

Original Article

PHYSICAL GROWTH STANDARDS IN SIX- TO TWELVE-YEAR-OLD CHILDREN IN MASHHAD, IRAN

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Background: Growth is an increase in the physical dimensions and its result is a quantitative change in the body. Development is a progressive increase in the skills and functional capacity of a child and its result is a qualitative change in a child's function.

Methods: This investigation was a descriptive, decompositive, and observative study, which was performed on a random group of 5,378, 6- to 12-year-old children in 45 schools in the urban population of Mashhad, Khorasan Province, Iran.

Results: The height and weight averages of the studied children were more than the averages of Nelson's Textbook of Pediatrics. However, as age increased, the height and weight averages of the studied children became less than the averages of Nelson.

Conclusion: To accelerate children's physical growth, we should closely follow up on factors which could fortify children and affect their growth.

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Keywords: Child • Mashhad • physical growth standards • urban population

Introduction

Growth¹ and development² are two terms that are usually used similarly. Each one depends on the other and, in normal children, they progress with each other.

Growth is an increase in the physical dimensions completely or partially and its result is a quantitative change in the body. In each child, there is a special growth aptitude, which cannot be overtaken, but which can be stopped at any stage. The followings have been named as different aspects of growth that have to be considered: physical growth, mental growth, emotional growth, and social growth.^{3,4}

Development is a progressive increase in the skills and functional capacity of a child and its result is a qualitative change in child's ability to function. Great importance is given to the child's

growth and development in religious Hadith.^{5 - 7} Russo emphasized the importance of different stages in physical and mental growth in his book.^{4,8}

Many factors can affect the growth such as genetics, socioeconomic condition, race, sex, psychological disorders such as stress, diseases, growth aptitude, hormones, and unknown factors.^{1, 2, 9 - 13} Many information are accessible about prenatal growth and development.^{1, 9, 14} The neonatal period has distinct stages of growth too. The average birth weight in eastern and African Americans is 2.9 – 3.2 kg. It has been reported that babies born to tall mothers are 8% heavier than the babies with short mothers. A 16% increase is also seen in the average weight of babies with tall mothers.¹⁵ In infants (4 weeks to one year of age) the rate of growth decreases about 20 g/day in the period between 3 and 6 month. The rate of growth decreases further more during 6 to 12 month of age.⁹ This trend continues in toddlers.¹ In many cases the child's birth weight can predict his growth potential.¹⁶ A maintained level of activity helps body growth including extremities.¹⁷

Other studies have evaluated children's growth rate in different parts of Iran, and the results have

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been published.^{18, 19} This investigation was carried out to study the physical growth standards in 6- to 12-year-old children in the urban population of Mashhad City.

Patients and Methods

This study was a descriptive, decompositive, and observative study, which was performed in a random group of 5378, 6- to 12-year-old children in 45 primary and secondary schools in the urban population of Mashhad between 1998 and 1999.

In this study, probability sampling was cluster sampling.²⁰ The studied schools were chosen randomly from the seven educational regions of Mashhad. The studied classes were chosen randomly from each school and in each class almost two-thirds of the students that had been chosen randomly, were studied.

To obtain the number of the studied samples, we used the following formula:

$$N = \frac{Z^2 * S^2}{D^2}$$

(where, N = sample number, Z = confidence level, S = deviation, and D = accuracy).

With D = 95%, maximum error of 1 kg, and standard deviation of 9.2 kg, the sample number was 325. These calculations were also the same for height.

The quantitative variables in this study included height, weight, and age of the target population and the qualitative variables of this study were birth ranking, the number of failure years of study at school, patients' death, divorce in the family, existence of a stepfather or stepmother, relationship between the parents, job and educational level of parents, and existence of special diseases.

The sampling method was cluster sampling. To obtain the required information, four investigators took part in this study and went to the schools in order to determine the required data (using various techniques) and to fill out the questionnaires.

The various techniques included a standard scaled stuffy measure, a standard springy balance, a set-square, and a questionnaire. All the investigators filled out the questionnaires and determined the required data using the same method. We used a questionnaire to acquire our required data. This questionnaire included some information about the students such as the date of birth, failure rates, years of study at the school, and

information about their parents such as the existence of a step-mother or father, family relationships, and their age, job, and educational level. In this study, the weight-age and height-age curves of the studied population were drawn and compared with the curves of the National Center for Health Statistics (NCHS). Changes in different percentiles of height and weight standards were also studied. In addition, the changes in different percentiles of weight and height standards were studied in male and female groups separately.

For data analysis, the SPSS software was used. Various statistical tests including the Chi-square, Friedman, and Student's *t*-tests were used in this study.

Results

Weight and height averages were obtained for the seven educational regions of Mashhad. The best weight and height growth was in region 3 (a rich and wealthy region) and the second was in region 6 (relatively rich region). The poorest weight and height growth area was region 5 (a poor region) ($P < 0.05$).

There was a significant relationship between the improvement of weight and height averages and the father's job and family economy ($P = 0.001$), mother's employment ($P = 0.0008$), father's education ($P = 0.0015$), and mother's education ($P = 0.005$). Unfortunately, the relationship between the well-educated mothers and under-educated and illiterate mothers was 1:4.

This study indicated that the physical growth averages of the students in Mashhad's population was a little more than the international standards in the 6 – 7-year-old group; as age increased, this average decreased and became less than the international standards. In the boys' group, the height and weight averages in the 6-year-old group were more than the Nelson's curves, but those in the 7-year-old category were less than the Nelson's curves. Thus, as age increased, this decrease became more than before.

In the girls' group, the weight average of the 6 – 8-year-old children was more than the average of Nelson; but in the 9 – 12-year-old group, this relationship became reversed and, as age increased, this difference became more.

The average of the 6-year-old girls in the studied population was more than the average of Nelson and in the 7-year-old girls. The height

average was equal to the height average specified in Nelson. In the 8 – 12-year-old girls, the height average was less than the height average of Nelson. The height and weight averages in the current reference were similar to the averages in the Nelson.

In this study, the height and weight averages in the studied children of Mashhad were more than those of the Brazilian children. The averages, obtained between the Mashhad data and Nelson differ, and by using ANOVA and Tucky tests, these differences were found to be significant in all the groups studied ($P < 0.05$).

Discussion

This study showed that the physical growth average in the children of Mashhad was more than Orumieh (1993), Shiraz (1976), and Brazil. However, the results from the present study were similar to another study, which has been carried out in Iran.²¹

Also, it was found that the height and weight averages of the studied children were more than the averages of Nelson, but as age increased, the height and weight averages of the studied children became less than the averages of Nelson.

To accelerate the children's physical growth and fortify them, we require social justice and a change in the education level of parents, especially mothers as well as improved vocations. Because of the significant difference between the standards of Iranian cities (such as Mashhad) and international standards, this study indicates that if we choose non-Iranian standards for our judgment basis, some Iranian children might be treated as abnormal, although they are normal and vice versa.

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