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Azemi, Diellëza; Koraqi, Hyrie; Selimi, Sara; Durmishi, Namik; and Lajqi, Violeta, "Nutritional quality of commercial baby food based on cereals" (2019). *UBT International Conference*. 429.  
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Nutritional quality of commercial baby food based on cereals

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Abstract. Commercial baby food based on cereals are the products usually made with cereals, sugar and variable additives. As the foodstuffs intended for particular nutritional uses, baby foods for infants and young children conforms to a set of strict guidelines e.g. nutritional quality, addition of additives, labelling. However, being an important supplement to children diet and for their progressive adaptation to ordinary food, the nutritional quality of commercial baby food based on cereals in very important. Samples of commercial baby food from the market and pharmacies were analyzed by parameters: pH, total soluble solids, moisture, total acidity, vitamin C, proteins, sugars and lipids. All samples of baby food are produced by foreign companies since currently there are no Kosovo manufacturers producing this range of products. The nutritional quality parameters are important to assess the quality of the product and how it can be safely stored. The analyzed parameters were all within the allowed limits. However, as a precaution, storage remarks in the product labels should always be followed.

Keywords: Baby food, nutritional quality, cereals.

Introduction

Commercial baby food based on cereals are the products usually made with cereals, sugar and variable additives. As the foodstuffs intended for particular nutritional uses, baby foods for infants and young children conforms to a set of strict guidelines e.g. nutritional quality, addition of additives, labelling. However, being an important supplement to children diet and for their progressive adaptation to ordinary food, the nutritional quality of commercial baby food based on cereals in very important. There is much evidence that the quality and composition of commercial baby food may contribute to present and future health benefits of young children. Since infants between 6 month and 3 years of age are rather limited in their food choices, the commercial baby foods serve as the important source of energy, basic nutrients, fiber, vitamins and minerals and establish their taste and eating patterns [1]. Infant cereals play an important role in the complementary feeding period. They include maize, rye, sorghum, millets, wheat, rice, barley and oats. Infant cereals are defined as “processed cereal-based foods” that are divided into “simple cereals which are or have to be reconstituted with milk or other appropriate nutritious liquids”; In many countries, infant cereals are among the first foods that are introduced at the beginning of the complementary feeding period. Cereals are an excellent source of energy, which is very important at the age of six months when exclusively breastfeeding is no longer sufficient to cover the nutritional requirements of the infant. Moreover, cereals
provide a substantial amount of carbohydrates (starch and fiber) and proteins, but are also a source of vitamins, minerals, and bioactive compounds [2].

In the recent decades, the reduction of time to be dedicated to the preparation of home meals has already led to the appearance of ready-to-eat food products on the market. The foods specifically manufactured for infants and young children have had an evolution. Prepared baby foods and formulas, intended for use of children aged between 4 months and 3 years, provide an appealing alternative for working mothers. They are also designed to meet the nutritional needs of children: high energy input, high protein and essential amino acid requirements, specific requirements for vitamins, minerals, macro and micronutrients, appropriate lipid content and little salt [3].

The aim of this work was to compare declared and real (measured) values of selected nutritive parameters to assess potential adulteration. The imbalance of calories and nutrients in some of the baby foods necessitates to encourage breast feeding at least during the first 6 months. The high protein contents may damage the kidney and the quantity and quality of protein in baby foods should be adjusted to simulate human milk. The protein quality may be improved by improving the processing and storage conditions. In order to reduce the risk of dental caries, baby foods in which sucrose should replace by glucose or lactose may be selected.

Nutrition education of mothers and health workers in kindergarten on the selection and preparation of right type of baby foods and weaning practices will go a long way in improving the nutritional status of infants and children in the country.

Samples of commercial baby food from the market and pharmacies were analyzed by parameters: pH, total soluble solids, dry matter, total acidity, vitamin C, sugars (total sugars, reducing sugars, sucrose), proteins and lipids. All samples of baby food are produced by foreign companies since currently there are no Kosovo manufacturers producing this range of products. This is the first research of this type in Kosovo and it should give us a novel result. The nutritional quality parameters are important to assess the quality of the product and how it can be safely stored. The analyzed parameters were all within the allowed limits. However, as a precaution, storage remarks in the product labels should always be followed.

**Materials and methods**

**Sampling Preparation**

Samples of commercial baby food based on cereals with trade name HUMANA (corn-based product) and HiPP (rice-based product) were purchased from the market and pharmacies in Kosovo during the period June 2019. 0.5 g of the product was diluted in 10 mL of acidified distilled water (1%) and extracted for 10 minutes. The solution was centrifuged at 3000 rpm for 10 minutes. The solid fraction, separated from the supernatant, was then subjected to a new extraction step. The liquid phases were collected and brought to a final volume of 10 mL. All analysis was performed in triplicate.
Nutritional analysis

Nutrient analysis was done for all collected samples. Determination of nutritional properties of baby food based on cereals with trade name HUMANA (corn-based product) and HiPP (rice-based product) were performed according the standard methods of the AOAC.2016 [5]. Total soluble solids content (TSS) measured using Abbe refractometer calibrate against sucrose and expressed in °Brix. Titratable acidity (TA) was measured according to AOAC Method and expressed as milligrams of citric acid. pH was measured using pH/mv meter, and dry matter (DM) was measured in triplicate by drying 5 g of the fresh fruits at 105°C until constant weight (4-6 hours). Determination of lipids was done by Soxhlet extraction after digestion of the samples by hydrochloric acid hydrolysis, followed by extraction of the fats with petroleum ether. After the extraction, lipid content was determined by weighing. Protein was determined by the Bradford method with some modifications. Gelatin is commonly used to create the standard curve, and the absorption is measured at 545 nm in a spectrophotometer. Reducing sugar was determined using the method of Lane and Eynon and Fehling’s solution as described by AOAC [5]. Total sugars were determined by the phenol-sulfuric acid method by Nielsen [6]. Glucose is commonly used to create the standard curve, and the absorption is measured at 490 nm. The sucrose mass fraction was determined by calculation from the difference between total and reduced sugars. Vitamin C content was estimated using spectrophotometric method with 2,4-dinotrophenyhydrazine as an indicator [5]. Samples was homogenized with metaphosphoric acid (5% metaphosphoric acid in 10% acetic acid solution in water), filtered and treated with 85% sulphuric acid solution and 2,4-dinotrophenyhydrazine, and then incubated at 60 °C for 60 min in a water bath. Absorbance was measured at 520 nm in a spectrophotometer (Genesys 10S UV-Visible,) for estimation of vitamin C in the fruits.
The energy content of the baby food samples was determined by calculating the amount of protein, fat and carbohydrate of respective food items and by using the following equation:

\[
Energy = (Protein \times 4.1) + (Fat \times 9.3) + (Carbohydrate \times 4.1)
\]

Statistical analysis

All data were expressed as the mean ± standard deviation of triplicate experiments. All statistical analysis performed using the MS Excel program and SPSS 22.0 statistics software. Differences were tested for significance using the ANOVA procedure, with a significance level of \( p < 0.05 \).
Results and Discussion

Samples of commercial baby food based on cereals with trade name HUMANA (corn-based product) and HiPP (rice-based product) were purchased from the market and pharmacies in Kosovo during the period June 2019 are given in Tables 1-2 and figure 1.

Table 1. The chemical composition of the baby food

<table>
<thead>
<tr>
<th>Sample</th>
<th>pH</th>
<th>W(DM)/%</th>
<th>TSS-/Brix</th>
<th>TA/ %</th>
<th>Vitamin C mg/100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 HUMANA</td>
<td>6.78±0.1</td>
<td>9.0±0.1</td>
<td>5.1±0.1</td>
<td>0.30±0.1</td>
<td>40±0.2</td>
</tr>
<tr>
<td>(corn-based product)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2 HiPP</td>
<td>6.95±0.1</td>
<td>2.0±0.1</td>
<td>11.1±0.1</td>
<td>0.51±0.1</td>
<td>0.2±0.1</td>
</tr>
<tr>
<td>(rice-based product)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as average value ± standard deviation of three replicates

Table 2. The nutritional composition of the baby food

<table>
<thead>
<tr>
<th>Sample</th>
<th>Total sugars g/100g</th>
<th>Reducing sugars g/100g</th>
<th>Sucrose g/100g</th>
<th>Lipids g/100g</th>
<th>Proteins g/100g</th>
<th>Energy kcal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 HUMANA</td>
<td>68.0±0.1</td>
<td>28.0±0.2</td>
<td>30.0±0.2</td>
<td>8.9±0.1</td>
<td>13.6±0.1</td>
<td>412</td>
</tr>
<tr>
<td>(corn-based product)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2 HiPP</td>
<td>85.0±0.3</td>
<td>3.22±0.1</td>
<td>81.78±0.3</td>
<td>0.7±0.2</td>
<td>7.2±0.1</td>
<td>379</td>
</tr>
<tr>
<td>(rice-based product)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as average value ± standard deviation of three replicates
The pH values tend to be higher, ranging from 6.78 ± 0.1 to sample $A_1$ (HUMANA) and 6.95 ± 0.1 to sample $A_2$ (HiPP). The values for baby food based on cereals of the total dry matter ranged from 9.0 ± 0.1% to sample $A_1$ (HUMANA) and to be lower to sample $A_2$ (HiPP) 2.0 ± 0.1%.

Soluble solids TSS/Brix content in samples baby food based on cereals ranged from 5.1 ± 0.1°Brix to sample $A_1$ (HUMANA) and to be higher to sample $A_2$ (HiPP) 11.1 ± 0.1°Brix. Total acidity in samples baby food based on cereals are lower ranged from 0.30 ± 0.1% to sample $A_1$ (HUMANA) and 0.22 ± 0.1% to sample $A_2$ (HiPP) of citric acid. The sample $A_1$ (HUMANA) is a good source of vitamin C. Content of vitamin C is 40 ± 0.2 mg/100g and lower value to sample $A_2$ (HiPP) only 0.2 ± 0.1 mg/100g of vitamin C. Baby food based on cereals as a good source of sugars. The total number of sugars present in these samples varied from 68.0 ± 0.1g/100g to sample $A_1$ (HUMANA) and 85.0 ± 0.1g/100g to sample $A_2$ (HiPP). From these value total sugars, reducing sugars varied from 28.0 ± 0.1g/100g to sample $A_1$ (HUMANA) and lower value to sample $A_2$ (HiPP) 3.22 ± 0.1g/100g. Protein values were estimated between 13.6 ± 0.1g/100g to sample $A_1$ (HUMANA) to 7.2 ± 0.2g/100g to sample $A_2$ (HiPP). Lipid contents is 8.9 ± 0.1g/100 to sample $A_1$ (HUMANA) and lower to sample $A_2$ (HiPP) 0.70 ± 0.2g/100g. The obtained results can be useful in clarifying the quality of baby food on base cereals. Samples of commercial baby food based on cereals with trade name HUMANA (corn-based product) and HiPP (rice-based product) were purchased from the market and pharmacies in Kosovo during the period June 2019 were all within the allowed limits. However, as a precaution, storage remarks in the product labels should always be followed.
Conclusion

Samples of commercial baby food based on cereals with trade name HUMANA (corn-based product) and HiPP (rice-based product) were purchased from the market and pharmacies in Kosovo during the period June 2019 were all within the allowed limits. However, as a precaution, storage remarks in the product labels should always be followed. All samples of baby food are produced by foreign companies since currently there are no Kosovo manufacturers producing this range of products. This is the first research of this type in Kosovo and it should give us a novel result. Nutrition education of mothers and health workers in kindergarten on the selection and preparation of right type of baby foods and weaning practices will go a long way in improving the nutritional status of infants and children in the country.

References