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COMPREHENSIVE ASSESSMENT OF THE QUALITY OF THE «PANCAKES», CONSIDERING ON THE NORMS OF THE PHYSIOLOGICAL NEEDS OF THE AVERAGE PERSON

Introduction. The assessment of the quality of dishes used by a person is in demand and involves a set of operations, which includes the choice of nomenclature of quality indicators of the product, the definition of the values of these indicators and their comparison with the basic. The aim of the work is to evaluate the quality of a new pancake dish for Ukraine, from the point of view of the norm of physiological needs of a human.

Materials and methods. Methods of research: qualimetric – complex quantitative assessment of the quality of pancakes, taking into account the norms of physiological needs of the average person.

Results and discussions. Taking into account the norms of the physiological needs of the average person, a comprehensive assessment of the quality of the «pancakes» dish is calculated. To combine the quality indicators into a generalized (complex) indicator, an additive mathematical model is used as the most common in qualimetry.

Conclusions. The method of estimating the quality of the «pancakes» dish is considered, taking into account the norms of the physiological needs of the average person. The structure of the quality indicators and the results of experimental studies of the complex-quantitative assessment of the quality of the «pancakes» dish are presented. Taking into account the norms of the physiological needs of the average person, a comprehensive assessment of quality is calculated. For a given dish, complex quality indicators for a group of energy substances, minerals and vitamins are defined.

Healthy eating has many benefits and is very important for everyone [1-3]. The formation of useful habits in the early years in many respects influences our future [4]. This helps to reduce the risk of subsequent diseases such as obesity, cardiovascular disease, diabetes and even cancer.

Efficient nutrition defines the physiological needs for the use of a particular product, because if everyone will be careful about planning their daily diet, we can refer to age-related diseases (cardiovascular, oncological, diabetes, obesity, osteoporosis) [5].

The Order of the Ministry of Health № 1073 «On Approval of the Norms for the Physiological Needs of the Population of Ukraine in the Basic Nutrients and Energy» takes into account the recommendations and standards of the World Health Organization (WHO) and the European Food Safety Agency, in particular, regarding the reduction of the caloric value for children of all ages. The problem of overweight and obesity in children and teenagers is becoming increasingly widespread in the European region.

Childhood obesity is considered one of the most serious challenges for public health in the 21st century. According to WHO, every third teenager in Europe has overweight or obesity. Particular concern is caused by the fact that the epidemic is increasing in Eastern European countries, where indicators have traditionally been lower.

The problem is also relevant for Ukraine. According to the Center of Medical Statistics of the Ministry of Healthcare of Ukraine, each year 15.5 thousand new cases of obesity in children are recorded. In total,

such children in Ukraine are about 70 thousand (according to 2016). Therefore, the updated of the Ministry of Healthcare of Ukraine rules reduce the energy requirement for children of different age groups by reducing the need for non-animal proteins and carbohydrates. At the same time, the requirement for the most balanced animal protein is increased. At the same time, reduced need for fats for preschool children and increased similar need for fats for school children.

Revised Mineral and Vitamin Needs for Children and Adults. Based on research results, recommendations of reputable Ukrainian and world health organizations, reduced vitamin A requirements, increased vitamin D, folic acid.

In 2017, the Law «On the Norms of Physiological Needs of the Population of Ukraine in Essential Nutrients and Energy» [6] was approved, which separately identified the daily needs of children and adults in the main macro- and micronutrients (vitamins, minerals, minerals and biologically active substances). Daily energy expenditure is determined for people depending on body weight, age, sex with the main metabolism and certain physical activity, which is divided into 5 groups.

Taking into account the above mentioned calculation will be conducted for women aged 18-29 with a physical activity rate of 1.6.

To calculate we have used the complex method of assessing the quality of products. This method consists in the expression of the level estimation by a single number resulting from the combination of the selected individual indicators into one complex index [7-8].

The most common method of assessing the quality of products is the most common. However, a comprehensive food assessment does not exclude a differential assessment, since in some cases the high value of a complex quality index may disguise the low level of product quality by some unit values.

Each quality index, being a quantitative characteristic (measure) of one of the properties of the model of the quality of the object (phenomenon), must reflect (to a greater or lesser extent) the ability (property) of this object (phenomenon) to satisfy the public needs (interests, values) in specific conditions. Thus, when forming (introducing) any quality indicator, the following components of quality must be taken into account: public needs; specific conditions; object and measure of satisfaction (gradation) needs. Quality Score should answer the question: to what extent this object (phenomenon) has the property (ability) to meet public demand (interest, value).

Method of determination of the complex assessment of the quality of the «pancakes» dish [9-13]:

1) The values of the indicators for given diets are determined by the formula:

$$P_{ij} = \frac{M_{ij}}{\sum M_{ij}}, \tag{2.8}$$

where M_{ij} – the contents i nutrients in the j group of substances with the diet.

2) In the same way, the basic values are determined according to the recommended norms:

$$P_{ij}^{basic} = \frac{M_{ij}^{basic}}{\sum M_{ij}^{basic}}, \tag{2.9}$$

where M_{ij}^{basic} – the value i nutrients in j the group of substances according to the norms of physiological needs.

3) Estimation of individual parameters of proteins, fats and carbohydrates is calculated by the formula:

$$K_{ij} = \left(\frac{P_{ij}}{P_{ij}^{basic}}\right)^{z}, \tag{2.10}$$

where P_{ij} – index of nutrient content in the daily ration (food intake);

P_{ij}^{basic} – basic (balanced) value of index of a nutrient material in daily ration (according to norms of physiological needs);

z – index, that considers the influence of changing index value on qualitative rate of an object, that is equal to plus 1 in proteins and carbohydrates content estimating and minus 1 in fats content estimating.

4) The values of the weighting factors m_{ij} of nutrients calculated by the formula:

$$m_{ij} = \frac{\frac{\sum M_{ij}^{basic}}{M_{ij}^{basic}}}{\sum \frac{\sum M_{ij}^{basic}}{M_{ij}^{basic}}}. \tag{2.11}$$

5) The complete index of the quality of the «pancakes» for the balance of nutrients for a two-tier structure will be determined using the

additive model:

$$K_o = \sum_{i=1}^{t} M_j \bullet \sum_{j=1}^{n_i} m_{ij} \bullet K_{ij}, \quad (2.12)$$

where M_j – weighting factor groups of nutrients.

Results and their discussion. According to the norms of content of energy substances, minerals and vitamins, which are included in the dish «pancakes», a re-calculation of nutrients content (Table 2.4).

Absolute values of the quality indices of energy nutrients, minerals and vitamins stimulate formula (2.8), which are: for proteins – P_p=0,129644; fats – P_f=0,153755; carbohydrates – P_c=0,716601; calcium – P_{Ca}=0,495886; phosphorus – P_P=0,442442; magnesium – P_{Mg}=0,054901; iron – P_{Fe}=0,003496; zinc – P_{Zn}=0,002175; iodine – P_I=0,0000241; cuprum – P_{Cu}=0,0000697; chromium – P_{Cr}=0,0000082; molybdenum – P_{Mo}=0,0000332; selenium – P_{Se}=0,0000229; manganese – P_{Mn}=0,0009431; ascorbic acid – P_C=0,1292338; retinol – P_A=0,0071102; tocopherol – P_E=0,2623967; calciferol – P_D=0,0000466; thiamine – P_{B1}=0,0213970; riboflavin – P_{B2}=0,0270302; pyroxidine – P_{B6}=0,0237165; niacin – P_{B3}=0,4317261; folate – P_{B9}=0,0031953; cobalamin – P_{B12}=0,0000496; biotin – P_{B7}=0,00089; vitamin K – P_K=0,0024128; pantothenic acid – P_{B5}=0,0907950. The values obtained are listed in Table 2.5.

Similarly, according to the recommended norms of physiological need (Table 2.4), the basic values of formula (2.9) were determined. The basic values of quality indices for energy, minerals and vitamins are: for proteins – P_p=0,146667; fats – P_f= 0,128889; carbohydrates – P_c =0,724444; calcium – P_{Ca}=0,3883741; phosphorus – P_P=0,4236809; magnesium – P_{Mg} = 0,1765337; iron – P_{Fe}=0,0060022; zinc – P_{Zn}=0,0042368; iodine – P_I=0,0000530; cuprum – P_{Cu}=0,0003531; chromium – P_{Cr}=0,0000177.

Molybdenum – P_{Mo}=0,0000247; selenium – P_{Se}=0,0000177; manganese – P_{Mn}=0,0007061; ascorbic acid – P_C=0,6235636; retinol – P_A=0,0089081; tocopherol – P_E=0,1336208; calciferol – P_D=0,0000446; thiamine – P_{B1}=0,0115805; riboflavin – P_{B2}=0,0142528; pyroxidine – P_{B6}=0,0160345; niacin – P_{B3}=0,1425288; folate – P_{B9}=0,0035632; cobalamin – P_{B12}=0,0000267; biotin – P_{B7}= 0,0004454; vitamin K – P_K=0,0008908; pantothenic acid – P_{B5}=0,0008908.

The values of the weighting factors m_{ij} of the nutrients were calculated according to the recommended physiological requirements (Table 2.4) by the formula (2.11).

Table 2.4

Recalculation of the content of energy substances, minerals, vitamins, which are included in pancakes

Nutrients	Name of the ingredient							Total
	Milk	Chicken yggs	Wheat flour	Ripper	Oil	Sugar	Salt	
Mass, g	210	40	200	5	25	30	3	513
Energy substances, g:								
Proteins	6,1	5,1	21,6	0	0	0	0	32,8
Fats	6,7	4,6	2,6	0	25	0	0	38,9
Carbo-hydrates	9,9	0,3	139,8	1,4	0	29,9	0	181,3
Mineral substances, mg								
Ca	252,0	22,0	36,0	293,8	0	0,9	11,4	616,1
P	189,0	76,8	172,0	109,6	0	0	2,3	549,7
Mg	29,40	4,80	32,00	1,35	0	0	0,66	68,21
Fe	0,210	1,000	2,400	0,551	0,005	0,090	0,087	4,343
Zn	0,840	0,444	1,400	0	0	0	0,018	2,702
I	0,019	0,008	0,003	0	0	0	0	0,030
Cu	0,025	0,033	0,020	0	0	0	0,008	0,087
Cr	0,004	0,002	0,004	0	0	0	0	0,010
Mo	0,011	0,002	0,025	0	0	0	0,003	0,041
Se	0,004	0,012	0,012	0	0	0	0	0,028
Mn	0,013	0,012	1,140	0	0	0	0,008	1,172
Vitamins, mg:								
C	2,730	0	0	0	0	0	0	2,730
A	0,046	0,104	0	0	0	0	0	0,150
E	0	0,240	3,000	0	2,303	0	0	5,543
D	0	0,001	0	0	0	0	0	0,001
B_1	0,084	0,028	0,340	0	0	0	0	0,452
B_2	0,315	0,176	0,080	0	0	0	0	0,571
B_6	0,105	0,056	0,340	0	0	0	0	0,501
B_3	1,680	1,440	6,000	0	0	0	0	9,120
B_9	0,011	0,003	0,054	0	0	0	0	0,068
B_{12}	0,001	0	0	0	0	0	0	0,001
B_7	0,007	0,008	0,004	0	0	0	0	0,019
K	0,001	0	0,001	0	0,049	0	0	0,051
B_5	0,798	0,520	0,600	0	0	0	0	1,918

Table 2.5

Calculation of absolute values, baseline values, weighting factors and unit quality indices

Absolute values		Basic values		Values of weighting factors		The values of unit quality indicators	
Energy substances							
P_p	0,129644	P_p^b	0,146667	m_p	0,42728	K_p	0,883938
P_f	0,153755	P_f^b	0,128889	m_f	0,486215	K_f	0,838275
P_c	0,716601	P_c^b	0,724444	m_c	0,086505	K_c	0,989173
Mineral substances							
P_{Ca}	0,495886	P_{Ca}^b	0,3883741	m_{Ca}	0,0000145	K_{Ca}	1,2768249
P_P	0,442442	P_P^b	0,4236809	m_P	0,0000133	K_P	1,0442809
P_{Mg}	0,054901	P_M^b	0,1765337	m_{Mg}	0,0000320	K_{Mg}	0,3109932
P_{Fe}	0,003496	P_{Fe}^b	0,0060022	m_{Fe}	0,0009397	K_{Fe}	0,5823898
P_{Zn}	0,002175	P_{Zn}^b	0,0042368	m_{Zn}	0,0013312	K_{Zn}	0,5133067
P_I	0,0000241	P_I^b	0,0000530	m_I	0,106499	K_I	0,4544151
P_{Cu}	0,0000697	P_{Cu}^b	0,0003531	m_{Cu}	0,0159749	K_{Cu}	0,1972602
P_{Cr}	0,0000082	P_{Cr}^b	0,0000177	m_{Cr}	0,3194976	K_{Cr}	0,4650536
P_{Mo}	0,0000332	P_M^b	0,0000247	m_{Mo}	0,2282126	K_{Mo}	1,3417513
P_{Se}	0,0000229	P_{Se}^b	0,0000177	m_{Se}	0,3194976	K_{Se}	1,2986394
P_{Mn}	0,0009431	P_{Mn}^b	0,0007061	m_{Mn}	0,0079874	K_{Mn}	1,3355473
Vitamins							
P_C	0,1292338	P_C^b	0,6235636	m_C	0,0000251	K_C	0,2072504
P_A	0,0071102	P_A^b	0,0089081	m_A	0,0017571	K_A	0,7981798
P_E	0,2623967	P_E^b	0,1336208	m_E	0,0001171	K_E	1,9637420
P_D	0,0000466	P_D^b	0,0000446	m_D	0,3514157	K_D	1,0468803
P_{B1}	0,0213970	P_{B1}^b	0,0115805	m_{B1}	0,0013516	K_{B1}	1,8476763
P_{B2}	0,0270302	P_{B2}^b	0,0142528	m_{B2}	0,0010982	K_{B2}	1,8964742
P_{B6}	0,0237165	P_{B6}^b	0,0160345	m_{B6}	0,0009762	K_{B6}	1,4790948
P_{B3}	0,4317261	P_{B3}^b	0,1425288	m_{B3}	0,0001098	K_{B3}	3,0290445
P_{B9}	0,0031953	P_{B9}^b	0,0035632	m_{B9}	0,0043927	K_{B9}	0,8967566
P_{B12}	0,0000496	P_{B1}^b	0,0000267	m_{B12}	0,5856928	K_{B12}	1,8563969
P_{B7}	0,00089	P_{B7}^b	0,0004454	m_{B7}	0,0351416	K_{B7}	1,9981066
P_K	0,0024128	P_K^b	0,0008908	m_K	0,0175708	K_K	2,7086035
P_{B5}	0,0907950	P_{B5}^b	0,0445403	m_{B5}	0,0003514	K_{B5}	2,0384938

The weighting factors were for: for proteins – m_p=0,42728; fats – m_f=0,486215; carbohydrates – m_c=0,086505; calcium – m_{Ca}=0,0000145; phosphorus – m_P=0,0000133; magnesium – m_{Mg}=0,0000320; iron – m_{Fe}=0,0009397; zinc – m_{Zn}=0,0042368; iodine – m_I=0,0000530;

cuprum – m_{Cu}=0,0159749; chromium – m_{Cr}=0,0159749; molybdenum – m_{Mo}=0,2282126; selenium – m_{Se}=0,3194976; manganese – m_{Mn}=0,0079874; ascorbic acid – m_C=0,0000251; retinol – m_A=0,0017571; tocopherol – m_E=0,0001171; calciferol – m_D=0,3514157; thiamine – m_{B1}=0,0013516; riboflavin – m_{B2}=0,0010982; pyroxidine – m_{B6}=0,0009762; niacin – m_{B3}=0,0001098; folate – m_{B9}=0,0043927; cobalamin – m_{B12}=0,5856928; biotin – m_{B7}=0,0351416; vitamin K – m_K=0,0175708; pantothenic acid – m_{B5}=0,0003514.

Estimation of the individual indicators of the quality of energy, minerals and vitamins was calculated using formula (2.10), using the data Table 2.5. The assessment of individual indicators was for: proteins – K_p=0,883938; fats – K_f=0,838275; carbohydrates – K_c=0,086505; calcium – K_{Ca}=1,2768249; phosphorus – K_P=1,0442809; magnesium – K_{Mg}=0,3109932; iron – K_{Fe}=0,5823898; zinc – K_{Zn}=0,5133067; iodine – K_I=0,4544151; cuprum – K_{Cu}=0,1972602; chromium – K_{Cr}=0,4650536; molybdenum – K_{Mo}=1,3417513; selenium – K_{Se}=1,2986394; manganese – K_{Mn}=1,3355473; ascorbic acid – K_C=0,2072504; retinol – K_A=0,7981798; tocopherol – K_E=1,9637420; calciferol – K_D=1,0468803; thiamine – K_{B1}=1,8476763; riboflavin – K_{B2}=1,8964742; pyroxidine – K_{B6}=1,4790948; niacin – K_{B3}=3,0290445; folate – K_{B9}=0,8967566; cobalamin –K_{B12}=1,8563969; biotin – K_{B7}=1,9981066; vitamin K – K_K=2,7086035; pantothenic acid – K_{B5}=2,0384938.

To calculate the complex index of pancakes for the balance of nutrients for a two-tier structure, formula (2.12) was used, in which the values of the mass factors (M) were taken for energy substances – 0,35; vitamins – 0,55; mineral substances – 0,1.

As a result of calculations, the «pancakes» has a comprehensive quality assessment, which is K_0=1,27.

Conclusions. The method of estimation of the quality of the «pancakes» is considered. The structure of quality indicators and the results of experimental studies of complex quantitative quality assessment are presented. Taking into account the norms of the physiological needs of the average person, namely women aged 18-29 with a physical activity factor of 1.6, a comprehensive assessment of the quality of the «pancakes» dish was calculated. For a given diet, complex quality indicators for a group of energy substances, minerals and vitamins are defined. It is also suggested to add to the diet of raspberries, which balances it on the index of vitamin C. It was found

that when adding raspberries the values of a complex quality index became the most balanced.

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