |

Bi = Birth. Mean values are given in parentheses.

**TABLE V–*Height Percentiles (cm) for Girls***

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 47.5 | 47.9 | 48.4 | 48.9 | 49.3 | 49.5 | 49.9 | 50.3 (49.9) | 50.6 | 50.9 | 51.3 | 51.5 | 52.1 | 52.7 | 53.1 |
| 3 | 55.8 | 56.4 | 57.1 | 57.9 | 58.1 | 58.2 | 58.7 | 59.1 (59.5) | 59.4 | 60.0 | 60.3 | 60.6 | 61.5 | 62.2 | 62.9 |
| 6 | 61.6 | 62.3 | 63.2 | 64.1 | 64.3 | 64.5 | 65.0 | 65.5 (65.9) | 66.0 | 66.4 | 66.8 | 67.1 | 68.1 | 68.9 | 69.7 |
| 9 | 65.6 | 66.4 | 67.5 | 68.5 | 67.8 | 69.1 | 69.6 | 70.0 (70.4) | 70.5 | 71.0 | 71.5 | 71.7 | 72.3 | 73.7 | 74.5 |
| 12 | 68.6 | 69.5 | 70.7 | 71.8 | 72.2 | 72.6 | 73.2 | 73.5 (74.3) | 74.1 | 74.6 | 74.9 | 75.3 | 76.5 | 77.4 | 78.0 |
| 18 | 73.8 | 74.8 | 76.2 | 77.6 | 78.1 | 78.5 | 79.3 | 79.8 (80.9) | 80.2 | 80.8 | 81.2 | 81.5 | 82.9 | 83.9 | 84.4 |
| 24 | 78.2 | 79.3 | 80.9 | 82.0 | 83.0 | 83.6 | 84.5 | 85.0 (85.7) | 85.4 | 86.1 | 86.6 | 86.9 | 88.4 | 89.6 | 90.2 |
| 30 | 82.0 | 83.2 | 84.9 | 86.6 | 87.2 | 87.8 | 88.8 | 89.9 (90.0) | 90.0 | 90.8 | 91.3 | 91.7 | 93.2 | 94.6 | 95.3 |
| 36 | 85.3 | 86.6 | 88.4 | 90.2 | 90.9 | 91.5 | 92.6 | 93.3 (94.1) | 94.0 | 94.9 | 95.4 | 95.8 | 97.5 | 99.0 | 99.9 |
| 42 | 88.3 | 89.7 | 91.5 | 93.5 | 94.1 | 94.7 | 95.8 | 96.7 (97.9) | 97.5 | 98.5 | 99.0 | 99.5 | 101.2 | 102.9 | 104.0 |
| 48 | 91.2 | 92.6 | 94.5 | 96.5 | 97.1 | 97.7 | 98.9 | 99.8 (101.6) | 100.8 | 101.9 | 102.4 | 102.9 | 104.6 | 106.4 | 107.6 |
| 54 | 94.1 | 95.5 | 97.3 | 99.5 | 100.1 | 100.7 | 101.8 | 102.9 (105.0) | 104.0 | 105.1 | 105.5 | 106.1 | 107.8 | 109.6 | 110.9 |
| 60 | 97.2 | 98.6 | 100.3 | 102.5 | 103.1 | 103.7 | 104.8 | 106.0 (108.4) | 107.1 | 108.2 | 108.8 | 109.3 | 110.9 | 112.6 | 113.8 |
| 66 | 100.6 | 102.0 | 103.5 | 105.8 | 106.5 | 107.1 | 108.1 | 109.3 (111.6) | 110.5 | 111.4 | 112.0 | 112.6 | 114.1 | 115.4 | 116.4 |
| 72 | 104.5 | 105.9 | 107.1 | 109.6 | 110.2 | 110.9 | 111.8 | 113.1 (114.6) | 114.1 | 114.9 | 115.5 | 116.1 | 117.4 | 118.3 | 118.7 |

Bi = Birth. Mean values are given in parentheses.

**TABLE VI**– *Centrewise Mean* and SE of Boys Height (cm) for Age Estimated from Mixed Longitudinal Series*

| Age (mo) | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 50.5 | 0.1 | 49.3 | 0.2 | 50.0 | 0.1 | 49.9 | 0.2 | 51.5 | 0.6 |
| 3 | 59.2 | 0.2 | 60.4 | 0.3 | 60.1 | 0.2 | 60.5 | 0.2 | 60.9 | 0.5 |
| 6 | 63.3 | 0.1 | 65.8 | 0.3 | 66.0 | 0.1 | 66.5 | 0.3 | 66.0 | 0.7 |
| 9 | 69.4 | 0.1 | 70.4 | 0.2 | 70.4 | 0.1 | 71.2 | 0.2 | 70.9 | 0.6 |
| 12 | 74.0 | 0.1 | 74.7 | 0.2 | 75.0 | 0.1 | 75.4 | 0.3 | 74.9 | 0.6 |
| 18 | 80.5 | 0.2 | 80.2 | 0.4 | 84.4 | 0.2 | 81.1 | 0.6 | 79.4 | 1.0 |
| 24 | 85.0 | 0.2 | 84.7 | 0.4 | 87.7 | 0.1 | 86.1 | 0.6 | 85.7 | 0.7 |
| 30 | 90.5 | 0.2 | 89.4 | 0.3 | 91.5 | 0.3 | 91.1 | 0.5 | 90.7 | 0.5 |
| 36 | 94.6 | 0.2 | 92.9 | 0.5 | 94.5 | 0.4 | 95.1 | 0.5 | 94.2 | 0.4 |
| 42 | 98.5 | 0.2 | 96.5 | 0.4 | 97.5 | 0.4 | 98.0 | 0.4 | 97.9 | 0.4 |
| 48 | 102.2 | 0.3 | 99.8 | 0.4 | 100.9 | 1.4 | 100.7 | 0.4 | 101.3 | 0.4 |
| 54 | 105.3 | 0.3 | 102.9 | 0.4 | 104.1 | 0.4 | 103.9 | 0.4 | 104.6 | 0.4 |
| 60 | 108.8 | 0.3 | 106.3 | 0.4 | 107.1 | 0.4 | 107.6 | 0.5 | 107.5 | 0.4 |
| 66 | 112.2 | 0.3 | 108.9 | 0.5 | 110.1 | 0.2 | 110.1 | 0.5 | 110.1 | 0.3 |
| 72 | 115.9 | 0.4 | 112.1 | 0.7 | 112.7 | 0.4 | 109.7 | 0.6 | — | — |

Bi = Birth; SE = Standard error.
* Means estimated at the specific ages using observations made at that age as well as at all preceding ages and at the immediately succeeding age.

The observed velocity percentile for boys and girls at different ages for 6 monthly intervals are presented in *Tables VIII* and *IX*. It appears that increments are higher in the early age period (first 12 months) and progressive deceleration was observed upto 6 years of age. The boys had marginally better gains than the girls. The total gain (50th percentile) in length/height (cm) from birth to 72 months was 63.2 and 62.8 cm for boys and girls, respectively.

### *Weight*

The weight percentile data are presented in *Table X* and *XL* Boys have marginally higher weight by around 0.3 kg at all age points except for birth weight.

The weight means with standard error (SE) for age and sex for different centres are given in *Tables XII* and *XIII*. The means were similar for Bangalore, Calcutta, Delhi and Varanasi for girls as well as boys. The Ludhiana means were significantly higher for girls as compared to other centres.

The weight velocity at 6 monthly interval in percentiles is given in *Table XIV* and *XV for* boys and girls, respectively. The total gain (50th percentile) in weight (kg) from birth to 72 months of age for boys and girls

**TABLE VIII**–*Velocity (6 Monthly Increments) Percentile of Height in cm (Boys)*

| | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age (mo) | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| 6 | 8.9 | 9.9 | 11.7 | 13.4 | 14.0 | 14.6 | 15.5 | 16.3 | 17.3 | 18.8 | 18.3 | 19.3 | 21.0 | 22.8 | 24.5 |
| 9 | 4.3 | 5.3 | 6.9 | 8.5 | 9.1 | 9.5 | 10.1 | 10.8 | 11.6 | 12.5 | 13.0 | 13.5 | 15.2 | 16.7 | 17.9 |
| 12 | 3.2 | 4.2 | 5.5 | 7.0 | 7.5 | 7.9 | 8.5 | 9.0 | 9.5 | 10.1 | 10.7 | 11.2 | 12.8 | 14.5 | 15.3 |
| 18 | 2.6 | 2.8 | 3.4 | 4.9 | 5.3 | 5.5 | 5.8 | 6.0 | 6.3 | 6.5 | 6.7 | 7.0 | 7.6 | 8.2 | 8.4 |
| 24 | 2.2 | 2.4 | 2.8 | 3.4 | 3.7 | 4.0 | 4.5 | 4.9 | 5.3 | 5.7 | 5.9 | 6.2 | 6.9 | 8.4 | 9.4 |
| 30 | 2.0 | 2.4 | 3.2 | 3.8 | 4.1 | 4.4 | 4.9 | 5.3 | 5.8 | 6.4 | 6.8 | 7.1 | 7.7 | 8.0 | 9.2 |
| 36 | 1.6 | 2.0 | 2.4 | 3.0 | 3.2 | 3.3 | 3.7 | 4.0 | 4.7 | 5.3 | 5.7 | 6.0 | 6.9 | 7.7 | 8.3 |
| 42 | 0.5 | 0.9 | 1.4 | 2.4 | 2.5 | 2.8 | 3.2 | 3.5 | 3.8 | 4.3 | 4.6 | 4.9 | 5.7 | 6.7 | 8.3 |
| 48 | 0.7 | 1.1 | 2.1 | 2.5 | 2.7 | 2.9 | 3.2 | 3.5 | 3.9 | 4.3 | 4.5 | 4.8 | 5.6 | 5.6 | 7.1 |
| 54 | 1.1 | 1.4 | 2.0 | 2.5 | 2.7 | 2.9 | 3.2 | 3.5 | 3.8 | 4.2 | 4.4 | 4.6 | 5.3 | 6.3 | 6.8 |
| 60 | 1.1 | 1.3 | 1.6 | 2.2 | 2.5 | 2.7 | 3.1 | 3.5 | 3.8 | 4.3 | 4.7 | 5.0 | 5.9 | 6.7 | 7.2 |
| 66 | 0.5 | 0.9 | 1.4 | 2.1 | 2.3 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.2 | 4.6 | 6.1 | 7.2 | 8.1 |
| 72 | 1.0 | 1.2 | 1.7 | 2.2 | 2.4 | 2.5 | 2.8 | 3.1 | 3.4 | 3.8 | 4.0 | 4.3 | 5.3 | 6.3 | 7.0 |

**TABLE IX**–*Velocity (6 Monthly Increments) Percentile of Height in cm (Girls)*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| 6 | 8.5 | 9.8 | 11.1 | 12.8 | 13.4 | 14.0 | 15.1 | 16.0 | 16.8 | 17.7 | 18.3 | 19.1 | 21.2 | 23.2 | 24.7 |
| 9 | 4.9 | 5.4 | 6.3 | 7.5 | 8.3 | 8.8 | 9.6 | 10.3 | 11.1 | 11.9 | 12.4 | 13.1 | 14.9 | 16.1 | 17.8 |
| 12 | 4.5 | 5.0 | 5.9 | 7.0 | 7.5 | 7.9 | 8.5 | 9.1 | 9.7 | 10.4 | 10.9 | 11.5 | 13.1 | 14.4 | 15.6 |
| 18 | 2.1 | 2.3 | 2.7 | 3.6 | 4.1 | 4.3 | 5.1 | 5.3 | 5.7 | 5.9 | 6.1 | 6.4 | 6.9 | 8.4 | 8.8 |
| 24 | 1.7 | 2.1 | 2.7 | 3.7 | 4.1 | 4.3 | 4.6 | 5.0 | 5.4 | 5.8 | 6.0 | 6.4 | 7.5 | 8.7 | 9.4 |
| 30 | 2.1 | 2.5 | 3.1 | 3.6 | 3.8 | 4.1 | 4.5 | 4.8 | 5.4 | 6.1 | 6.4 | 7.0 | 7.9 | 8.6 | 8.9 |
| 36 | 0.9 | 1.2 | 1.6 | 2.5 | 2.9 | 3.2 | 3.6 | 4.0 | 4.6 | 5.3 | 5.6 | 5.9 | 6.6 | 7.0 | 7.7 |
| 42 | 1.5 | 1.9 | 2.2 | 2.6 | 3.0 | 3.1 | 3.4 | 3.7 | 4.0 | 4.4 | 4.6 | 4.9 | 5.7 | 6.4 | 7.2 |
| 48 | 0.8 | 1.3 | 2.1 | 2.6 | 2.8 | 3.0 | 3.3 | 3.7 | 4.1 | 4.5 | 4.8 | 5.1 | 6.0 | 7.0 | 7.0 |
| 54 | 0.9 | 1.2 | 1.8 | 2.4 | 2.6 | 2.8 | 3.2 | 3.5 | 3.7 | 4.1 | 4.3 | 4.6 | 5.2 | 6.0 | 6.6 |
| 60 | 0.7 | 1.1 | 1.5 | 2.2 | 2.4 | 2.7 | 3.1 | 3.5 | 3.8 | 4.3 | 4.6 | 4.9 | 6.4 | 7.4 | 8.1 |
| 66 | 0.6 | 1.0 | 1.7 | 2.3 | 2.4 | 2.6 | 2.9 | 3.2 | 3.6 | 3.8 | 4.0 | 4.4 | 5.6 | 7.6 | 8.9 |
| 72 | 1.2 | 1.6 | 2.1 | 2.4 | 2.5 | 2.7 | 2.9 | 3.2 | 3.5 | 3.4 | 4.0 | 4.3 | 5.0 | 5.6 | 5.8 |

**TABLE X**–*Percentile for Weight (kg) of Boys*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 2.5 | 2.6 | 2.7 | 2.9 | 3.0 | 3.0 | 3.0 | 3.1 (3.3) | 3.2 | 3.4 | 3.5 | 3.5 | 3.7 | 3.9 | 4.0 |
| 3 | 4.8 | 4.9 | 5.0 | 5.2 | 5.3 | 5.4 | 5.5 | 5.7 (6.0) | 5.8 | 5.9 | 6.0 | 6.2 | 6.4 | 6.6 | 6.7 |
| 6 | 6.2 | 6.3 | 6.5 | 6.8 | 6.9 | 7.0 | 7.2 | 7.4 (7.8) | 7.5 | 7.7 | 7.8 | 8.0 | 8.2 | 8.5 | 8.6 |
| 9 | 7.2 | 7.3 | 7.6 | 7.9 | 8.0 | 8.1 | 8.3 | 8.5 (9.2) | 8.6 | 8.8 | 8.9 | 9.2 | 9.5 | 9.8 | 10.1 |
| 12 | 7.8 | 8.0 | 8.3 | 8.7 | 8.8 | 8.9 | 9.1 | 9.3 (10.2) | 9.4 | 9.7 | 9.8 | 10.1 | 10.4 | 10.9 | 11.2 |
| 18 | 8.9 | 9.1 | 9.6 | 10.0 | 10.1 | 10.2 | 10.5 | 10.7 (11.5) | 10.8 | 11.1 | 11.3 | 11.5 | 12.0 | 12.6 | 13.1 |
| 24 | 9.8 | 10.0 | 10.6 | 11.1 | 11.2 | 11.3 | 11.7 | 11.9 (12.3) | 12.0 | 12.4 | 12.5 | 12.8 | 13.4 | 14.1 | 14.7 |
| 30 | 10.6 | 10.9 | 11.4 | 12.0 | 12.1 | 12.3 | 12.5 | 12.9 (13.5) | 13.1 | 13.5 | 13.7 | 14.0 | 14.7 | 15.4 | 16.0 |
| 36 | 11.3 | 11.6 | 12.1 | 12.7 | 12.9 | 13.1 | 13.5 | 13.8 (14.6) | 14.1 | 14.4 | 14.7 | 15.0 | 15.8 | 16.6 | 17.2 |
| 42 | 11.9 | 12.3 | 12.8 | 13.4 | 13.6 | 13.8 | 14.3 | 14.6 (15.7) | 14.9 | 15.3 | 15.6 | 16.0 | 16.9 | 17.7 | 18.3 |
| 48 | 12.5 | 12.9 | 13.4 | 14.1 | 14.4 | 14.6 | 15.0 | 15.4 (16.7) | 15.9 | 16.2 | 16.5 | 17.0 | 17.9 | 18.7 | 19.3 |
| 54 | 13.1 | 13.6 | 14.1 | 14.9 | 15.1 | 15.3 | 15.8 | 16.2 (17.7) | 19.7 | 17.1 | 17.4 | 17.9 | 18.9 | 19.8 | 20.3 |
| 60 | 13.8 | 14.3 | 14.9 | 15.8 | 16.0 | 16.1 | 16.6 | 17.1 (18.7) | 17.6 | 18.0 | 18.4 | 18.9 | 19.9 | 21.0 | 21.5 |
| 66 | 14.5 | 15.0 | 15.8 | 16.8 | 17.0 | 17.0 | 17.6 | 18.1 (19.7) | 18.6 | 19.1 | 19.5 | 19.9 | 21.0 | 22.3 | 22.7 |
| 72 | 15.3 | 15.8 | 17.0 | 18.1 | 18.1 | 18.1 | 18.7 | 19.2 (20.7) | 19.7 | 20.2 | 20.7 | 22.1 | 22.1 | 23.8 | 24.2 |

Bi=Birth; Mean values are given in parentheses.

**TABLE XI**–*Percentile for Weight (kg) of Girls*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 2.5 | 2.5 | 2.7 | 2.9 | 3.0 | 3.0 | 3.0 | 3.2 (3.2) | 3.2 | 3.3 | 3.4 | 3.5 | 3.8 | 3.9 | 3.9 |
| 3 | 4.5 | 4.6 | 4.8 | 4.9 | 5.0 | 5.1 | 5.3 | 5.4 (5.4) | 5.6 | 5.8 | 5.9 | 6.0 | 6.3 | 6.5 | 6.6 |
| 6 | 5.9 | 6.0 | 6.3 | 6.4 | 6.5 | 6.6 | 6.8 | 7.0 (7.2) | 7.2 | 7.4 | 7.6 | 7.7 | 7.9 | 8.2 | 8.4 |
| 9 | 6.8 | 7.0 | 7.2 | 7.5 | 7.6 | 7.7 | 7.9 | 8.1 (8.6) | 8.3 | 8.5 | 8.7 | 8.8 | 9.1 | 9.4 | 9.6 |
| 12 | 7.5 | 7.7 | 8.0 | 8.3 | 8.5 | 8.6 | 8.8 | 9.0 (9.5) | 9.2 | 9.3 | 9.5 | 9.6 | 10.0 | 10.3 | 10.5 |
| 18 | 8.6 | 8.8 | 9.1 | 9.7 | 9.8 | 10.0 | 10.1 | 10.4 (10.8) | 10.6 | 10.7 | 10.9 | 11.0 | 11.5 | 11.9 | 12.2 |
| 24 | 9.4 | 9.7 | 10.1 | 10.7 | 10.9 | 11.1 | 11.4 | 11.6 (11.8) | 11.8 | 12.0 | 12.2 | 12.3 | 12.9 | 13.3 | 13.7 |
| 30 | 10.1 | 10.4 | 10.9 | 11.6 | 11.8 | 12.0 | 12.3 | 12.6 (13.0) | 12.9 | 13.1 | 13.3 | 13.5 | 14.2 | 14.8 | 15.2 |
| 36 | 10.8 | 11.1 | 11.6 | 12.3 | 12.4 | 12.8 | 13.1 | 13.5 (14.1) | 13.9 | 14.1 | 14.4 | 14.6 | 15.3 | 16.0 | 16.7 |
| 42 | 11.3 | 11.7 | 12.2 | 12.9 | 13.2 | 13.5 | 13.9 | 14.3 (15.1) | 14.8 | 15.0 | 15.4 | 15.7 | 16.4 | 17.1 | 18.0 |
| 48 | 11.9 | 12.3 | 12.9 | 13.6 | 13.9 | 14.2 | 14.6 | 15.1 (16.0) | 15.6 | 16.0 | 16.4 | 16.7 | 17.5 | 18.2 | 19.4 |
| 54 | 12.6 | 13.0 | 13.6 | 14.3 | 14.6 | 14.9 | 15.4 | 15.9 (16.8) | 16.5 | 16.9 | 17.3 | 17.7 | 18.5 | 19.3 | 20.6 |
| 60 | 13.4 | 13.9 | 14.5 | 15.1 | 15.5 | 15.7 | 16.2 | 16.8 (17.7) | 17.4 | 17.8 | 18.3 | 18.6 | 19.6 | 20.2 | 21.9 |
| 66 | 14.4 | 14.9 | 15.6 | 16.1 | 16.5 | 16.8 | 17.2 | 17.8 (18.6) | 18.3 | 18.9 | 19.3 | 19.6 | 20.6 | 21.1 | 23.1 |
| 72 | 15.7 | 16.3 | 17.0 | 17.5 | 17.8 | 18.0 | 18.3 | 18.9 (19.5) | 19.3 | 20.0 | 20.3 | 20.5 | 21.7 | 22.0 | 24.3 |

Bi = Birth.

**TABLE XII**–*Centrewise Mean and SE of Boys Weight (kg) for Age Estimated from Mixed Longitudinal Series*

| Age (mo) | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 3.15 | 0.03 | 3.14 | 0.04 | 3.15 | 0.04 | 3.26 | 0.08 | 3.05 | 0.10 |
| 3 | 5.75 | 0.05 | 5.74 | 0.08 | 5.62 | 0.06 | 6.23 | 0.08 | 5.88 | 0.13 |
| 6 | 6.72 | 0.05 | 7.17 | 0.07 | 7.17 | 0.07 | 7.64 | 0.10 | 7.29 | 0.23 |
| 9 | 8.21 | 0.04 | 8.37 | 0.09 | 8.37 | 0.07 | 8.82 | 0.10 | 8.46 | 0.27 |
| 12 | 9.57 | 0.04 | 9.40 | 0.10 | 9.38 | 0.13 | 9.79 | 0.13 | 9.15 | 0.23 |
| 18 | 10.87 | 0.08 | 10.56 | 0.18 | 11.27 | 0.07 | 11.12 | 0.32 | 10.80 | 0.38 |
| 24 | 11.79 | 0.06 | 11.68 | 0.17 | 12.46 | 0.06 | 12.57 | 0.30 | 12.15 | 0.38 |
| 30 | 12.89 | 0.06 | 12.88 | 0.15 | 12.54 | 0.19 | 13.16 | 0.20 | 12.80 | 0.19 |
| 36 | 13.89 | 0.07 | 13.88 | 0.15 | 13.66 | 0.19 | 13.82 | 0.19 | 13.50 | 0.16 |
| 42 | 14.88 | 0.11 | 14.83 | 0.16 | 14.54 | 0.17 | 14.65 | 0.16 | 14.41 | 0.15 |
| 48 | 16.03 | 0.11 | 15.48 | 0.16 | 15.58 | 0.16 | 15.59 | 0.16 | 15.14 | 0.17 |
| 54 | 17.00 | 0.11 | 16.47 | 0.16 | 16.63 | 0.19 | 16.78 | 0.19 | 15.97 | 0.18 |
| 60 | 18.04 | 0.15 | 17.60 | 0.17 | 17.70 | 0.20 | 17.73 | 0.20 | 17.09 | 0.20 |
| 66 | 18.96 | 0.13 | 18.94 | 0.22 | 18.63 | 0.20 | 19.17 | 0.26 | 17.78 | 0.18 |
| 72 | 19.85 | 0.16 | 20.35 | 0.33 | 19.93 | 0.25 | — | — | — | — |

centres are also given in *Tables XXII* and *XXIII*. Ludhiana children show more gain and remain higher as compared to other centres. Chest overtook head circumference by 11.4 and 12.0 months in boys and girls, respectively. The earliest take over was observed in Delhi children by 9.24 and 9.85 months for boys and girls, respectively (*Table XXII)*. At all age points upto 66 months the 50th percentile values for chest circumference were higher in boys as compared to girls, except for the value at 72 months where both boys and girls had similar 50th percentile value. The increments for chest circumference in case of boys were higher, upto 36 months of age; thereafter, the girls had marginally higher increments. The total gain (median) in chest circumference from birth to 72 months of age for boys and girls was 23.3 and 23.0 cm, respectively.

### *Midarm Circumference*

The percentiles are presented in *Tables XXV* and *XXVI* for boys and girls. The 50th centile values for boys and girls were similar; only marginal difference was noted at 3rd and 97th centiles. The means with SE for various centres are presented in *Tables XXVII* and *XXVIII*. The means were higher for Ludhiana as compared to other centres.

In velocity, the maximum increment appeared to be in the first 9 months of life which was marginally higher for boys than

**TABLE XIII**–*Centrewise Mean and SE of Girls Weight (kg) for Age Estimated from Mixed Longitudinal Series*

| Age (mo) | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 3.11 | 0.03 | 3.16 | 0.05 | 3.12 | 0.04 | 3.15 | 0.06 | 3.09 | 0.15 |
| 3 | 5.45 | 0.07 | 5.53 | 0.10 | 5.51 | 0.06 | 5.86 | 0.07 | 5.46 | 0.11 |
| 6 | 6.30 | 0.06 | 6.97 | 0.08 | 7.18 | 0.07 | 7.31 | 0.10 | 6.80 | 0.12 |
| 9 | 7.61 | 0.05 | 8.13 | 0.09 | 8.26 | 0.07 | 8.48 | 0.11 | 7.86 | 0.15 |
| 12 | 8.91 | 0.06 | 9.15 | 0.12 | 9.20 | 0.07 | 9.43 | 0.11 | 8.85 | 0.19 |
| 18 | 10.63 | 0.08 | 10.43 | 0.14 | 10.78 | 0.07 | 11.11 | 0.42 | 9.60 | 0.35 |
| 24 | 11.68 | 0.08 | 11.30 | 0.15 | 11.45 | 0.05 | 12.13 | 0.39 | 11.31 | 0.42 |
| 30 | 12.73 | 0.06 | 12.27 | 0.15 | 12.20 | 0.16 | 12.82 | 0.21 | 11.94 | 0.29 |
| 36 | 13.79 | 0.07 | 13.27 | 0.14 | 13.47 | 0.20 | 13.38 | 0.19 | 12.99 | 0.22 |
| 42 | 14.84 | 0.09 | 14.24 | 0.15 | 14.61 | 0.19 | 14.12 | 0.17 | 13.52 | 0.18 |
| 48 | 15.94 | 0.10 | 15.12 | 0.15 | 15.52 | 0.21 | 15.32 | 0.19 | 14.38 | 0.19 |
| 54 | 17.01 | 0.11 | 16.24 | 0.15 | 16.54 | 0.21 | 16.48 | 0.22 | 15.34 | 0.21 |
| 60 | 17.99 | 0.14 | 17.02 | 0.17 | 17.27 | 0.20 | 17.61 | 0.26 | 16.38 | 0.28 |
| 66 | 18.92 | 0.18 | 18.08 | 0.16 | 17.66 | 0.13 | 18.50 | 0.31 | 17.27 | 0.39 |
| 72 | 19.71 | 0.17 | 18.94 | 0.23 | 18.69 | 0.14 | | | | |

Bi = Birth; SE = Standard error.

girls. Thereafter, the increments were small and similar upto 66 months of age *(Tables XXIX* and *XXX)*.

## Discussion

Habicht *et al.* (12) stated that there are small differences 3% for height and 6% for weight in different ethnic groups with similar socio-economic status. In contrast, the varying socio-economic status can have higher difference (12% for height and 30% for weight). Therefore, these workers recommended that both genetic and ecologic background as well as their mutual interaction be taken into account in the construction of growth references. Similarly, Goldstein and Tanner(13), Tanner(14) have argued for local standards, which need to be updated from time to time to account for changing socio-economic level. The use of western standards set unattainable goal and overestimate degree of under nutrition among children. The same could be avoid-. ed by using local attainable as standards(15-19). Vanloon *et al.*(20) working in 4 different geographical areas showed that growth curves had heterogeneity as well as the values had varying differences as compared to the NCHS standard for individual age points. Presently in India, growth charts/ road to health cards/child health card/ weight for age charts in practice are

**TABLE XIV**–*Velocity (6 Monthly Increment) Percentile of Weight in kg (Boys)*

| Age at end of interval | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| 6 | 2.35 | 2.59 | 2.91 | 3.34 | 3.53 | 3.71 | 4.03 | 4.28 | 4.52 | 4.76 | 4.88 | 5.03 | 5.59 | 3.91 | 3.98 |
| 9 | 0.99 | 1.18 | 1.50 | 2.01 | 2.21 | 2.35 | 2.62 | 2.85 | 3.08 | 3.29 | 3.40 | 3.58 | 4.15 | 4.46 | 4.58 |
| 12 | 0.67 | 0.97 | 1.23 | 1.64 | 1.82 | 1.96 | 2.19 | 2.39 | 2.59 | 2.78 | 2.89 | 3.06 | 3.59 | 3.93 | 4.07 |
| 18 | 0.61 | 0.68 | 0.87 | 1.02 | 1.09 | 1.15 | 1.28 | 1.38 | 1.46 | 1.55 | 1.50 | 1.64 | 1.81 | 3.00 | 2.07 |
| 24 | 0.19 | 0.32 | 0.61 | 0.74 | 0.81 | 0.87 | 1.01 | 1.14 | 1.30 | 1.17 | 1.53 | 1.65 | 1.92 | 2.29 | 2.65 |
| 30 | 0.13 | 0.21 | 0.42 | 0.67 | 0.73 | 0.79 | 0.91 | 1.03 | 1.15 | 1.35 | 1.49 | 1.62 | 2.04 | 3.41 | 3.02 |
| 36 | 0.17 | 0.28 | 0.57 | 0.66 | 0.74 | 0.81 | 0.95 | 1.09 | 1.22 | 1.35 | 1.42 | 1.48 | 1.84 | 1.89 | 3.62 |
| 42 | 0.30 | 0.49 | 0.57 | 0.70 | 0.76 | 0.84 | 0.96 | 1.11 | 1.26 | 1.41 | 1.48 | 1.63 | 3.96 | 2.36 | 3.64 |
| 48 | 0.16 | 0.27 | 0.51 | 0.67 | 0.75 | 0.83 | 0.99 | 1.12 | 1.24 | 1.37 | 1.43 | 1.50 | 3.52 | 3.14 | 3.61 |
| 54 | 0.16 | 0.26 | 0.51 | 0.71 | 0.81 | 0.91 | 1.10 | 1.22 | 1.35 | 1.49 | 1.64 | 1.80 | 3.24 | 3.78 | 3.24 |
| 60 | 0.20 | 0.33 | 0.54 | 0.69 | 0.76 | 0.84 | 0.98 | 1.14 | 1.30 | 1.46 | 3.70 | 3.70 | 3.26 | 3.73 | 3.18 |
| 66 | 0.16 | 0.26 | 0.51 | 0.63 | 0.70 | 0.76 | 0.89 | 1.03 | 1.24 | 1.46 | 3.65 | 3.88 | 3.34 | 3.83 | 3.15 |
| 72 | 0.26 | 0.41 | 0.51 | 0.71 | 0.81 | 0.86 | 0.97 | 1.07 | 1.18 | 1.39 | 1.51 | 1.71 | 2.20 | 2.34 | 2.40 |

**TABLE XV**–*Velocity (6 Monthly Increment) Percentile of Weight kg (Girls)*

| Age at end of interval | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| 6 | 1.18 | 1.33 | 1.76 | 2.58 | 2.98 | 3.16 | 3.48 | 3.80 | 4.14 | 4.45 | 4.61 | 4.77 | 5.37 | 6.24 | 6.58 |
| 9 | 0.23 | 0.38 | 0.77 | 1.38 | 1.67 | 1.86 | 2.19 | 2.51 | 2.81 | 3.12 | 3.26 | 3.42 | 4.39 | 5.01 | 5.26 |
| 12 | 0.21 | 0.36 | 0.70 | 1.18 | 1.34 | 1.50 | 1.82 | 2.13 | 2.40 | 2.68 | 2.81 | 2.96 | 3.79 | 4.21 | 4.39 |
| 18 | 0.45 | 0.48 | 0.56 | 0.73 | 0.81 | 0.88 | 1.03 | 1.18 | 1.29 | 1.40 | 1.45 | 1.51 | 2.10 | 2.50 | 2.62 |
| 24 | 0.49 | 0.55 | 0.69 | 0.85 | 0.89 | 0.93 | 1.01 | 1.09 | 1.17 | 1.30 | 1.39 | 1.49 | 1.82 | 2.27 | 2.50 |
| 30 | 0.20 | 0.33 | 0.47 | 0.63 | 0.72 | 0.80 | 0.91 | 1.02 | 1.13 | 1.26 | 1.35 | 1.43 | 1.59 | 1.99 | 2.30 |
| 36 | 0.22 | 0.37 | 0.51 | 0.74 | 0.82 | 0.87 | 0.96 | 1.05 | 1.14 | 1.26 | 1.36 | 1.46 | 1.99 | 2.31 | 2.47 |
| 42 | 0.14 | 0.24 | 0.47 | 0.65 | 0.73 | 0.81 | 0.96 | 1.10 | 1.22 | 1.35 | 1.41 | 1.47 | 1.90 | 2.39 | 2.63 |
| 48 | 0.40 | 0.52 | 0.60 | 0.76 | 0.84 | 0.92 | 1.07 | 1.20 | 1.33 | 1.47 | 1.58 | 1.75 | 2.15 | 2.46 | 3.02 |
| 54 | 0.14 | 0.23 | 0.47 | 0.69 | 0.79 | 0.90 | 1.07 | 1.20 | 1.33 | 1.46 | 1.56 | 1.71 | 2.05 | 2.40 | 2.68 |
| 60 | 0.12 | 0.21 | 0.41 | 0.62 | 0.70 | 0.77 | 0.92 | 1.10 | 1.29 | 1.49 | 1.67 | 1.86 | 2.33 | 2.82 | 3.13 |
| 66 | 0.28 | 0.47 | 0.57 | 0.71 | 0.79 | 0.86 | 1.00 | 1.15 | 1.30 | 1.45 | 1.55 | 1.70 | 2.00 | 2.40 | 2.77 |
| 72 | 0.35 | 0.42 | 0.50 | 0.66 | 0.73 | 0.81 | 0.91 | 1.02 | 1.12 | 1.28 | 1.43 | 1.57 | 1.95 | 2.44 | 2.85 |

**TABLE XVI**–*Percentile for Head Circumference (cm) of Boys*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 33.2 | 33.4 | 34.1 | 34.1 | 34.2 | 34.3 | 34.5 | 34.8 (34.8) | 34.9 | 35.1 | 35.4 | 35.5 | 36.0 | 36.5 | 36.7 |
| 3 | 38.0 | 38.2 | 38.6 | 39.1 | 39.2 | 39.4 | 39.6 | 39.8 (40.6) | 39.9 | 40.1 | 40.4 | 40.6 | 41.0 | 41.5 | 41.9 |
| 6 | 40.8 | 41.1 | 41.3 | 42.1 | 42.2 | 42.4 | 42.6 | 42.8 (43.8) | 42.9 | 43.2 | 43.4 | 43.6 | 44.0 | 44.4 | 44.9 |
| 9 | 42.4 | 42.7 | 43.0 | 43.7 | 43.8 | 44.0 | 44.2 | 44.4 (45.8) | 44.6 | 44.9 | 45.1 | 45.2 | 45.6 | 46.1 | 46.5 |
| 12 | 43.3 | 43.6 | 44.0 | 44.6 | 44.7 | 44.8 | 45.1 | 45.3 (47.0) | 45.6 | 45.9 | 46.0 | 46.1 | 46.5 | 47.0 | 47.4 |
| 18 | 44.6 | 44.9 | 45.4 | 45.8 | 45.9 | 46.0 | 46.4 | 46.6 (48.4) | 47.0 | 47.3 | 47.4 | 47.4 | 47.9 | 48.3 | 48.7 |
| 24 | 45.5 | 45.8 | 46.4 | 46.8 | 46.9 | 46.9 | 47.3 | 47.6 (49.2) | 48.0 | 48.4 | 48.4 | 48.4 | 48.8 | 49.4 | 49.7 |
| 30 | 46.2 | 46.4 | 47.0 | 47.4 | 47.5 | 47.6 | 48.1 | 48.4 (49.9) | 48.8 | 49.2 | 49.2 | 49.3 | 49.7 | 50.2 | 50.5 |
| 36 | 46.6 | 46.9 | 47.4 | 47.9 | 48.0 | 48.2 | 48.6 | 49.0 (50.5) | 49.3 | 49.7 | 49.8 | 49.9 | 50.4 | 50.8 | 51.1 |
| 42 | 46.9 | 47.2 | 47.7 | 48.2 | 48.4 | 48.6 | 49.0 | 49.4 | 49.7 | 50.1 | 50.2 | 50.4 | 50.9 | 51.4 | 51.6 |
| 48 | 47.0 | 47.4 | 47.8 | 48.5 | 48.6 | 48.9 | 48.3 | 49.7 | 50.0 | 50.4 | 50.6 | 50.8 | 51.4 | 51.8 | 52.1 |
| 54 | 47.2 | 47.5 | 47.9 | 48.7 | 48.9 | 49.1 | 49.6 | 50.0 | 50.3 | 50.7 | 50.9 | 51.1 | 51.8 | 52.3 | 52.6 |
| 60 | 47.4 | 47.7 | 48.1 | 48.9 | 49.1 | 49.4 | 49.9 | 50.3 | 50.6 | 51.0 | 51.3 | 51.5 | 52.2 | 52.8 | 53.1 |
| 66 | 47.6 | 48.1 | 48.5 | 49.2 | 49.5 | 49.8 | 50.3 | 50.7 | 51.0 | 51.4 | 51.7 | 52.0 | 52.8 | 53.5 | 53.8 |
| 72 | 48.1 | 48.5 | 49.2 | 49.7 | 49.9 | 50.2 | 50.9 | 51.2 | 51.6 | 52.0 | 52.4 | 52.5 | 53.5 | 54.3 | 54.6 |

Bi=Birth; Mean values are given in parentheses.

**TABLE XVII**–*Percentile for Head Circumference (cm) of Girls*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 33.0 | 33.1 | 33.5 | 33.9 | 34.1 | 34.2 | 34.4 | 34.6 (34.3) | 34.9 | 35.1 | 35.3 | 35.4 | 35.7 | 36.1 | 36.5 |
| 3 | 37.6 | 37.9 | 38.4 | 38.9 | 39.0 | 39.1 | 39.3 | 39.5 (39.5) | 39.7 | 39.9 | 40.1 | 40.3 | 40.6 | 41.0 | 41.1 |
| 6 | 40.3 | 40.7 | 41.2 | 41.8 | 41.9 | 42.1 | 42.3 | 42.4 (42.4) | 42.6 | 42.9 | 43.0 | 43.2 | 43.6 | 43.9 | 44.0 |
| 9 | 41.8 | 42.2 | 42.8 | 43.3 | 43.5 | 43.7 | 43.9 | 44.1 (44.3) | 44.3 | 44.5 | 44.6 | 44.8 | 45.2 | 45.5 | 45.6 |
| 12 | 42.7 | 43.0 | 43.6 | 44.1 | 44.3 | 44.5 | 44.7 | 45.0 (45.6) | 45.2 | 45.4 | 45.5 | 45.6 | 46.1 | 46.4 | 46.5 |
| 18 | 43.8 | 44.2 | 44.7 | 45.2 | 45.5 | 45.7 | 46.0 | 46.2 (47.1) | 46.5 | 46.7 | 46.8 | 46.9 | 47.7 | 47.8 | 48.0 |
| 24 | 44.6 | 45.0 | 45.5 | 46.0 | 46.4 | 46.5 | 46.8 | 47.2 (48.1) | 47.5 | 47.7 | 47.8 | 47.9 | 48.5 | 48.9 | 49.1 |
| 30 | 45.2 | 45.6 | 46.0 | 46.6 | 46.9 | 47.1 | 49.4 | 47.8 (48.8) | 48.1 | 48.4 | 48.6 | 48.7 | 49.1 | 49.8 | 50.0 |
| 36 | 45.6 | 46.0 | 46.4 | 47.0 | 47.3 | 47.5 | 47.9 | 48.2 (49.3) | 48.5 | 48.9 | 49.1 | 49.3 | 50.0 | 50.4 | 50.8 |
| 42 | 45.8 | 46.2 | 46.6 | 47.3 | 47.5 | 47.8 | 48.1 | 48.5 | 48.9 | 49.3 | 49.6 | 49.8 | 50.5 | 51.0 | 51.4 |
| 48 | 46.0 | 46.5 | 46.9 | 47.6 | 47.7 | 48.0 | 48.4 | 48.7 | 49.1 | 49.7 | 50.0 | 50.2 | 50.9 | 51.5 | 51.9 |
| 54 | 46.2 | 46.7 | 47.1 | 47.8 | 47.9 | 48.3 | 48.6 | 49.1 | 49.5 | 50.0 | 50.4 | 50.6 | 51.4 | 52.0 | 52.5 |
| 60 | 46.5 | 47.0 | 47.4 | 48.1 | 48.3 | 48.6 | 49.0 | 49.5 | 50.0 | 50.5 | 50.8 | 51.1 | 51.8 | 52.6 | 53.0 |
| 66 | 47.0 | 47.4 | 47.8 | 48.6 | 48.8 | 49.1 | 49.6 | 50.2 | 50.7 | 51.1 | 51.4 | 51.6 | 52.4 | 53.3 | 53.7 |
| 72 | 47.8 | 47.9 | 48.4 | 49.1 | 49.6 | 49.8 | 50.4 | 51.2 | 51.7 | 51.9 | 52.1 | 52.3 | 53.0 | 54.1 | 54.6 |

Bi=Birth; Mean values are given in parentheses.

**TABLE XVIII**–*Centrewise Mean and SE of Boys' Head Circumference in cm Estimated from Mixed Longitudinal Series*

| Age | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mo) | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 34.33 | 0.16 | 34.40 | 0.11 | 34.79 | 0.21 | 34.76 | 0.16 | 34.40 | 0.46 |
| 3 | 39.38 | 0.11 | 40.11 | 0.15 | 40.10 | 0.10 | 39.91 | 0.16 | 40.10 | 0.36 |
| 6 | 42.17 | 0.08 | 42.49 | 0.11 | 42.67 | 0.07 | 43.06 | 0.15 | 42.49 | 0.34 |
| 9 | 43.67 | 0.06 | 43.95 | 0.09 | 44.53 | 0.06 | 44.79 | 0.16 | 44.20 | 0.39 |
| 12 | 44.89 | 0.06 | 45.39 | 0.11 | 45.97 | 0.22 | 45.86 | 0.16 | 45.42 | 0.52 |
| 18 | 46.89 | 0.13 | 46.74 | 0.14 | 48.32 | 0.08 | 47.16 | 0.74 | 46.94 | 0.26 |
| 24 | 47.52 | 0.10 | 47.48 | 0.13 | 48.32 | 0.06 | 48.43 | 0.19 | 47.83 | 0.22 |
| 30 | 48.29 | 0.08 | 48.03 | 0.11 | 48.35 | 0.13 | 48.73 | 0.16 | 48.43 | 0.18 |
| 36 | 49.02 | 0.08 | 48.41 | 0.11 | 48.84 | 0.12 | 49.14 | 0.14 | 48.69 | 0.22 |
| 42 | 49.78 | 0.08 | 48.77 | 0.11 | 49.10 | 0.11 | 49.43 | 0.11 | 48.84 | 0.13 |
| 48 | 50.45 | 0.08 | 49.21 | 0.12 | 49.36 | 0.11 | 49.93 | 0.12 | 49.15 | 0.13 |
| 54 | 51.05 | 0.09 | 49.56 | 0.13 | 49.53 | 0.10 | 50.39 | 0.13 | 49.45 | 0.13 |
| 60 | 51.53 | 0.10 | 49.88 | 0.14 | 49.77 | 0.10 | 50.73 | 0.14 | 49.77 | 0.15 |
| 66 | 52.40 | 0.12 | 50.08 | 0.15 | 49.83 | 0.10 | 51.32 | 0.26 | 49.99 | 0.16 |

* Means estimated at the specified ages using observations made at that age as well as at all previous ages and at the immediately succeeding age.

basically derived from the growth charts designed showing upper line NCHS 50th centile of weight for boys, the lower line being 3rd centile for girls.

The present study meets the WHO criteria of selecting well nourished population, based on well defined sampling criteria in seven centres to cover various parts of the country. The anthropometric scales were similar and the staff was trained at Varanasi (coordinating centre). The difference has come up in the sample design, the present study is on cross linked design based on the method suggested by Rao and Rao(21). Thus, a well-nourished selected child nearing its birthday or its portion (3rd or 6th months) has been measured three times in a period of two years of study. This is an contrast to the selection of 200 children cross-sectionally for each age and sex point. However, as far as possible only one child has been selected from a family unit. In the present study, comparison of height data for individual centre and for combined pooled data of all the centres, the 50th centile at any age point showed a maximum of 3% variation. Thus, one is justified in presenting the growth percentiles for the data by pooling the observations from different regions of the country.

In view of the variation as compared to the NGHS and Europeans but proximity to

**TABLE XIX**—*Centrewise Mean and SE of Girls Head Circumference in cm Estimated from Mixed Longitudinal Series*

| Age | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mo) | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 34.54 | 0.08 | 34.12 | 0.11 | 34.73 | 0.09 | 34.74 | 0.17 | 34.59 | 0.26 |
| 3 | 38.93 | 0.13 | 39.71 | 0.19 | 39.98 | 0.10 | 39.50 | 0.16 | 38.97 | 0.24 |
| 6 | 41.76 | 0.14 | 42.24 | 0.16 | 42.56 | 0.07 | 42.26 | 0.13 | 41.54 | 0.29 |
| 9 | 43.50 | 0.08 | 43.67 | 0.13 | 44.17 | 0.06 | 44.08 | 0.13 | 43.57 | 0.37 |
| 12 | 44.55 | 0.08 | 44.96 | 0.11 | 45.38 | 0.06 | 45.22 | 0.11 | 45.02 | 0.52 |
| 18 | 46.22 | 0.12 | 46.29 | 0.17 | 46.79 | 0.26 | 46.41 | 0.40 | 46.87 | 0.48 |
| 24 | 47.13 | 0.11 | 46.93 | 0.14 | 47.58 | 0.06 | 47.00 | 0.20 | 47.57 | 0.33 |
| 30 | 47.86 | 0.13 | 47.39 | 0.39 | 47.98 | 0.19 | 48.24 | 0.21 | 47.39 | 0.30 |
| 36 | 48.72 | 0.10 | 47.69 | 0.12 | 48.03 | 0.16 | 48.46 | 0.19 | 47.54 | 0.19 |
| 42 | 49.44 | 0.13 | 48.02 | 0.11 | 48.45 | 0.15 | 48.87 | 0.15 | 47.91 | 0.15 |
| 48 | 50.43 | 0.11 | 48.31 | 0.14 | 48.59 | 0.18 | 49.43 | 0.17 | 48.12 | 0.13 |
| 54 | 50.96 | 0.10 | 48.02 | 0.12 | 49.01 | 0.13 | 49.84 | 0.17 | 48.45 | 0.14 |
| 60 | 51.36 | 0.11 | 49.02 | 0.12 | 49.10 | 0.15 | 50.19 | 0.17 | 48.83 | 0.13 |
| 66 | 52.20 | 0.11 | 49.30 | 0.14 | 49.19 | 0.19 | 50.45 | 0.19 | 49.01 | 0.19 |

Asians, it would be more appropriate to use the Indian growth data as reference instead of the NCHS standard(22). This suggestion is further strengthened by the data collected for 6 monthly increments (the height velocity). As the velocity (increment) rate was lower during the study age period as compared to the increments reported-for American children by Baumgartner(23). In contrast, it can be argued that the differences observed particularly in case of Ludhi-ana (approaching close to the NCHS and other centres having significantly lower values) may indicate: *(a)* regional differences, *(b)* population having secular trend; and (c) changing social inputs.

The recent data from European countries show that boys in Netherlands, Denmark and Norway are taller than NCHS by around 2!7 cm at 72 months of age. The present Indian data remain lower by 2.5 cm at this age point as compared to NCHS. The height means for Indian, Hongkong and Thailand children are very similar but lower than the means observed for Chinese by 1.0 cm. The Japanese boy is shorter by 0.7 cm as compared to Indian and other Asians *(Table XXXI)*.

The girls in Netherlands and Denmark are taller by 3.7 and 2.6 cm, respectively as compared to those from Spain and NCHS data. Indian girls are short by 1.0 cm at 72 mo of age; however remained close to NCHS during birth to 9 mo and 30 to 36 mo. The Chinese girls are taller by 1.0-1.5 cm but Japanese are short by 1.0 cm as compared

**TABLE XX**–*Percentile for Chest Circumference (cm) of Boys*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 30.9 | 31.1 | 31.3 | 31.8 | 32.1 | 32.2 | 32.4 | 32.6 | 33.0 | 33.4 | 33.6 | 33.7 | 34.3 | 34.5 | 34.8 |
| 3 | 36.2 | 36.3 | 36.8 | 37.3 | 37.6 | 37.7 | 38.1 | 38.4 | 38.8 | 39.1 | 39.4 | 39.6 | 40.4 | 41.5 | 42.1 |
| 6 | 39.4 | 39.6 | 40.3 | 40.8 | 41.1 | 41.3 | 41.7 | 42.0 | 42.4 | 42.7 | 43.0 | 43.3 | 44.0 | 45.8 | 46.5 |
| 9 | 41.3 | 41.6 | 42.3 | 42.9 | 43.2 | 43.4 | 43.8 | 44.1 | 44.5 | 44.9 | 45.2 | 45.4 | 46.3 | 48.0 | 48.9 |
| 12 | 42.4 | 42.9 | 43.5 | 44.2 | 44.5 | 44.7 | 45.1 | 45.4 | 45.8 | 46.2 | 46.5 | 46.8 | 47.8 | 49.3 | 50.2 |
| 18 | 44.1 | 44.7 | 45.4 | 46.1 | 46.4 | 46.7 | 47.0 | 47.4 | 47.7 | 48.3 | 48.6 | 48.8 | 50.1 | 51.2 | 52.2 |
| 24 | 45.4 | 46.0 | 46.7 | 47.6 | 47.9 | 48.2 | 48.5 | 49.0 | 49.2 | 49.9 | 50.2 | 50.5 | 51.8 | 52.7 | 53.7 |
| 30 | 46.3 | 47.0 | 47.7 | 48.7 | 48.9 | 49.3 | 49.7 | 50.2 | 50.4 | 51.1 | 51.4 | 51.7 | 53.1 | 53.9 | 55.0 |
| 36 | 47.0 | 47.7 | 48.5 | 49.4 | 49.7 | 50.1 | 50.5 | 51.1 | 51.3 | 52.0 | 52.3 | 52.6 | 54.1 | 54.9 | 55.9 |
| 42 | 47.5 | 48.2 | 49.0 | 49.9 | 50.3 | 50.7 | 51.2 | 51.8 | 52.1 | 52.8 | 53.1 | 53.4 | 54.7 | 55.7 | 56.7 |
| 48 | 48.0 | 48.6 | 49.4 | 50.4 | 50.8 | 51.1 | 51.8 | 52.4 | 52.8 | 53.4 | 53.8 | 54.1 | 55.3 | 56.5 | 57.5 |
| 54 | 48.5 | 49.1 | 49.9 | 50.8 | 51.2 | 51.6 | 52.3 | 53.1 | 53.4 | 54.1 | 54.4 | 54.8 | 56.0 | 57.4 | 58.3 |
| 60 | 49.2 | 49.8 | 50.5 | 51.3 | 51.8 | 52.2 | 53.0 | 53.8 | 54.2 | 54.9 | 55.2 | 55.6 | 56.7 | 58.3 | 59.1 |
| 66 | 50.1 | 50.6 | 51.2 | 52.1 | 52.6 | 53.0 | 53.9 | 54.7 | 55.1 | 55.8 | 56.2 | 56.6 | 57.7 | 59.4 | 60.2 |
| 72 | 51.4 | 51.9 | 52.3 | 53.2 | 53.6 | 54.2 | 55.0 | 55.9 | 56.1 | 57.1 | 57.4 | 57.9 | 59.2 | 60.8 | 61.6 |

**TABLE XXI**–*Percentile for Chest Circumference (cm) of Girls*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 30.3 | 30.6 | 31.1 | 31.5 | 31.7 | 32.0 | 32.2 | 32.4 | 32.6 | 33.0 | 33.3 | 33.5 | 34.0 | 34.4 | 34.8 |
| 3 | 35.7 | 36.1 | 36.6 | 37.0 | 37.2 | 37.3 | 37.7 | 38.0 | 38.3 | 38.7 | 39.0 | 39.2 | 40.0 | 40.7 | 41.3 |
| 6 | 38.9 | 39.4 | 39.9 | 40.4 | 40.7 | 40.7 | 41.2 | 41.6 | 41.8 | 42.3 | 42.5 | 42.7 | 43.6 | 44.6 | 45.2 |
| 9 | 40.8 | 41.3 | 41.8 | 42.5 | 42.7 | 42.8 | 43.4 | 43.7 | 43.9 | 44.3 | 44.6 | 44.8 | 45.7 | 46.7 | 47.4 |
| 12 | 41.8 | 42.3 | 43.0 | 43.7 | 44.0 | 44.2 | 44.7 | 45.0 | 45.2 | 45.6 | 45.9 | 46.1 | 46.9 | 47.9 | 48.7 |
| 18 | 43.3 | 43.9 | 44.6 | 45.6 | 45.9 | 46.2 | 46.7 | 46.9 | 47.3 | 47.6 | 47.9 | 48.6 | 48.9 | 49.9 | 50.7 |
| 24 | 44.4 | 45.0 | 45.9 | 46.9 | 47.2 | 47.7 | 48.1 | 48.4 | 48.8 | 49.1 | 49.4 | 49.7 | 50.5 | 51.5 | 52.4 |
| 30 | 45.1 | 45.8 | 46.7 | 47.8 | 48.2 | 48.7 | 49.1 | 49.4 | 50.0 | 50.3 | 50.7 | 50.9 | 51.8 | 52.9 | 53.5 |
| 36 | 45.7 | 46.4 | 47.4 | 48.5 | 48.9 | 49.3 | 49.8 | 50.2 | 50.9 | 51.3 | 51.7 | 51.9 | 53.0 | 54.1 | 54.4 |
| 42 | 46.1 | 46.9 | 47.9 | 48.9 | 49.3 | 49.8 | 50.4 | 50.9 | 51.7 | 52.1 | 52.5 | 52.8 | 53.9 | 55.1 | 55.9 |
| 48 | 46.6 | 47.3 | 48.3 | 49.3 | 49.8 | 50.2 | 50.8 | 51.4 | 52.3 | 52.9 | 53.2 | 53.5 | 54.8 | 56.0 | 56.8 |
| 54 | 47.1 | 47.8 | 48.7 | 49.8 | 50.2 | 50.7 | 51.4 | 52.1 | 53.0 | 53.7 | 54.0 | 54.3 | 55.6 | 56.8 | 57.7 |
| 60 | 47.8 | 48.5 | 49.2 | 50.4 | 50.9 | 51.3 | 52.1 | 52.9 | 53.9 | 54.5 | 54.9 | 55.2 | 56.5 | 57.5 | 58.6 |
| 66 | 48.8 | 49.3 | 50.0 | 51.4 | 51.8 | 52.3 | 53.1 | 54.0 | 54.9 | 55.6 | 55.9 | 56.3 | 57.4 | 58.5 | 59.5 |
| 72 | 50.3 | 50.5 | 51.0 | 52.7 | 53.1 | 53.7 | 54.6 | 55.4 | 56.2 | 56.9 | 57.4 | 57.6 | 58.4 | 59.4 | 60.6 |

**TABLE XXII**–*Centrewise Mean and SE of Boys Chest Circumference (cm) Estimated from Mixed Longitudinal Series*

| Age | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mo) | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 32.75 | 0.08 | 32.04 | 0.15 | 32.16 | 0.06 | 33.19 | 0.18 | 32.86 | 0.29 |
| 3 | 38.18 | 0.13 | 38.42 | 0.21 | 38.32 | 0.13 | 40.69 | 0.20 | 39.30 | 0.44 |
| 6 | 41.18 | 0.11 | 41.23 | 0.16 | 41.47 | 0.10 | 44.22 | 0.23 | 41.33 | 0.56 |
| 9 | 43.22 | 0.10 | 43.01 | 0.18 | 44.23 | 0.06 | 46.98 | 0.22 | 43.67 | 0.59 |
| 12 | 45.04 | 0.08 | 45.22 | 0.53 | 45.75 | 0.06 | 48.49 | 0.26 | 45.34 | 0.43 |
| 18 | 48.23 | 0.21 | 47.48 | 0.28 | 48.03 | 0.15 | 48.74 | 0.47 | 48.70 | 0.70 |
| 24 | 49.04 | 0.15 | 48.75 | 0.25 | 52.02 | 0.96 | 50.57 | 0.49 | 49.20 | 0.93 |
| 30 | 50.14 | 0.15 | 49.55 | 0.21 | 50.19 | 0.27 | 51.22 | 0.42 | 49.45 | 0.42 |
| 36 | 51.26 | 0.10 | 50.54 | 0.20 | 50.99 | 0.25 | 52.14 | 0.32 | 49.90 | 0.18 |
| 42 | 52.42 | 0.09 | 50.81 | 0.23 | 51.83 | 0.23 | 52.62 | 0.26 | 51.03 | 0.24 |
| 48 | 53.46 | 0.08 | 51.46 | 0.19 | 52.56 | 0.22 | 53.68 | 0.29 | 51.55 | 0.22 |
| 54 | 54.11 | 0.07 | 52.19 | 0.20 | 53.41 | 0.27 | 54.21 | 0.29 | 52.21 | 0.22 |
| 60 | 55.18 | 0.10 | 52.97 | 0.22 | 54.76 | 0.31 | 54.93 | 0.26 | 53.10 | 0.26 |
| 66 | 56.32 | 0.13 | 53.85 | 0.28 | 55.15 | 0.32 | 55.88 | 0.32 | 53.43 | 0.31 |

* Means estimated at the specified ages using observations made at that age as well as all previous ages and at the immediately succeeding age.

to the Indians *(Table XXXI)*.

The 50th weight centiie for boys upto 6 mo approached around 30-40th centiie and between 20-30th centiie for age 9-72 mo as compared to NCHS standards. For girls, the 50th centiie of the present study is near 40-50th centiie upto 6 mo and thereafter between 30-40th centiie of NCHS standards. The European boys and girls from Norway, Poland, Netherland, Denmark and Italy weigh significantly higher than those in NCHS data. Similar weight means are observed for Asian boys and girls. Indians are lighter by 1.5 kg and 0.6-0.9 kg for boys and girls, respectively as compared to the NCHS data *(Table XXXII)*.

The comparative data for head and chest circumferences in *Table XXXIII* show that both parameters are smaller, in Indian children.

The velocity for weight and head circumference as in case of height in early years was lower in Indian children of the present study as compared to the American counterparts(23). The mid-arm circumference values are lower than those for European counterparts *(Table XXXIV)*.

The height and weight data from Ludhi-ana, Delhi, Calcutta and Varanasi show that growth potential level observed in the present study continues in later life (6-18

**TABLE XXIII**–*Centrewise Mean and SE of Girls Chest Circumference (cm) Estimated from Mixed Longitudinal Series*

| Age | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mo) | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 32.71 | 0.10 | 31.66 | 0.13 | 32.02 | 0.06 | 33.28 | 0.20 | 32.40 | 0.37 |
| 3 | 37.64 | 0.16 | 38.00 | 0.21 | 38.35 | 0.13 | 40.10 | 0.20 | 38.15 | 0.30 |
| 6 | 40.75 | 0.17 | 40.87 | 0.18 | 41.28 | 0.10 | 43.16 | 0.21 | 40.17 | 0.31 |
| 9 | 42.99 | 0.15 | 42.56 | 0.15 | 43.85 | 0.07 | 45.84 | 0.25 | 42.41 | 0.43 |
| 12 | 44.69 | 0.13 | 44.44 | 0.16 | 45.54 | 0.14 | 47.45 | 0.22 | 44.77 | 0.55 |
| 18 | 47.39 | 0.14 | 46.76 | 0.23 | 47.07 | 0.18 | 48.69 | 1.40 | 48.03 | 1.01 |
| 24 | 48.83 | 0.14 | 47.35 | 0.24 | 48.32 | 0.15 | 49.60 | 0.97 | 48.66 | 0.61 |
| 30 | 50.03 | 0.15 | 48.34 | 0.21 | 49.77 | 0.21 | 51.03 | 0.63 | 48.75 | 0.45 |
| 36 | 51.29 | 0.14 | 49.36 | 0.22 | 50.70 | 0.23 | 51.25 | 0.40 | 49.00 | 0.26 |
| 42 | 52.48 | 0.13 | 49.85 | 0.19 | 51.83 | 0.24 | 51.74 | 0.30 | 49.68 | 0.22 |
| 48 | 53.31 | 0.11 | 50.47 | 0.21 | 52.77 | 0.27 | 53.21 | 0.34 | 50.31 | 0.23 |
| 54 | 54.12 | 0.08 | 51.35 | 0.21 | 53.69 | 0.28 | 53.56 | 0.31 | 51.34 | 0.25 |
| 60 | 54.04 | 0.13 | 51.73 | 0.23 | 54.52 | 0.30 | 54.26 | 0.32 | 52.08 | 0.33 |
| 66 | 56.32 | 0.17 | 52.51 | 0.24 | 55.09 | 0.21 | 55.26 | 0.53 | 52.72 | 0.40 |

* Means estimated at the specified ages using observations made at that age as well as all previous ages and at the immediately succeeding age.

yr of age)(36). Thus, it could be said that growth level attainable in India be used on pooled data or on regional basis to avoid overestimates of undernutrition. The need for continuous efforts to collect data for growth parameters on longitudinal (in adolescence) or cross sectional basis in a nation wide approach will ultimately provide an assessment measure for optimal growth potential.

**Acknowledgements**

We are grateful to Dr. C. Gopalan, Chairman Nutrition Foundation of India, New Delhi, for valuable guidance and financial support.

We are also indebted to Sv. Shri Raj Seth, Laxmi Kant, U.D. Sharma, and Ms Preeta Agarwal from the Computer Science Section and NNMB Unit for help.

**TABLE XXIV**–*Means Estimate of Age (Months) with Standard Error (SE) at which CC Overtakes HC in Children from Delhi, Ludhania, Varanasi, Calcutta and Bangalore according to Sex by Simple Mathematical (Spearman-Karber) Method*

| | Delhi | | Ludhiana | | Varanasi | | Calcutta | | Bangalore | | Pooled |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | |
| Male | 9.240 | 1.123 | 11.210 | 0.443 | 23.580 | 0.950 | 20.040 | 1.179 | 15.120 | 1.676 | 11.400 |
| Female | 9.850 | 1.865 | 10.680 | 0.532 | 24.520 | 0.916 | 18.780 | 1.086 | 17.280 | 1.735 | 12.000 |
| Total | 9.660 | 0.950 | 11.090 | 0.338 | 23.920 | 0.625 | 19.140 | 0.759 | 16.380 | 1.146 | |

CC = Chest circumference; HC = Head circumference.

**TABLE XXV**–*Percentiles for Mid-arm Circumference (cm) of Boys*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 8.9 | 8.9 | 9.1 | 9.3 | 7.4 | 9.5 | 9.7 | 9.8 | 9.9 | 10.2 | 10.3 | 10.4 | 10.7 | 11.2 | 11.3 |
| 3 | 10.0 | 10.1 | 10.4 | 10.8 | 11.1 | 12.1 | 11.9 | 12.3 | 12.5 | 12.8 | 12.9 | 13.0 | 13.4 | 13.9 | 14.2 |
| 6 | 10.8 | 11.0 | 11.4 | 11.9 | 12.2 | 12.4 | 13.1 | 13.7 | 14.0 | 14.2 | 14.4 | 14.5 | 14.9 | 15.4 | 15.7 |
| 9 | 11.4 | 11.6 | 12.1 | 12.6 | 12.9 | 13.1 | 13.8 | 14.3 | 14.6 | 14.8 | 15.1 | 15.2 | 15.6 | 16.1 | 16.4 |
| 12 | 11.9 | 12.1 | 12.7 | 13.1 | 13.4 | 13.5 | 14.0 | 14.5 | 14.8 | 15.0 | 15.3 | 15.5 | 15.9 | 16.3 | 16.6 |
| 18 | 12.6 | 13.0 | 13.5 | 13.9 | 14.0 | 14.2 | 14.4 | 14.8 | 15.1 | 15.3 | 15.6 | 15.9 | 16.2 | 16.7 | 17.0 |
| 24 | 13.2 | 13.5 | 14.1 | 14.4 | 14.5 | 14.6 | 14.7 | 15.0 | 15.3 | 15.6 | 15.9 | 16.1 | 16.5 | 17.0 | 17.2 |
| 30 | 13.6 | 13.9 | 14.4 | 14.7 | 14.8 | 14.9 | 15.0 | 15.2 | 15.5 | 15.8 | 16.1 | 16.3 | 16.8 | 17.3 | 17.5 |
| 36 | 13.9 | 14.2 | 14.5 | 14.8 | 14.9 | 15.1 | 15.2 | 15.4 | 15.7 | 16.0 | 16.2 | 16.5 | 17.1 | 17.5 | 17.8 |
| 42 | 14.0 | 14.3 | 14.6 | 14.9 | 15.0 | 15.2 | 15.4 | 15.6 | 15.9 | 16.2 | 16.4 | 16.7 | 17.4 | 17.7 | 18.1 |
| 48 | 14.1 | 14.3 | 14.6 | 14.9 | 15.1 | 15.3 | 15.6 | 15.8 | 16.0 | 16.4 | 16.6 | 16.8 | 17.6 | 18.0 | 18.4 |
| 54 | 14.2 | 14.3 | 14.6 | 15.0 | 15.2 | 15.4 | 15.8 | 16.0 | 16.3 | 16.6 | 16.8 | 17.0 | 17.8 | 18.2 | 18.7 |
| 60 | 14.2 | 14.4 | 14.7 | 15.1 | 15.4 | 15.5 | 16.0 | 16.2 | 16.5 | 16.9 | 17.0 | 17.2 | 18.0 | 18.5 | 19.0 |
| 66 | 14.3 | 14.4 | 14.9 | 15.8 | 15.6 | 15.8 | 16.2 | 16.5 | 16.9 | 17.2 | 17.4 | 17.5 | 18.2 | 18.9 | 19.4 |
| 72 | 14.4 | 14.6 | 15.4 | 15.7 | 16.0 | 16.1 | 16.5 | 16.7 | 17.3 | 17.5 | 17.8 | 18.0 | 18.4 | 19.4 | 19.8 |

**TABLE XXVI**–*Percentiles for Mid-arm Circumference (cm) of Girls*

| Age (mo) | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| Bi | 8.4 | 9.4 | 9.2 | 9.4 | 9.6 | 9.7 | 9.8 | 9.9 | 9.9 | 10.1 | 10.4 | 10.5 | 10.9 | 11.2 | 11.1 |
| 3 | 9.5 | 10.4 | 10.3 | 10.8 | 11.1 | 11.3 | 11.8 | 12.2 | 12.4 | 12.6 | 12.8 | 12.8 | 13.3 | 13.6 | 13.7 |
| 6 | 10.4 | 11.1 | 11.2 | 11.7 | 12.1 | 12.5 | 13.0 | 13.5 | 13.8 | 14.0 | 14.1 | 14.2 | 14.6 | 14.9 | 15.2 |
| 9 | 11.1 | 11.7 | 11.8 | 12.4 | 12.7 | 12.9 | 13.6 | 14.1 | 14.5 | 14.7 | 14.8 | 14.8 | 15.3 | 15.6 | 15.9 |
| 12 | 11.7 | 12.2 | 12.3 | 12.9 | 13.2 | 13.4 | 13.9 | 14.3 | 14.6 | 14.9 | 15.0 | 15.1 | 15.6 | 16.0 | 16.2 |
| 18 | 12.6 | 13.0 | 13.1 | 13.7 | 13.8 | 14.0 | 14.4 | 14.7 | 14.9 | 15.2 | 15.4 | 15.6 | 16.0 | 16.5 | 16.7 |
| 24 | 13.2 | 13.6 | 13.7 | 14.2 | 14.3 | 14.5 | 14.7 | 15.0 | 15.2 | 15.5 | 15.7 | 15.9 | 16.4 | 16.9 | 17.1 |
| 30 | 13.5 | 14.0 | 14.1 | 14.5 | 14.7 | 14.8 | 15.0 | 15.2 | 15.5 | 15.8 | 16.0 | 16.2 | 16.7 | 17.2 | 17.4 |
| 36 | 13.6 | 14.2 | 14.3 | 14.7 | 14.9 | 15.1 | 15.3 | 15.4 | 15.7 | 16.0 | 16.2 | 16.4 | 17.0 | 17.4 | 17.8 |
| 42 | 13.6 | 14.4 | 14.5 | 14.8 | 15.0 | 15.2 | 15.5 | 15.7 | 15.9 | 16.2 | 16.4 | 16.6 | 17.3 | 17.6 | 18.1 |
| 48 | 13.6 | 14.5 | 14.6 | 14.9 | 15.1 | 15.3 | 15.6 | 15.8 | 16.1 | 16.5 | 16.6 | 16.8 | 17.5 | 17.8 | 18.3 |
| 54 | 13.7 | 14.5 | 14.6 | 15.0 | 15.2 | 15.5 | 15.8 | 16.0 | 16.3 | 16.7 | 16.8 | 17.0 | 17.7 | 18.0 | 18.6 |
| 60 | 13.8 | 14.6 | 14.7 | 15.1 | 15.4 | 15.6 | 15.9 | 16.2 | 16.6 | 16.9 | 17.1 | 17.2 | 17.9 | 18.3 | 18.8 |
| 66 | 14.2 | 14.7 | 14.8 | 15.4 | 15.6 | 15.8 | 16.1 | 16.4 | 16.8 | 17.2 | 17.4 | 17.5 | 18.1 | 18.5 | 18.9 |
| 72 | 14.8 | 14.9 | 15.1 | 15.8 | 16.0 | 16.1 | 16.3 | 16.7 | 17.2 | 17.5 | 17.7 | 17.9 | 18.2 | 18.9 | 19.1 |

**TABLE XXVII**—*Centrewise Mean and SE of Boys Midarm Circumference (cm) Estimated from Mixed Longitudinal Series*

| Age | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mo) | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 9.89 | 0.10 | 10.02 | 0.07 | 9.96 | 0.05 | 9.98 | 0.08 | 10.19 | 0.20 |
| 3 | 10.79 | 0.08 | 12.12 | 0.12 | 12.45 | 0.05 | 12.99 | 0.13 | 12.82 | 0.27 |
| 6 | 11.53 | 0.08 | 13.36 | 0.11 | 13.96 | 0.03 | 14.46 | 0.11 | 13.62 | 0.31 |
| 9 | 12.49 | 0.08 | 14.10 | 0.13 | 15.08 | 0.03 | 15.16 | 0.11 | 14.31 | 0.32 |
| 12 | 13.69 | 0.07 | 14.40 | 0.14 | 15.46 | 0.03 | 15.70 | 0.13 | 14.84 | 0.35 |
| 18 | 14.27 | 0.11 | 14.93 | 0.17 | 14.33 | 0.05 | 15.11 | 0.29 | 15.30 | 0.29 |
| 24 | 14.71 | 0.09 | 15.12 | 0.14 | 15.29 | 0.15 | 15.38 | 0.24 | 15.29 | 0.29 |
| 30 | 15.21 | 0.03 | 15.49 | 0.11 | 14.97 | 0.16 | 15.55 | 0.21 | 15.19 | 0.16 |
| 36 | 15.85 | 0.09 | 15.68 | 0.11 | 15.26 | 0.11 | 15.63 | 0.15 | 15.28 | 0.08 |
| 42 | 16.28 | 0.08 | 15.83 | 0.12 | 15.44 | 0.10 | 15.89 | 0.13 | 15.50 | 0.07 |
| 48 | 16.57 | 0.08 | 15.84 | 0.11 | 15.60 | 0.09 | 16.51 | 0.12 | 15.80 | 0.09 |
| 54 | 16.85 | 0.07 | 16.04 | 0.11 | 15.90 | 0.11 | 16.83 | 0.12 | 16.03 | 0.09 |
| 60 | 17.41 | 0.07 | 16.07 | 0.22 | 16.16 | 0.12 | 17.14 | 0.13 | 16.27 | 0.12 |

**TABLE XXVIII**—*Centrewise Mean and SE of Girls Midarm Circumference (cm) Estimated from Mixed Longitudinal Series*

| Age | Ludhiana | | Varanasi | | Calcutta | | Delhi | | Bangalore | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mo) | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Bi | 9.70 | 0.07 | 10.01 | 0.08 | 9.89 | 0.06 | 10.12 | 0.08 | 10.27 | 0.30 |
| 3 | 10.56 | 0.08 | 11.58 | 0.13 | 12.35 | 0.06 | 12.80 | 0.13 | 12.26 | 0.15 |
| 6 | 11.17 | 0.08 | 12.97 | 0.13 | 13.89 | 0.03 | 14.03 | 0.13 | 13.31 | 0.18 |
| 9 | 11.93 | 0.07 | 13.77 | 0.14 | 14.86 | 0.05 | 14.85 | 0.14 | 13.97 | 0.21 |
| 12 | 12.93 | 0.08 | 14.20 | 0.15 | 15.22 | 0.03 | 15.49 | 0.15 | 14.55 | 0.21 |
| 18 | 14.03 | 0.14 | 14.86 | 0.12 | 14.27 | 0.05 | 14.96 | 0.74 | 14.91 | 0.36 |
| 24 | 14.63 | 0.10 | 15.08 | 0.11 | 14.70 | 0.06 | 15.53 | 0.39 | 15.11 | 0.46 |
| 30 | 15.26 | 0.09 | 15.29 | 0.12 | 15.24 | 0.12 | 15.68 | 0.22 | 15.05 | 0.33 |
| 36 | 15.76 | 0.09 | 15.63 | 0.11 | 15.42 | 0.12 | 15.28 | 0.22 | 15.09 | 0.17 |
| 42 | 16.12 | 0.07 | 15.86 | 0.09 | 15.68 | 0.12 | 15.87 | 0.14 | 15.28 | 0.12 |
| 48 | 16.51 | 0.09 | 16.09 | 0.10 | 15.90 | 0.13 | 16.57 | 0.15 | 15.67 | 0.11 |
| 54 | 16.63 | 0.07 | 16.29 | 0.10 | 16.89 | 0.12 | 16.79 | 0.14 | 15.95 | 0.12 |
| 60 | 17.88 | 0.07 | 16.42 | 0.10 | 16.26 | 0.13 | 17.05 | 0.15 | 16.15 | 0.15 |

**TABLE XXIX**–*Velocity (6 Monthly Increment) Percentile of Mid-arm Circumfernece (cm) of Boys*

| Age at interval | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| 6 | 0.8 | 1.0 | 1.4 | 2.0 | 2.3 | 2.6 | 3.2 | 3.7 | 4.1 | 4.6 | 4.8 | 5.2 | 6.2 | 7.5 | 8.1 |
| 9 | 0.3 | 0.4 | 0.8 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.0 | 3.0 | 3.2 | 3.4 | 4.1 | 4.8 | 5.3 |
| 12 | 0.1 | 0.2 | 0.4 | 0.8 | 0.9 | 1.0 | 1.3 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.5 | 4.0 | 4.8 |
| 18 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 1.1 | 1.2 | 1.3 |
| 24 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 1.2 | 1.4 |
| 30 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 0.1 | 1.5 | 1.6 |
| 36 | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.6 | 0.7 | 0.7 | 0.9 | 1.3 | 1.5 |
| 42 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 1.0 | 1.2 | 1.5 |
| 48 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.7 | 0.7 | 0.8 | 1.1 | 1.2 | 1.4 |
| 54 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 1.0 | 1.1 | 1.2 |
| 60 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.7 | 0.7 | 0.8 | 1.0 | 1.2 | 1.4 |
| 66 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 1.0 | 1.2 | 1.3 |
| 72 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.9 | 1.1 | 1.1 |

**TABLE XXX**–*Velocity (6 Monthly Increment) Percentile of Mid-arm Circumfernece (cm) of Girls*

| Age at interval | Percentile | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd | 5th | 10th | 20th | 25th | 30th | 40th | 50th | 60th | 70th | 75th | 80th | 90th | 95th | 97th |
| 6 | 0.6 | 0.7 | 1.1 | 1.7 | 2.0 | 2.2 | 2.7 | 3.2 | 3.7 | 4.2 | 4.5 | 4.7 | 5.6 | 6.3 | 6.8 |
| 9 | 0.2 | 0.3 | 0.5 | 1.0 | 1.1 | 1.3 | 1.6 | 1.8 | 2.2 | 2.6 | 2.9 | 3.1 | 3.7 | 4.4 | 4.9 |
| 12 | 0.1 | 0.2 | 0.3 | 0.6 | 0.8 | 0.9 | 1.2 | 1.5 | 1.7 | 2.0 | 2.2 | 2.5 | 3.0 | 3.0 | 4.3 |
| 18 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 1.1 | 1.2 | 1.3 |
| 24 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 1.0 | 1.1 |
| 30 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 1.0 | 1.1 | 1.2 |
| 36 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 0.8 | 0.9 | 1.1 |
| 42 | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.5 | 0.7 | 1.3 | 1.6 | 1.7 |
| 48 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.5 | 2.3 | 2.9 |
| 54 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 1.0 | 1.6 | 1.7 |
| 60 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 1.1 | 1.4 | 1.7 |
| 66 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 1.1 | 1.4 | 1.7 |
| 72 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 0.8 | 0.9 | 1.0 |

**TABLE XXXI**–*Comparison of Height (cm) of European and Asian Children*

| Country | Place | Author/Year | | | Age (months) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Bi | 0 | 3 | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 60 | 72 |
| | | | **European** | | | | | | | | | | | | |
| Belgium | Brussels | Vercauteren 1984 (24) | Median | B | | | | | | | | | 102.5 | 109.5 | 116.1 |
| | | | | G | | | | | | | | | 101.0 | 109.0 | 115.0 |
| Denmark | National | Andersen *et al.* 1982 (25) | Mean | B | | | | | 78.0 | | 88.5 | 97.2 | 104.7 | 111.2 | 118.8 |
| | | | | G | | | | | 78.0 | | 87.1 | 96.5 | 103.5 | 111.0 | 117.2 |
| Hungary | National | Eiben & Panto 1986 (26) | Mean | B | | | | | | | | 97.5 | 103.0 | 109.3 | 116.2 |
| | | | | G | | | | | | | | 97.2 | 102.0 | 109.0 | 116.0 |
| Netherlands | National | Roede & Van Weiringen 1985 (27) | Mean | B | | | | | 76.4 | | 88.6 | 98.2 | 105.7 | 112.4 | 118.8 |
| | | | | G | | | | | 74.8 | | 87.7 | 97.0 | 104.8 | 111.9 | 118.3 |
| Norway | Bergen | Waaler 1983 (28) | Mean | B | | | | | | | | 99.4 | 105.8 | 112.4 | 118.7 |
| | | | | G | | | | | | | | 97.3 | 104.3 | 110.6 | 117.3 |
| Poland | Warsaw | Kurniewicz-Witczakowa *et al.* 1983 (29) | Mean | B | | | | | 77.2 | | 86.5 | 95.5 | 103.8 | 110.0 | 117.8 |
| | | | | G | | | | | 77.5 | | 85.2 | 94.9 | 103.0 | 109.8 | 116.1 |
| Spain | Bilbao | Hernandez *et al.* 1985 (30) | Median | B | | | | | 75.0 | | 86.7 | 95.2 | 102.5 | 108.7 | 114.1 |
| | | | | G | | | | | 73.3 | | 85.4 | 94.1 | 101.5 | 108.9 | 114.0 |
| NCHS | USA | Hamill *et al.* 1977 (6) | Median | B | 50.5 | 61.1 | 67.8 | 72.3 | 76.1 | 82.4 | 87.6 | 94.9 | 102.9 | 109.9 | 116.1 |
| | | | | G | 49.1 | 58.9 | 65.3 | 69.4 | 73.3 | 79.9 | 85.4 | 94.0 | 101.5 | 108.9 | 114.0 |
| | | | **Asian** | | | | | | | | | | | | |
| China (PRC) | Urban | Zhang & Huang 1988 (31, 32) Zhang 1977 | Mean | B | | | | | 76.5 | | 87.9 | 95.1 | 102.1 | 108.6 | 114.7 |
| | | | | G | | | | | 75.1 | | 86.6 | 94.2 | 101.2 | 107.6 | 113.9 |
| Hong Kong | Chinese | Leung *et al.* 1987 (33) | Mean | B | | | | | | | | | 101.1 | 107.6 | 113.8 |
| | | | | G | | | | | | | | | 100.6 | 106.8 | 113.0 |
| Japan | National | Kikuta & Takaishi 1987 (34) | Mean | B | | | | | | | 85.0 | 92.0 | 99.0 | 106.0 | 113.0 |
| | | | | G | | | | | | | 85.0 | 92.0 | 97.0 | 105.0 | 112.0 |
| Thailand | Bangkok | Khanjanasthti *et al.* (35) | Median | B | | | | | 74.9 | | 86.3 | 95.6 | 102.8 | 108.0 | 113.8 |
| | | | | G | | | | | 72.8 | | 85.0 | 94.6 | 101.3 | 107.4 | 112.1 |
| Present Study | | | Median | B | 50.4 | 59.4 | 65.9 | 70.6 | 74.3 | | 86.0 | 94.4 | 100.8 | 106.7 | 113.6 |
| | | | | G | 50.3 | 59.1 | 65.5 | 70.0 | 73.5 | | 79.8 | 93.3 | 99.8 | 106.0 | 113.1 |

**TABLE XXXI**–*Comparison of Weight (kg) of European and Asian Children*

| Country | Place | Author/Year | | | Age (months) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Bi | | 3 | 6 | 9 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| | | | | **European** | | | | | | | | | | | | | | | |
| Belgium | Brussels | Vercauteren 1985 (24) | Median | B | | | | | | | | | | | | | 17.0 | 19.0 | 21.0 |
| | | | | G | | | | | | | | | | | | | 16.5 | 19.0 | 21.0 |
| Denmark | National | Andersen *et al.* 1982 (25) | Mean | B | | | | | 10.9 | | 13.4 | | 15.4 | | 17.4 | | 19.3 | | 21.4 |
| | | | | G | 3.4 | 5.8 | 7.6 | 9.1 | 10.2 | | 12.6 | | 14.9 | | 16.7 | | 19.1 | | 21.2 |
| Hungary | National | Eiben & Panto 1986 (26) | Mean | | | | | | | | | | 15.0 | | 16.1 | | 18.0 | | 20.5 |
| Netherlands | National | Roede & Van Weiringen 1985 (27) | Mean | B | | | | | 10.1 | | 13.1 | | 15.4 | | 17.6 | | 19.6 | | 21.7 |
| | | | | G | | | | | 9.5 | | 12.6 | | 15.0 | | 17.2 | | 19.3 | | 21.4 |
| Netherlands | Oosterwolde | Gerver, 1988 (23) | Median | B | | | | | 10.2 | | 13.1 | | 15.3 | | 17.5 | | 19.7 | | 21.9 |
| | | | | G | | | | | 9.8 | | 12.6 | | 14.8 | | 17.4 | | 19.7 | | 21.9 |
| Norway | Bergen | Knudtzon *et al.* 1989 (23) | Median | B | | | | | 10.3 | | 13.0 | | | | 17.0 | | | | |
| | | | | G | | | | | 9.7 | | 12.2 | | | | 16.7 | | | | |
| Norway | Bergen | Waaler 1983 (28) | Mean | B | | | | | | | | | 16.1 | | 17.6 | | 19.8 | | 21.9 |
| | | | | G | | | | | | | | | 15.1 | | 17.1 | | 18.9 | | 21.0 |
| Poland | Warsaw | Kurniewicz-Witzakowa 1983 *et al.* (29) | Mean | B | | | | | 10.7 | | 13.0 | | 14.8 | | 16.9 | | 19.2 | | 21.8 |
| | | | | G | | | | | 9.9 | | 12.3 | | 14.5 | | 16.4 | | 18.5 | | 20.9 |
| Spain | Bilbao | Hernandez *et al.* 1985 (30) | Median | B | | | | | 10.1 | | 12.7 | | 14.9 | | 17.0 | | 18.8 | | 20.9 |
| | | | | G | | | | | 9.6 | | 12.1 | | 14.5 | | 16.7 | | 18.4 | | 20.7 |
| NCHS | USA | Hamill *et al.* 1977 (6) | Median | B | 3.3 | 6.0 | 7.8 | 9.2 | 10.2 | 11.5 | 12.6 | 13.5 | 14.6 | 15.7 | 16.7 | 17.7 | 18.7 | 19.7 | 20.7 |
| | | | | G | 3.2 | 5.4 | 7.2 | 8.6 | 9.5 | 10.8 | 11.9 | 13.0 | 14.1 | 15.1 | 16.0 | 16.8 | 17.7 | 18.6 | 19.5 |
| | | | | **Asian** | | | | | | | | | | | | | | | |
| China (PRC) | Urban | Zhang & Huang 1988 Zhang 1977 (31, 32) | Mean | B | | | | | 9.9 | | 12.2 | | 14.0 | | 15.6 | | 17.4 | | 19.2 |
| | | | | G | | | | | 9.2 | | 11.7 | | 13.4 | | 15.2 | | 16.8 | | 18.7 |
| Hong Kong | Chinese | Leung *et al.* 1987 (33) | Median | B | | | | | | | | | | | 15.2 | | 16.9 | | 18.7 |
| | | | | G | | | | | | | | | | | 14.8 | | 16.4 | | 18.2 |
| Japan | National | Kikuta & Takaishi 1987 (34) | Mean | B | | | | | | | 13.0 | | 14.0 | | 15.0 | | 17.5 | | 20.0 |
| | | | | G | | | | | | | 11.0 | | 14.0 | | 15.0 | | 17.0 | | 19.0 |
| Thailand | Bangkok | Khanjanasthti *et al.* (35) | Median | B | | | | | 9.6 | | 12.3 | | 14.6 | | 16.1 | | 17.2 | | 19.9 |
| | | | | G | | | | | 9.1 | | 11.7 | | 14.0 | | 15.6 | | 17.6 | | 18.8 |
| Present Study | | | Median | B | 3.1 | 5.7 | 7.4 | 8.5 | 9.3 | | 11.9 | | 13.8 | | 15.4 | | 17.1 | | 19.2 |
| | | | | G | 3.2 | 5.4 | 7.0 | 8.1 | 9.0 | | 11.6 | | 13.5 | | 15.1 | | 16.8 | | 18.9 |

**TABLE XXXIII**–*Head and Chest Circumference (cm) of European Children*

| Country | Place | Author/Year | | Age (months) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 3 | 6 | 9 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| | | | **Head Circumference** | | | | | | | | | | | | | | | |
| Netherlands | | Roede & Van (27) Weiringen 1985 | Mean | | 39.7 | 42.8 | 45.6 | 45.9 | | | | | | | | | | |
| Spain | Bilbo | Hernandez *et al.* 1985 (30) | Median | 34.0 | 40.1 | 42.8 | 44.7 | 46.0 | 47.3 | | | | | | | | | |
| Poland | Warsaw | Kurniewicz-Witczakowa *et al.* 1983 (29) | Mean | 34.3 | 40.0 | 43.2 | 45.3 | 46.3 | 47.3 | | | | | | | | | |
| | | | **Chest Circumference (cm)** | | | | | | | | | | | | | | | |
| Poland | Warsaw | Kurniewicz-Witczakowa *et al.* 1983 (29) | Mean | 32.9 | 41.0 | 44.6 | 46.7 | 47.4 | 48.1 | | | | | | | | | |

**TABLE XXXIV**–*Comparison of Midarm Circumference (cm) of European and Asian Children*

| Country | Place | Author/Year | | Age (months) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Bi | 0 | 3 | 6 | 9 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| | | | | **European** | | | | | | | | | | | | | | | |
| Hungary | National | Eiben & Panto 1986 (26) | Mean | | | | | | | | | | 16.7 | | 16.8 | | 17.0 | | 17.4 |
| Netherlands | Oosterwolde | Gerver 1988 (23) | Mean | | | | | | 16.3 | | 17.0 | | 17.4 | | 17.6 | | 17.7 | | 17.9 |
| Norway | Bergen | Waaler 1983 (28) | Mean | | | | | | | | | | 16.4 | | 16.8 | | 17.3 | | 17.6 |
| Poland | Warsaw | Kurniewicz-Witczakowa *et al.* 1983 (29) | Mean | | | | | | 16.0 | | 16.5 | | 16.6 | | 16.8 | | 17.3 | | 17.9 |
| Spain | Bilbao | Hernandez *et al.* 1985 (30) | Mean | | | | | | 16.0 | | 16.3 | | 16.7 | | 17.0 | | 17.2 | | 17.4 |
| | | | | **Asian** | | | | | | | | | | | | | | | |
| Nepal | Terai region | Martorell *et al.* 1984 (23) | Mean | B | | | | | | | | | 13.9 | | 14.1 | | 14.0 | | 14.0 |
| | | | | G | | | | | | | | | 13.4 | | 13.8 | | 13.9 | | 13.7 |
| Present Study | | | Median | B | 9.8 | 12.3 | 13.7 | 14.3 | 14.5 | | 15.0 | 15.2 | 15.4 | | 15.8 | | 16.2 | 16.5 | 16.7 |
| | | | | G | 9.9 | 12.2 | 13.5 | 14.1 | 14.3 | | 15.0 | 15.2 | 15.4 | | 15.8 | | 16.2 | | 16.7 |

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