Assessing the Main Anthropometric Variable with Teenagers from Maramureş Country

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Abstract. The anthropometric measurements allow establishing the condition of growth and development of the organism. 180 subjects have been studied, aged between 13 – 14, grouped in three batches, two living in town and one in the countryside. The results lead to the following conclusions: all indicators studied increased in the age span 13 – 14; the somatic development was influenced by the subjects’ age, gender and domicile.

The total water and the muscle mass vary strongly connected with the height and weight growth. These indexes increase during puberty. The total water varies strictly connected with the muscle mass, and it depends on age, genre, physical activity and life environment.

Keywords: teenagers, stature, weight, total water, muscle mass

INTRODUCTION

Pre-puberty begins with both genders around the age of 10 – 11 and lasts, with girls, about 2 years, up to 12 – 13, and in case of boys it lasts four years, up to 14 – 15 years. When studying the growth and the development of the body, the research of the soma usually precedes the research of the organs, the exterior aspects are more accessible to direct information and objective determination, and the changes occurred in time can be more easily recorded, followed and compared with one another, than the internal ones.

In the puberty period, the somatic development is influenced by internal and external factors which bring about quantitative and qualitative changes. The great number of studies (Abbass, 1998; Pantsiotou, 2007; Simalcsik and Simalcsik, 2007) carried out so far in this domain has focused on these changes, supplying a large number of data referring to the morphological and functional modifications of the soma.

Studying the main anthropometric variables on an homogenous batch of teenagers allows the observation of the growth and the development of the organism as well as the appreciation concerning the nutrition condition of the teenager population studied.

MATERIALS AND METHODS

The study has been carried out on a batch of 180 teenagers, aged 13 – 14 divided into three batches having each 60 subjects. Two batches were made up of teenagers living in towns, the first batch in Baia Mare, the 2nd batch in Baia Sprie, and the third batch in the countryside Lâpuș zone. 90 male subjects and 90 female subjects have been studied.

The recommended procedures for the anthropometric measurements are the subjects in orthostatic posture wearing light clothes. The measurements have been carried out on healthy subjects. The variables studied were: height (Iv-sol) with the stadiometer and the weight, with
a calibrated balance. The data have been processed statistically with Student’s t test, the aberrant values have been eliminated according to Chavennet’s criterion (Snedecor and Cochram, 1978; Weber, 1980). The statistic interpretation has been carried out separately for the three batches, and according to genres. For each biometric index the average and the standard deviation have been calculated, the obtained values being analyzed comparatively.

The quantity of water is calculated according to gender, according to the following formulas:

Total water (male) = 0,184xG + 0,345xT-35,270

Total water (female) = 0,295xG + 0,195xT-14,013

where G = weight, T = the subject’s height (Niculescu et al., 2006).

The muscle mass is obtained by using the formula:
Muscle mass = (total water/73) x100.

The correlation was done with the Pearson correlation coefficient (Badea and Georgescu, 2003; Jaba and Grama, 2004).

RESULTS AND DISCUSSION

The somatic indexes (height and weight) increase at puberty (Heger et al., 2008). In the last decade one has noticed a phenomenon of acceleration of the specific growth of the young people, both in towns and in the countryside.

The average values and the standard deviations referring to the weight are included in Tab. 1. The height has been and is considered one of the main indexes of the somatic growth. The height is more influenced by heredity and less by environmental factors. That is why it represents a more stable index, which varies within narrower limits (it decreases only very rarely).

<table>
<thead>
<tr>
<th>Zone</th>
<th>Antropometric indicators</th>
<th>13 years</th>
<th>14 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X + Es</td>
<td>X + Es</td>
</tr>
<tr>
<td>Baia Mare</td>
<td>Weight (kg)</td>
<td>56.77 ± 1.51</td>
<td>48.55 ± 1.42</td>
</tr>
<tr>
<td></td>
<td>Height (cm)</td>
<td>165.22 ± 1.40</td>
<td>162.6 ± 1.48</td>
</tr>
<tr>
<td>Baia Sprie</td>
<td>Weight (kg)</td>
<td>54.80 ± 4.46</td>
<td>55.11 ± 2.84</td>
</tr>
<tr>
<td></td>
<td>Height (cm)</td>
<td>164.00 ± 1.53</td>
<td>153.77 ± 0.35</td>
</tr>
<tr>
<td>Lăpuș Zone</td>
<td>Weight (kg)</td>
<td>42.05 ± 1.82</td>
<td>43.58 ± 1.38</td>
</tr>
<tr>
<td></td>
<td>Height (cm)</td>
<td>157.15 ± 1.81</td>
<td>157.05 ± 1.35</td>
</tr>
</tbody>
</table>

The height in case of male subjects, aged 13, had average values between 165,22 ± 1,40 cm (Baia Mare), 164,00 ± 1,53 cm (Baia Sprie) and 157,15 ± 1,81 cm (Lăpuș zone), and the differences between average values were between 1,22 cm and 8,07 cm in favour of teenagers with the domicile in Baia Mare (Fig. 1). The influence of civilization and the hyperproteic nutrition has determined the increase of the average height of the children living in town, as compared with those living in the countryside.

Weight is a very labile index, which depends less on genetic factors and more on the influences of the external (nutrition) and internal (metabolism) environment. The average
value for the weight of the male subjects, aged 13, from Baia Mare, was of 56.77 ± 1.51 kg as compared to 54.80 ± 4.46 kg in case of those from Baia Sprie and of 42.05 ± 1.82 kg in case of teenagers from the countryside. The differences between the average weight of the teenagers from Baia Mare and Baia Sprie were of 1.98 kg, and between those from Baia Mare and the Lăpuș zone, of 14.72 kg (Fig. 2).

In case of both genders puberty is characterized by a rapid growth in height and by a low increase in weight. Generally, height characterizes rather well the individual’s development and is the value against which all the other anthropometric measurement can be related to/referred to. The Pearson correlation system was of -0.22, which shows a negative correlation between height and weight.

The average height of the female teenagers, aged 13, was 162.6 ± 1.48 cm in case of subjects from Baia Sprie and of 157.05 ± 1.35 cm in case of subjects from the Lăpuș zone (Fig. 1). The weight of the female teenagers aged 13 had average values between n. 55.11 ± 2.84 kg in Baia Sprie, 48.55 ± 1.42 kg in Baia Mare and 43.58 ± 1.38 kg in the countryside (Fig. 2). The differences referring to weight between the female teenagers from Baia Mare and those from Baia Sprie were of 6.56 kg and of 11.53 kg as compared to those from the countryside.

The Pearson correlation coefficient between the weight and height is of 0.76, which demonstrates a strong connection between the two parameters.
At the age of 14 the male subjects had big values for weight, the growth being of 4.13 kg for those from Baia Mare, of 6.70 kg for those from Baia Sprie and of 14.97 kg in case of those from the countryside. As far as height is concerned, it has increased with 0.6 cm for the first batch, 7.2 cm for the second batch and 6.23 for the batch from the countryside. It is well known that the town population has bigger sizes than that from the countryside. This is due to the intervention of a great number of factors of the urban environment which stimulate growth (Ruder, 1978).

The Pearson correlation coefficient between the height and weight is of 0.81, which demonstrates a strong connection between the two parameters.

The weight and the height of the female subjects aged 14 show increases as compared with the pubertal stage. These increases were of 8.85 kg in Baia Mare and of 10.4 kg in town. As far as height is concerned, it has increased in all cases, the increase being of 3.2 cm (Baia Mare), 7.23 cm (Baia Sprie) and of 6.33 cm (countryside). In the post-pubertal stage, all the investigated somatic indexes have increased (Heger et al., 2008; Vasilov et al., 2001).

The correlation coefficient between height and weight is of 0.24.

The female investigated teenagers from Baia Mare and Baia Sprie showed increased values of the weight and height in the pubertal stage, unlike those from the countryside, in whose case the weight and the height have increased during the post-pubertal stage.

In case of the male subjects the height and the weight begin to increase in the pre-pubertal period, an increase which increases more in the pubertal stage.

As far as height and weight are concerned, one can notice an upward evolution of the studied batches. In the last decade on can notice a phenomenon of acceleration of the specific increase of all teenagers, both from the countryside and from towns (Abbass, 1998).

In Tab. 2 are presented the average values of the total water and the average values referring to the muscle mass. In the period 10 – 16 years water is accumulated in the body in different quantities, according to the gender.

The average values of the total water and of the muscle water with the investigated subjects

<table>
<thead>
<tr>
<th>Zone</th>
<th>Indexes</th>
<th>13 years</th>
<th></th>
<th>14 years</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Baia Mare</td>
<td>Total water (l)</td>
<td>32.17</td>
<td>25.05</td>
<td>33.13</td>
<td>35.24</td>
</tr>
<tr>
<td></td>
<td>Muscle mass (kg)</td>
<td>44.06</td>
<td>34.34</td>
<td>45.38</td>
<td>48.28</td>
</tr>
<tr>
<td>Baia Sprie</td>
<td>Total water (l)</td>
<td>31.39</td>
<td>32.20</td>
<td>35.10</td>
<td>33.36</td>
</tr>
<tr>
<td></td>
<td>Muscle mass (kg)</td>
<td>43.00</td>
<td>44.10</td>
<td>48.08</td>
<td>45.70</td>
</tr>
<tr>
<td>Lăpus zone</td>
<td>Total water (l)</td>
<td>26.27</td>
<td>29.45</td>
<td>33.26</td>
<td>33.67</td>
</tr>
<tr>
<td></td>
<td>Muscle mass (kg)</td>
<td>36.53</td>
<td>40.35</td>
<td>45.56</td>
<td>46.13</td>
</tr>
</tbody>
</table>

In case of female teenagers, about 12 l are accumulated, and in case of male teenagers, 16 l (Nicolescu et al., 2006). The data presented in Tab. 2 show the increase of the quantity of total water for the studied batches.

In case of male teenagers, aged 14, the total water content increased with 0.96 l (1st batch), 3.7 l (second batch), 6.99 l (3rd batch) as compared with teenagers aged 13. In case of female teenagers, aged 14, the total water from the organism increased with 10.19 l (1st batch), 1.97 l (2nd batch) and 4.22 (3rd batch) as compared with teenagers aged 13.

The evolution of the muscle mass is extremely dynamic. During adolescence an active increase of the muscle mass takes place, which is related to the processes of growth and development of the organism.
In case of male teenagers, aged 14, the growths were of 9.03 kg in the countryside, 5.08 kg in case of teenagers from Baia Sprie and of 1.32 in case of teenagers from Baia Mare. The muscle mass increased in case of female teenagers, the increase was between 1.6 kg (second batch), 5.78 (3rd batch) and 13.94 kg (1st batch).

In the period 13 – 14 years takes place the increase of the muscle mass because the biological development involves the growth of the muscle mass (Pietrobelli et al., 1998; Prejbeanu et al., 2008).

CONCLUSIONS

The study allowed us to draw the following conclusions: during the puberty period one notices the growth in weight and height, the somatic development being influenced by age, genre and environment. All somatic indexes increase with subjects aged 14, the leap concerning height being around this age, and the increase in weight is observed at the age of 13 -14.

The total water and the muscle mass vary strongly connected with the height and weight growth. These indexes increase during puberty. The total water varies strictly connected with the muscle mass, and it depends on age, genre, physical activity and life environment.

The big increase of the total water and of the muscle mass is observed with the teenagers from the countryside, because the growth and development leap in case of these subjects is big at the age of 14.

REFERENCES