

ANTHROPOMETRIC PARAMETERS OF THE CHEST IN SCHOOL-AGE CHILDREN OF TASHKENT CITY

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Relevance

Anthropometric examination makes it possible to characterize the individual development of the organism, identify deviations from the norm, determine their causes, and then carry out health-improving and therapeutic measures. The problem of preserving the health of the young population requires an in-depth study of both the physiological mechanisms of adaptation and the morphofunctional characteristics. The identification of morphofunctional and etiological mechanisms of the development of pathological processes in various body systems is a leading problem in theoretical and practical medicine. The child's body is ontogenetically characterized by a complex of psychophysiological adaptive capabilities, leading to the dynamics of functional processes and the formation of new physiological levels of activity of the organism.

Aim. Development of scientifically based criteria for assessing the anthropometric indicators of the chest and the biological maturation of school-age children in rural areas of the Tashkent region based on identifying age and sex characteristics of the development of somatometric parameters.

Material and methods. Anthropometric indicators of the chest were studied in dynamics among children aged 7-16 years living in rural areas of the Tashkent region. In total, more than 1,200 school-age children were examined. All subjects were divided into 10 age groups. Each age group from 7 to 16 years included more than 60 boys and girls.

Anthropometric studies of children were carried out using approved methods in accordance with the methodological recommendations of N.Kh. Shamirzaev et al. (Tashkent, 1998) and using a standard set of anthropometric instruments widely used in scientific research. To determine cephalometric parameters, a spreading and sliding caliper and a linen centimeter tape (with a millimeter scale) were used, all of which passed metric verification.

The assessment of anthropometric indicators was carried out in two ways: parametric (sigma) and nonparametric (centile). When distributing children according to their level of development, the $M \pm 1\sigma$ indicator was used – the range of average values typical for normal parameters (in our case, this is group II of children); $M + 1\sigma$ represents the upper limit of the norm, and $M - 1\sigma$ corresponds to the lower limit of the norm. Deviations within $M - 1.1\sigma$ to $M - 2\sigma$, $M - 2.1\sigma$ to $M - 3\sigma$ and less indicate values below average and low (group I). Deviations within $M + 1.1\sigma$ to $M + 2\sigma$ and $M + 2.1\sigma$ to $M + 3\sigma$ and higher indicate above-average and high values (group III).

In studying the growth processes of the chest, the following anthropometric parameters were measured: circumference, transverse, and anteroposterior dimensions. All measurements were performed in an upright position.

The chest circumference was measured in three states: at maximum inspiration, during a pause, and at maximum expiration.

Results and discussion. Analysis of statistical data showed that the average chest circumference at maximum inspiration in school-age boys ranged from 62.6 ± 0.35 cm (at age 7) to 87.3 ± 0.63 cm (at age 16), and in girls – from 62.6 ± 0.39 cm to 84.7 ± 0.68 cm, respectively. The total increase in chest circumference at maximum inspiration from 7 to 16 years was 24.7 cm (39.5%) in boys and 22.1 cm (35%) in girls. The maximum annual increase in chest perimeter was observed in boys at ages 9–10 (3.9 cm or 5.9%), 12–13 (4.3 cm or 5.8%), and 14–15 (5.5 cm or 6.8%) years; in girls – at ages 10–11 (3.2 cm or 4.7%), 12–13 (4 cm or 5.4%), and 13–14 (3 cm or 3.9%) years. Over 9 years, the average annual increase in this indicator was 2.7 cm in boys and 2.5 cm in girls.

The increase in chest circumference at rest during the study period amounted to 23.9 cm or 39.9% in boys (from 59.8 ± 0.34 to 83.7 ± 0.60 cm) and 21.9 cm or 36.7% in girls (from 59.6 ± 0.39 to 81.5 ± 0.68 cm). That is, the chest circumference at rest increased on average 1.4 times. The greatest annual increase in chest circumference at rest in boys was observed at ages 9–10 (3.7 cm or 5.9%), 12–13 (4.2 cm or 5.9%), and 14–15 (5.4 cm or 6.9%) years; in girls – at ages 10–11 (3 cm or 4.6%), 12–13 (4.3 cm or 6.1%), and 14–15 (3 cm or 3.4%) years. On average, the increase in chest circumference at rest from ages 7 to 16 was 2.7 cm per year in boys and 2.4 cm per year in girls.

During the studied age period, the chest circumference at full expiration increased in both boys and girls by 1.4 times; the total increase over 9 years was 23.4 cm (39.7%) and 21.2 cm (36.3%), respectively.

The maximum age-related increase in boys was observed at ages 9–10 (3.6 cm or 5.8%), 12–13 (4.1 cm or 5.9%), and 14–15 (5.3 cm or 6.9%) years; in girls – at ages

12–13 (4.2 cm or 6.2%), 10–11, 13–14, and 14–15 (2.8 cm or an average of 4%) years. The average annual increase in this indicator from 7 to 16 years in both sexes was approximately 2.5 cm.

Analysis of data using the parametric (sigma) method showed that in boys of group I aged 7 to 16 years, chest circumference at rest increased by an average of 35.2%, at full expiration – by 33.8%, and at full inspiration – by 35.6%; in group II – by 40.8%, 40.8%, and 41.3%; and in group III – by 39.3%, 39.5%, and 40.6%, respectively.

The greatest annual increase in chest circumference, regardless of the state of measurement (pause, full expiration, or full inspiration), was observed in boys of group I at ages 12–13 (on average 8%), in group II at ages 14–15 (on average 7%), and in group III at ages 14–15 (on average 9%).

The study of the dynamics of chest circumference changes in girls revealed that by the age of 16, in group I, chest circumference during pause increased by 33.4%, at full expiration – by 33.1%, and at full inspiration – by 30.3%; in group II – by 38.9%, 38.2%, and 37.8%; and in group III – by 38.8%, 38.2%, and 38.8%, respectively. The greatest annual increases in chest circumference in girls were observed in group I at ages 12–13 (during pause – 6.1%, full expiration – 6.1%, and full inspiration – 4.9%) and at ages 13–14 (7.4%, 7.1%, and 6.4%, respectively); in group II – at ages 12–13 (7.7%, 6.7%, and 5.2%); and in group III – at ages 10–11 and 14–15 (pause – 5%, expiration – 5%), while at full inspiration the greatest annual increase was at ages 7–8 (5.1%).

By comparing the indicators of all age and sex groups, it can be noted that the number of boys with average chest circumference (CC) indicators (Group II) at rest was 69.8%, during deep inhalation – 69.3%, and during exhalation – 71.4%; the number of girls was 70.2%, 69.3%, and 69.2%, respectively. The number of children in Groups I and III, i.e., with deviations in the development of the CC (at relative rest, maximum inspiration, and expiration) from normal values, both in the direction of decreased and increased values, generally ranged from 13.1 to 16.7%.

In the age period from 7 to 16 years, the increase in the anteroposterior diameter of the chest in boys was 6.1 cm (41.2%), in girls – 4.8 cm (35%), i.e., this indicator increased on average 1.4 times during the school years. The greatest increase was observed in boys aged 7–8 years (by 0.9 cm or 6.6%), 12–13 years (by 1.5 cm or 9.2%), and 15–16 years (by 1.1 cm or 3.2%), in girls – at 7–8 years (by 0.6 cm or 4.4%) and 12–13 years (by 1.2 cm or 7.5%). The average increase over the studied age period was 0.6 cm per year.

Analysis of the data showed that in all groups of the examined children there was a tendency toward an increase in the anteroposterior diameter of the chest with

age. In boys of Group I from 7 to 16 years, the indicators increased by 38.7%, in Group II – by 40.9%, and in Group III – by 34.9%; in girls – by 31.6%, 36.5%, and 35.3%, respectively. High annual rates of increase in the anteroposterior diameter of the chest in children of both sexes were noted at the ages of 7–8 and 12–13 years. The number of boys with average parameters of the anteroposterior chest diameter ranged from 63.7 to 76% (on average – 68.4%). Consequently, the average number of boys in Group I was 15.1% (from 10.9 to 19.8%), and in Group III – 16.3% (from 9 to 23.8%).

In girls, the range of fluctuations with average values and deviations from them practically did not differ from the indicators of male peers. Thus, the group of girls with normal anteroposterior chest diameter values included 71.4% (from 61.3 to 78.3%, depending on age). Consequently, the number of deviations from the norm toward reduced and low anteroposterior chest diameters was 13.6% (from 9 to 18.9%), and toward increased and high parameters – 15.1% (from 7.9 to 19.8%, depending on the age group).

During the studied age period, the transverse chest diameter in children of both sexes increased almost as much as the anteroposterior diameter (1.4 times). The increase of this indicator over 9 years amounted to 8.9 cm (47.1%) and 7.9 cm (42.2%) in boys and girls, respectively. The maximum increase was observed in boys aged 9–10 (1.3 cm or 6.4%), 12–13 (1.6 cm or 7%), 13–14 and 14–15 years (1.2 and 1.8 cm or 4.9 and 8.3%, respectively); in girls, the greatest annual increases were noted at 10–11, 11–12, 13–14, and 14–15 years of age (1.2; 1.6; 1.1; and 1.1 cm or 5.9; 7.4; 4.6; and 4.4%, respectively). From ages 7 to 16, the average increase in the transverse chest diameter among the examined schoolchildren was almost 1 cm per year.

A comparative analysis of the absolute and relative growth values showed that with age, the transverse chest diameter in school-aged children increases to a greater extent than the anteroposterior diameter (8.9 and 7.9 cm or 47.1 and 42.2% versus 6.1 and 4.8 cm or 41.2 and 35%, respectively, in boys and girls).

Conclusion. Thus, by studying the chest size in children, it was determined that the CC, both at rest and during deep inhalation and exhalation, increased in boys more than in girls during school years (on average, 39.7% versus 36.1%). The maximum increases in CC size (at rest, during inspiration, and expiration) in girls were observed one year later than in males, but only up to the age of 12. When dividing children into three groups according to the level of CC development, it was determined that from ages 6 to 17, an average of 70.5% of boys and 69.6% of girls had average CC values (Group II), 14% and 15.5% had below-average and low values (Group I), and 15.5% and 14.9% had above-average and high CC values; the

minimal relative increase in CC during school years was characteristic of children in Group I.

A comparative analysis of the growth of the chest diameters in children aged 7 to 16 years showed that boys were characterized by a greater increase in anteroposterior (1.2 times) and transverse (1.1 times) chest diameters than their female peers; in children of both sexes, the transverse chest diameter increased more than the anteroposterior one (47.1% versus 41.2% among boys and 42.2% versus 35% among girls). The distribution of children by groups depending on the level of development of the chest diameters showed that almost an equal number of boys (69%) and girls (69.8%) were included in Group II; the number of children in Group III was greater than in Group I (among boys by 1.2 times, i.e., 17.2% versus 13.8%; among girls – by 1.4 times, i.e., 17.6% versus 12.7%).

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