

- of *Pseudomonas aeruginosa* bacteremia in 127 consecutive neutropenic patients with hematologic malignances. *Int J Infect Dis* 1998; 3: 99–104.
18. Coullioud D, Van der Auwera P, Viot M, Lasset C. Prospective multicentric study of the etiology of 1051 bacteremic episodes in 782 cancer patients. *Support Care Cancer* 1993; 1: 34–46.
19. Viscoli C, Girmenia C, Marinus A, *et al.* Candidemia in cancer patients: a prospective multicenter surveillance study by the invasive fungal infection group of EORTC. *Clin Infect Dis* 1999; 28: 1071–79.

Increased Heights and Weights of Isfahani Female Children and Adolescents in Iran

by Ashraf Aminorroaya, Masoud Amini, Anis Fard Mosavi, and Zohreh Sanaat

Isfahan Endocrine Research Center, Department of Internal Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

Summary

Considering the different patterns of growth in various societies, an anthropometric evaluation of 6–18-year-old female students was carried out in 1997 in Isfahan, Iran with the goal of establishing height and weight values for use in clinical settings. 4638 female Isfahani students aged 6–18 years were selected by a random cluster sampling. Their height (cm) and weight (kg) were measured and the related percentiles were determined. The results were compared with previous studies in Iran using Student's *t*-test. Findings show an increase of 6–12 cm in height and of 1–4 kg in weight of Isfahani female 6–18-year-old students as compared with a similar study in 1975. The height curves can be approximately superposed on those of NCHS growth charts, but American girls are significantly heavier than Isfahani girls after the age of 14. The growth parameters among Isfahani female students have improved compared with those of their compatriots and also their fellow citizens 22 years earlier. Improvements in nutrition, health services or other unknown environmental factors may have contributed to an increase in the growth indexes.

Introduction

Height and weight are important indexes to determine the health status of children and adolescents. Special biological mechanisms regulate this growth pattern. Many genetic, systemic, endocrine and geographic factors affect the growth and it has different patterns in various societies.¹ NCHS growth charts are used in many parts of the world.² Some cross-sectional studies have been conducted in Isfahan, a central city of Iran (1975), Shiraz in southern Iran, and Tehran (1990–1992).^{3–5} All the percentiles of generated charts were substantially below those of the NCHS charts, but the spread was similar. In 1997, an anthropometric evaluation of 6–18-year-old Isfahani female students was carried out. The goal of the study was to establish height and weight values for use in clinical settings.

Acknowledgments

We thank the Isfahan Province Health Center, Education and Development Administration for their help in performing this study.

Correspondence: Ashraf Aminorroaya MD, **Isfahan Endocrine Research Center**, Amin Hospital, Ebnesina St., Iran. Tel. 0098-311-4463193; Fax 0098-311-4460772. E-mail <aminorroaya@med.mui.ac.ir>.

Method

Isfahan Province, located in the central part of Iran, has a total population of approximately 4 000 000 and its capital city has a total population of approximately 1 000 000. From 200 000 female Isfahani students aged 6–18 years in 1997, we selected 4638 people by a random cluster sampling. The height (cm) and weight (kg) were measured by trained health staff and their percentiles were determined by SPSS software. To compare the results with previous similar studies in Iran in 1975, and 1990–1992,^{4,5} Student's *t*-test was used and *p*-values less than 0.05 were considered statistically significant.

Results

The generated centiles are shown in Tables 1 and 2.

Discussion

In this study the height and weight of 6–18-year-old female Isfahani students were measured in 1997. The generated results are eligible only to female children and adolescents of Isfahan city. A research study performed in Tehran city in 1990–1992 reported that

all growth charts of Tehrani children aged 2–18 years were substantially below those of the NCHS charts, although the spread was similar.⁵ Isfahani growth percentiles are almost similar to NCHS percentiles in 1997 (Figs 1 and 2).

A comparison of Isfahani female students aged 6–18 years in 1997 to female American children of the same ages shows that the growth curves of Isfahani female students in 1997 can be approximately superposed on those of NCHS, which were determined 18 years earlier (Fig. 1). Although the height of female American children and adolescents may have increased during this 18-year interval, and although it is not logical to say that the heights of American girls in 1997 are equal to those of Isfahani girls, this study shows that NCHS charts can be applied to the evaluation of female Isfahani children.

The curves of weights in Isfahani girls lay approximately on those of NCHS until 14 years of age. American girls are significantly heavier than Isfahani girls after that age (by 2–4 kg), although the differences in heights are negligible (Table 2, Fig. 2). These differences may be due to characteristics of the body frames and muscle mass which establish after puberty. If the nutritional status was the cause, the mentioned differences should have been observed earlier than 14 years of age. One possibility is that gonadal steroids have greater effects on increasing muscle mass or bone density in American girls compared with Isfahani students due to genetic differences.

In comparison with a similar study, which was carried out on 10–14-year-old Isfahani girls in 1975,² the 6–12 cm increase in height was observed over 22

TABLE 1
Centiles, mean and standard deviation of Isfahani female students' heights in 1997

| Age | Frequency | SD | \bar{X} | P ₅ | P ₁₀ | P ₂₅ | P ₅₀ | P ₇₅ | P ₉₀ | P ₉₅ |
|-----|-----------|-----|-----------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 6 | 252 | 5.1 | 118 | 110 | 112 | 115 | 118 | 122 | 125 | 126 |
| 7 | 279 | 5.3 | 124 | 115 | 117 | 120 | 124 | 128 | 130 | 132 |
| 8 | 255 | 5.5 | 129 | 119 | 122 | 126 | 129 | 132 | 136 | 138 |
| 9 | 254 | 6.6 | 134 | 123 | 126 | 130 | 134 | 138 | 142 | 144 |
| 10 | 295 | 7.4 | 140 | 129 | 131 | 135 | 140 | 145 | 151 | 153 |
| 11 | 359 | 7.8 | 146 | 134 | 137 | 142 | 147 | 152 | 156 | 159 |
| 12 | 370 | 6.7 | 152 | 140 | 143 | 148 | 152 | 156 | 160 | 162 |
| 13 | 390 | 6.1 | 156 | 145 | 148 | 152 | 156 | 160 | 163 | 165 |
| 14 | 421 | 5.8 | 158 | 149 | 150 | 155 | 158 | 162 | 165 | 168 |
| 15 | 446 | 5.8 | 159 | 151 | 153 | 156 | 160 | 163 | 167 | 169 |
| 16 | 554 | 5.9 | 160 | 150 | 152 | 156 | 160 | 164 | 167 | 170 |
| 17 | 457 | 5.4 | 159 | 150 | 152 | 156 | 159 | 163 | 166 | 168 |
| 18 | 306 | 6.1 | 159 | 149 | 152 | 156 | 159 | 164 | 167 | 170 |

Total $n = 4638$. SD = standard deviation, \bar{X} = mean, P = percentile, P₅₀ = median.

TABLE 2
Centiles, mean and standard deviation of Isfahani female students' weights in 1997

| Age | Frequency | SD | \bar{X} | P ₅ | P ₁₀ | P ₂₅ | P ₅₀ | P ₇₅ | P ₉₀ | P ₉₅ |
|-----|-----------|-----|-----------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 6 | 252 | 3.8 | 21 | 15 | 18 | 19 | 21 | 23 | 26 | 28 |
| 7 | 279 | 4.2 | 24 | 19 | 20 | 21 | 24 | 26 | 30 | 32 |
| 8 | 255 | 4.6 | 27 | 20 | 22 | 24 | 26 | 30 | 33 | 36 |
| 9 | 254 | 5.5 | 30 | 22 | 24 | 25 | 29 | 33 | 37 | 40 |
| 10 | 295 | 7.5 | 34 | 24 | 26 | 30 | 33 | 39 | 45 | 50 |
| 11 | 359 | 8.8 | 39 | 27 | 29 | 33 | 37 | 44 | 50 | 56 |
| 12 | 370 | 9.1 | 44 | 30 | 32 | 36 | 43 | 50 | 57 | 60 |
| 13 | 390 | 9.4 | 48 | 36 | 37 | 41 | 46 | 54 | 60 | 66 |
| 14 | 421 | 9 | 51 | 39 | 41 | 45 | 50 | 55 | 62 | 67 |
| 15 | 446 | 9 | 54 | 42 | 44 | 48 | 52 | 60 | 65 | 71 |
| 16 | 554 | 8.5 | 53 | 41 | 43 | 47 | 51 | 58 | 65 | 70 |
| 17 | 457 | 8.6 | 54 | 42 | 45 | 49 | 53 | 60 | 67 | 71 |
| 18 | 306 | 8.8 | 54 | 42 | 45 | 49 | 54 | 59 | 65 | 71 |

Total $n = 4638$. SD = standard deviation, \bar{X} = mean, P = percentile, P₅₀ = median.

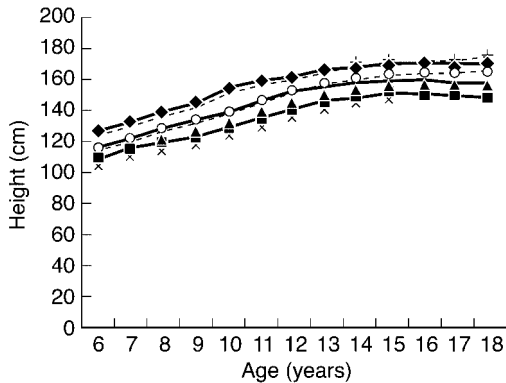


FIG. 1. Comparison of height percentiles of Isfahani female students in 1997 with NCHS standards. ■, P₅; ▲, P₅₀; ◆, P₉₅; *, P₅ of NCHS; ○, P₅₀ of NCHS; +, P₉₅ of NCHS.

years. The median of their weights increased as much as 1–4 kg from 1975 to 1997. Because the genetic and geographic factors remained unchanged during these 22 years, these significant differences may be due to improvements in nutrition and health service delivery status or some unknown factors.

The median heights and weights of children in Shiraz a decade ago lay approximately on the 25th percentile of US children, but were above most groups of children from the developing world.⁴ The heights of Isfahani female students in 1997 were almost equal to those of NCHS.

All the centiles of heights and weights of urban Isfahani female students aged 6–18 years in 1997 were comparable to those of NCHS charts. Their growth parameters have improved compared with those of their compatriots and also their fellow citizens 22 years earlier. Improvements in nutrition, health services or other unknown environmental factors may have contributed to an increase in the growth indexes.

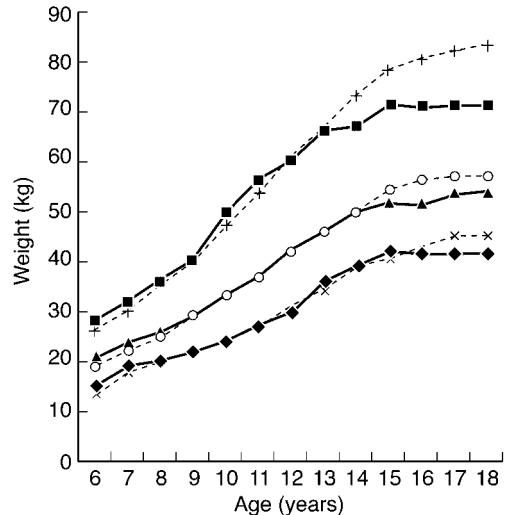


FIG. 2. Comparison of weight percentiles of Isfahani female students in 1997 with NCHS standards. ■, P₅; ▲, P₅₀; ◆, P₉₅; *, P₅ of NCHS; ○, P₅₀ of NCHS; +, P₉₅ of NCHS.

References

1. Tse WY, Hindmarsh PC, Brook CGD. The infancy-childhood-puberty model of growth: clinical aspects. *Acta Paediatr Scand* 1989; 356 (Suppl): 38–43.
2. Hamill PV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM. Physical growth: National Center for Health Statistics Percentiles. *Am J Clin Nutr* 1979; 32: 607–29.
3. Malek Afzali H, Foutohi H. Evaluation of heights and weights in Iranian adolescents. *Daro va Darman* 1984; 15: 12–20.
4. Taghi Ayatollahi SM, Carpenter RG. Growth of school children of southern Iran in relation to the NCHS standards. *Am Hum Biol* 1991; 18: 515–22.
5. Hosseini M, Carpenter RG, Mohammad K. Growth of children in Iran. *Ann Hum Biol* 1998; 25: 249–61.