Development during Infancy in Relation with Nourishment in Children from a Romanian Nursery

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Abstract: - In the present study we have investigated the anthropometrical indices (weight, height, thorax perimeter, cranial perimeter, body mass index) during infancy and their relation to nourishment (food intake, nutritive value of food). The study was performed on a group of 54 children (27 girls and 27 boys), aged between 1.5-3 years, in a children nursery in Tîrgoviște, Romania. The methods consisted of a nourishment inquiry, using the list of foods released from storehouse over 10 days, twice (in October 2008 and February 2009) and a transverse epidemiological inquiry using the anthropometrical indices of infant children. Nourishment of children is deficient in milk, eggs, animal fats, vegetables, and excessive for meat, potatoes, fruits and sugar, with normal intake of protein, deficient of carbohydrates and excessive of fats. The anthropometrical indices indicate a decrease to below the minimal values for thorax perimeter and body mass index (BMI) in the age group of 2.5-3 years. There is inverse relation milk, fruits–BMI, and a direct relation potatoes–weight, BMI. Obtained results show an inconsistent association between nutrients and child anthropometrical indices, depending on the nutrient type and child age.

Key-Words: children, 1-3 years of age, anthropometrical indices, nourishment inquiry, relation development – nourishment, Central Eastern European region

1 Introduction

Central Eastern Europe is an area with many changes performed lately and with numerous health aspects, poorly investigated. Many children younger than 3 years are exposed in this region, like in other study areas, to multiple risks, including poverty, malnutrition and poor health [1]. A misbalanced nourishment of children causes changes in metabolism, development and health. Development per se does not ensure a better health [2]. For all that child growth and development is considered a health indicator. Stature by weight (BMI–Body Mass Index) changes with varying economic conditions during early childhood [3]. Overweight and poor diets are becoming a greater burden for the poor than for the rich [4]. Adult height is determined by genetic potential and by net nutrition, the balance between food intake and the demands on it, including the demands of the disease, most importantly during early childhood [5]. The aim of the present study is to investigate anthropometrical indices and children nourishment (food intake and nutritive value of food) during infancy and the relation between them, in a children’s nursery in Tîrgoviște, Romania, an area of Central Eastern Europe.

2 Material and methods

The study was conducted in a group of 54 children (27 girls and 27 boys), aged between 1.5-3 years, in a children’s nursery in Tîrgoviște, Romania. The methods consisted of a nourishment inquiry using the list of foods released from the storehouse over 10 days, two times, in two different months (in October-2008 and February-2009) and a transverse epidemiological inquiry using the anthropometrical indices of infant children measured in March, 2009. The nourishment inquiry considered the quantities of food released from the storehouse over 10 days in October 2008 and 10 days in February 2009, and the number of consumers (children aged between 1.5-3 years). The quantity of each group of food in the 16 groups was counted per consumer and day. The energetic value and nutritive value (protein, carbohydrates and fats) of the foods received by children were counted considering the quantity of food per consumer and day.

\[ \text{Calories} = \text{calories} \% \times \text{consumable product (g)/100} \] (1)

The quantities of food lost during processing were considered.

\[ \text{Consumable product} = \text{commercial products (100 – p)/100} \] (2)
The values found were compared to needs (in tables) for this age group.

The transverse inquiry consisted in the measurement of anthropometrical indices (weight – weighing machine, height - anthrop meter, thorax and cranial perimeter – metric ribbon) of the investigated children. The Body Mass Index (Quetelet Index) was counted by the formula:

\[ BMI = \frac{G}{H^2} \]  

\( BMI \) – Body Mass Index; \( G \) – weight; \( H \) – height

The relation anthropometrical indices – nourishment was investigated through linear regression (models that depend linearly on their unknown parameters) using the statistical program SPSS 13.

3 Results

3.1 Sample structure

The sample structure consisted of 50% boys and 50% girls. The most frequent were the children aged between 25-30 months (23% girls and 31% boys) (Fig.1).

3.2 Nourishment inquiry

3.2.1 Food intake

Food intake (mean per consumer and day) by groups of food was investigated over 10 days, two times in two different months (October 2008 and February 2009) (Fig.2).

Following each group of food, the children’s nourishment was deficient during both periods of the nourishment inquiry for milk (Fig.3), eggs (Fig.4), animal fats (Fig.5), vegetables-starchy roots (Fig.6) and vegetables-leaves, fruits (Fig.7).
In the second period of the nourishment inquiry an excessive intake was observed for potatoes (Fig. 11), fruits (Fig. 12) and sugar (Fig. 13).
3.2.2 Nutritive value

Daily means of energy intake (calories) were higher than children’s needs for the age 1-3 years (Fig. 14).

![Daily means of energy intake (calories) during the both periods of alimentary inquiry](image)

Fig. 14. Daily means of energy intake (calories) during the both periods of alimentary inquiry

The means of daily nutritive factors (proteins, carbohydrates and fats) compared with needs during the both periods of the nourishment inquiry can be seen in Fig. 15. The nutritive factors intake was normal-excessive for proteins, deficient for carbohydrates and excessive for fats.

![Daily means of proteins, carbohydrates and fats (g) during both periods of inquiry](image)

Fig. 15. Daily means of proteins, carbohydrates and fats (g) during both periods of inquiry

The protein intake was ensured, especially by meat, cheese, bread, cereals and potatoes, in both periods of the nourishment inquiry (Fig. 16).

![Daily intake of proteins (g) by groups of food during both periods of alimentary inquiry](image)

Fig. 16. Daily intake of proteins (g) by groups of food during both periods of alimentary inquiry

The carbohydrates intake was ensured by bread, cereals, potatoes, fruits and sugar products (Fig. 17). A decreased intake of bread during the second period of alimentary inquiry can be a cause of the decreased level of carbohydrates registered in February. This deficient intake of bread was not compensated by the high intake of potatoes, fruits and sugar products observed during the same month. Therefore, bread can be considered a major source of carbohydrates for the children investigated.

![Daily intake of carbohydrates (g) by groups of food during both periods of inquiry](image)

Fig. 17. Daily intake of carbohydrates (g) by groups of food during both periods of inquiry

Fats intake was ensured by meat, milk, cheese, animal and vegetal fats (very excessive in October), potatoes and sugar products (especially sweets with high concentration of fats – chocolate) (Fig. 18).

![Daily intake of fats (g) by groups of food during both periods of alimentary inquiry](image)

Fig. 18. Daily intake of fats (g) by groups of food during both periods of alimentary inquiry

The excessive energy intake can be explained by this excessive intake of fats in both periods of the nourishment inquiry. Vegetal (vegetable oil) and animal fats (meat, cheese and animal fats) seem to be the main source of excessive energy intake.

3.3 Physical development

Means of anthropometrical indices followed by 3 age groups (18-24 months, 25-30 months and 31-36 months) interval of normal values (maximal and minimal values) can be seen in Fig. 19 (weight), Fig. 20 (height), Fig. 21 (thorax perimeter), Fig. 22...
(cranial perimeter) and Fig. 23 (Body Mass Index – BMI). Weight increases with age, but with a decrease of the growing rhythm. If in the lowest age group the mean exceeds the maximal limit of the normal values interval, in the highest age group it is equal to this limit (Fig. 19).

Height increases with age and it is situated in the normal interval of values for all age groups (Fig. 20). The growing rhythm also decreases.

Thorax perimeter is over (first age group), in (second age group), under the interval of normal values (third age group) and decreases between second and third age groups (Fig. 21).

Cranial perimeter is excessively increased in the first and second age group and it is in the interval of normal values in the third age groups (Fig. 22).

BMI is excessive, in normal interval and deficient in the first, second and third age group, respectively (Fig. 23).

3.4 Relation development - nourishment

For the majority of anthropometrical indices we did not find a relation with investigated groups of food. There is a statistical significant relation between milk, fruits and potatoes with BMI (Table 1). Potatoes related powerful with weight also (B=0.002, Std. Error=0.003, t=2.522 and P=0.021).

<table>
<thead>
<tr>
<th>Model 1</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>18.203</td>
<td>1.034</td>
<td>17.609</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fruits</td>
<td>-0.01</td>
<td>0.002</td>
<td>-4.809</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Milk</td>
<td>-0.018</td>
<td>0.005</td>
<td>-3.533</td>
<td>0.003</td>
</tr>
<tr>
<td>Potatoes</td>
<td>0.007</td>
<td>0.003</td>
<td>2.178</td>
<td>0.046</td>
</tr>
</tbody>
</table>

These results indicate relation anthropometrical indices – nourishment depending on group of food.
4 Discussion and limitations
In some studies there are differences between genders referring to anthropometric indices (boys were found to be taller than girls in all ages and heavier only for the age period from 1 to 3 years) and nourishment needs (boys older than 2 years of age were found to have a higher energy intake, proteins, fats, carbohydrates compared to girls) [5]. Due to the small number of investigated children, a separate analysis on gender would not be reliable for our study. An interesting result of the present study is the peculiar evolution of means of thorax perimeter and BMI which decrease below normal interval of values in the age group 2.5-3 years, unlike in the other study realized in the same area where these indices increase [6]. Nourishment inquiry indicates a misbalanced diet deficient in basal food such as of: milk, eggs, animal fats and vegetables. Milk is very necessary for children until 2 years of age [7]. Excessive intake of meat, cheese, vegetable fats determined an energetic excessive diet, at the risk of overweight observed in other studies [8]. Excessive intake of fruit and potatoes during the second periods of nourishment inquiry seems to have a relation with children’s development and the existing relations: inverse relation fruits-BMI and direct relation potatoes-BMI and weight confirm this assumption. Nutritive factors intake present a peculiar aspect: high intake of protein and fats (especially polyunsaturated) and decreased carbohydrate intake. There are many studies which indicate this combination of nutritive factors with therapeutic purpose in adults: weight loss [9, 10], reduced cardiovascular risk [11] and decreased glycemic level in diabetes [12]. This perspective offered by literature sustains a possible preventive effect of low carbohydrates found in the infants’ diet. The decreased BMI, related with fruits and potatoes, found in our study is an effect of the misbalanced diet, and covering a food deficiency with other food excess is not effective.

5 Conclusions
There is good development of children with a good evolution of anthropometrical indices (weight, height, cranial perimeter) except thorax perimeter and BMI, despite the misbalanced diet (reach in energy, protein and fats and poor in carbohydrates). There is an inverse relation milk, fruits–BMI and direct relation potatoes–BMI, weight. Obtained results show an inconsistent association between nutrients and child anthropometrical indices, depending on nutrients and child age.

References: