The Growth Pattern of Selected Primary School Children in Riyadh, Saudi Arabia

A. A. R. Al-Shoshan


During the 1989 academic year, 2677 public primary school Saudi children, in 33 selected schools, in Riyadh, were examined and assessed for their growth pattern. The height for age values, for both boys and girls, were below the median, fluctuating between the 15th and 30th percentiles, of the smoothed standard curves of the National Center for Health Statistics, NCHS/USA. The 6-year-old children manifesting no stunting, were close to the 40th and 45th percentiles. The weight for age, and mid-arm circumference values showed a similar pattern. Triceps skinfold thickness (TSF) values were slightly different. They were lower, both for boys and girls, at 6 years of age, then gradually approached the 50th and 30th percentiles at ages 12 and 13 years respectively, which indicated a trend toward obesity.

The growth patterns of children have always been a focus of attention, as indicators of their nutritional status, and utilized as one of the major criteria for potential intervention programmes and projects. Socioeconomic variables, among others, have also direct and indirect impacts on growth pattern, dietary habits, social behaviour and mental development. Considering the fact that mankind itself is the key element for national development, therefore, the periodic monitoring of growth patterns appears to be essential in order to establish regional and national standard norms for assessment of the nutritional status of this vulnerable group.

Among body parameters, weight, height, arm circumference, and triceps skinfold thickness are universally utilized for the evaluation of growth and development. Similar studies, longitudinal, as well as cross-sectional, were documented for the development of standard norms. Few regional and local studies on the anthropometry of Saudi children, dealing mainly with infants and preschoolers, have been reported. These studies have all indicated failure to thrive, and the prevalence of undernourishment, and showed that Saudi children's median body measurements are below the established norms, and fluctuate between the 10th and 5th percentiles of the National Center for Health Statistics (NCHS) standards.

The present study was designed to generate additional baseline data for the growth pattern of Riyadh school children, aged 6–13 years, and compare them with other studies in the Kingdom, the Gulf region, other countries, and with international standards.
Subjects and Methods

There were 430 public primary schools in Riyadh, during the school year of 1988–89, 240 for boys, and 190 for girls, enrolling a total of 153,352 Saudi students which represented 74,275 boys, and 79,077 girls. The average admission age was around 6 years and older. The number of Saudi students selected and examined was proportional to the total number of students enrolled in each school. Thirty-three primary schools, out of 430 (7.7%), 15 for boys and 18 for girls, were selected. The selected schools were visited in advance, and students between the ages of 6 and 13 years were included in the study (2677 students of a total 2791). The survey started on 20 March 1989, and terminated on 16 December 1989. The survey teams, one for boys, and one for girls’ schools, were scheduled in such a manner so that the students were able to pass through the station units where registration, anthropometry, clinical examination, dietary assessment and socio-economic interviews and related observations were recorded and documented.

Anthropometric measurements were carried out according to Jelliffe and Jelliffe. A Lange caliper was used for the skinfold thickness, and other equipment and techniques were standardized, and a reasonable accuracy was secured. The Statistical Package for Social Sciences (SPSS/PC + ) was utilized for data processing. Median (50th percentiles) values for weight and height for each sex, and age group were plotted against the NCHS/USA standards. Similarly, median values for mid-arm circumference, and skinfold thickness for each sex and age group were also compared with NCHS standards. Mean values for weight and height, as percentages of the NCHS/USA median, were also calculated in order to compare them with other studies.

Table 1

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>N</th>
<th>Weight (kg) mean</th>
<th>SD</th>
<th>Height (cm) mean</th>
<th>SD</th>
<th>MAC (cm) mean</th>
<th>SD</th>
<th>TSF (mm) mean</th>
<th>SD</th>
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*Age is rounded so that (5.50–6.49) considered 6 years and so on
MAC: mid-arm circumference
TSF: triceps skinfold.
other studies showed similar growth patterns. Children hold their best positions, and higher percentage values, on admission, then demonstrate a decline in growth velocity during their first year of schooling; then they fluctuate constantly during the period 8-11 years of age and have a second major drop in height and weight percentage values during the period 11-13 years of age for boys, and 10-12 years of age for girls.

**Discussion**

This study showed the growth pattern of public primary school children in Riyadh, aged 6-13 years. The height for age, a common indicator of mild to moderate form of chronic undernourishment, and weight for age which reflects the current nutritional status, both have indicated that the growth patterns of the Saudi school children are below the 50th percentiles of the NCHS/USA during their formative years. The data clearly indicate that the values fluctuate between the 5th and 30th percentiles for height, and between the 15th and 25th percentiles for weight. The heights and weights, which are lower than the international standards, during the formative years, could very
well be due to multifactorial aetiology. The most ideal height position at 6–7 years of age resembled the data collected for the new enrollees on their admission. The Riyadh boys and girls held the highest possible height percentage, 99.5% and 98.7% of the US median, respectively, among the comparison group. Other studies, with somewhat lower values, showed a similar pattern. This could indicate that all children reached their preschool age period with a good recovery phase which brought them closer to the US standards. Similar findings were reported by Kanawati et al.28,29 and Waterlow.30 The percentage values of the comparison group have shown a decline in growth velocity during the first year of schooling compared with their original position on admission. An identical situation was observed with the weight percentage values as well. This may very well be the result of institutionalization, and its adverse effects on health and nutritional status.

It is interesting, however, to note that a fairly constant, and somewhat slowly declining growth pattern follows the earlier phase. One could observe the fluctuation of all values during the period from 8 to 11 years of age. Such a pattern of fluctuation was common among the other comparison groups evaluated.20–22,24–26 A second major drop in height and weight values in all comparison groups becomes evident after the period of 11–13 years for boys, and 10–12 years for girls when compared with NCHS/USA median values. The puberty spurt, and its associated growth factors were among the major points which may help to explain the second drop. It is a fairly well established fact that heredity, socioeconomic background, and malnutrition are among the major limiting factors for the maximum attainable genetic potential for growth and development.28,30–33 To elucidate this fact it was suggested to undertake a comparative study between wealthy, elite children and the US standards.31 The body size has been reported to affect the growth acceleration, and the larger framed children have their growth acceleration period earlier than their small framed counterparts.1,4 Children, as early as 2 years of age, who will take a slower course to mature at adolescence are smaller than their contemporaries, and the girls who experience earlier menarche will have greater growth velocity, but somewhat shorter growth period during their adolescence years. Girls who mature early continue to have an increased ratio of weight to height in adult life when compared with those who mature slowly.34

The skinfold thickness, as a specific index for obesity, has some advantage over the weight for height. The correlation of multiple skinfold
measurements with body fat is approximately 0.7. Racial, and ethnic backgrounds, must be taken into consideration. The subcutaneous fat tissues of the American children which show a steady decrease in values throughout the preschool years in both sexes, however, begin to accumulate as early as at 8 years of age in girls, and 10 years of age in boys. When the fat tissue becomes apparent, according to Nelson et al., the growth spurt is initiated. The children of Riyadh have also shown a similar pattern when compared with the NCHS/USA standards; and accumulate more fat during the period 9–12 years of age in boys, and 9–13 years in girls.

In conclusion, the study has clearly shown that Riyadh primary school Saudi children grow below the 50th percentiles of the NCHS/USA standards during their formative years. This is in agreement with the growth patterns of other studies in the region. The data for skinfold thickness, however, showed a different pattern as compared with international standards. This may signal that both forms of malnutrition co-exist, and affect the children of Saudi Arabia. However, heredity, bodysize, health, socioeconomic status and nutritional factors should not be overlooked.

Acknowledgement

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References


