Considerations on an algorithm for evaluation of somatic phenotype transformations determined by the nutritional status of vulnerable populations

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Abstract: The evaluation of the somatic phenotype physical development in vulnerable populations is imposed by the World Health Organization. Based on our experience, we elaborated a study algorithm that can be used when elaborating public health strategies.

Key Words: anthropometry, evaluation algorithm, somatic and phenotype transformation

Growth in height and weight is an indicator for nutrition status. It is determined by a variety of genetic and environmental factors (alimentation, social, cultural, emotional factors).

In 1993 the WHO experts expressed the necessity for the elaboration of a new international reference for children physical development. The prevalence of obesity, particularly infantile obesity, increased rapidly during the last 2 decades both in industrialized and under development countries. This phenomenon determined WHO to consider starting from 1998, that obesity is a major world public health problem.

To this aspect WHO recommends for the evaluation of the somatic and phenotype changes the use of anthropometric data. It is considered that antropometry is a universally valid technique that allows for the evaluation of physical development, nutrition status and health status. The matter raised great interest for stating the public health strategies and influencing medical practitioners’ decisions.

Aim and objectives of the study

Relatively high frequency in the number of segments of vulnerable populations requires the knowledge of an algorithm for the assessment of the phenotype transformations determined by the nutritional status in terms of contemporary socio-economic stress. Few nominations of the vulnerable segments of the populations are enough to understand the attention they should be given: children, seniors, immigrant communities, homeless and shelter dependent, undocumented persons. Everybody is concerned for the maintenance of the body weight status within the ideal, normal limits. In the history of knowledge there were concerns for their evaluation.

Broca (1871) made the first correlation between height and weight. He quickly established a formula to determine the ‘weight’ of an adult, knowing the height of the subject. This correlation has entered into the current use as the ”Broca index”: \[ W = H - 100 \] where \( W \) = body mass, \( H \) = size.

Quetelet (1830; 1850) has developed a statistical indicator of the weight relative to height, named ‘Body Mass Index’(BMI). Periodic evaluation of this index brings information for checking the health status of a studied group and should not be used to make the diagnosis on a single person.

\[ \text{BMI} = \frac{W}{H^2} \]

where: \( W \) = body mass, \( H \) = Height

Ideal weight is often calculated by chemical studies, “Lorentz’s formula”

\[ W = \frac{(H-100) - (H-150)}{2} \]

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Body mass index is applicable to subjects aged between 18 and 65, but is not suitable for children, pregnant women, athletes with high muscle mass and elderly people. Quetelet index is used by U.S. insurance companies for determining the risk of cardiovascular diseases in patients over 65 years old. Body Mass Index value increases with an increased risk of cardiovascular diseases: heart failure, hypertension, myocardial infarction and pulmonary diseases (sleep apnea syndrome). For routine evaluation of somatic phenotypic transformation we propose the following algorithm used in anatomic and clinical research.

**Algorithm for somatic and phenotype evaluation**

The experience of our research crew allowed us to elaborate an algorithm for the somatic and phenotype evaluation of different populations in two stages. During the first stage, we achieve: the lots’ organization, statement of the evaluation parameters (age, weight, and height), indicators selection (weight/age, height/age, BMI/height) and the elaboration of the tables containing the primary registered data. During the second stage we processed the evaluation data: statistic processing: media, amplitude, standard deviation, sigma classes BMI calculation. Finally, we represented graphically the observed phenomena.

**A. ORDER OF DETERMINATIONS**

1. Setting the groups and the frequency of the determinations
2. Setting the parameters used in evaluation:
   - Age
   - Body Weight
   - Stature (height)
3. Selection of the indicators:
   - Body Weight / age
   - Height / age
   - Body mass / height = BMI
4. Performing and recording in tables the determinations:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Subject identity</th>
<th>Somatometrics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name and Surname</td>
<td>Birth date</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Group</td>
<td>No. of cases</td>
<td>Mean (x)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Group</td>
<td>No. of cases</td>
<td>Sigmatic class</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>x-3σ</td>
</tr>
<tr>
<td>Years</td>
<td>Sex</td>
<td>Classes standardized BMI values</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>15.50-17.99</td>
</tr>
</tbody>
</table>

**B. OBSERVATION DATA PROCESSING**

1. Primary data processing
   a. Calculation - mean values recorded on groups and - mean standard-deviation
   b. Establishing the sigmatic classes
2. Body Mass Index (BMI) calculation and distribution of cases by BMI class values
3. Graphical representation of:
   a. Distribution by number of cases
   b. Values distribution by sigmatic classes
   c. Time related distribution of the variables
   d. Graphical representation

**References**