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MINERAL CONTENT OF MENUS OFFERED BY SOCIAL WELFARE HOME

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: The aging of the population in Poland and globally has increased interest in nutrition for the elderly. Their diets are inappropriate, but modifications should be introduced gradually. This is important in hospital settings, sanatoriums or social care homes, where patients have few choices.

Aim of the study: The study aimed to assess the content of the selected mineral salts in ten day menus offered by the Social Welfare Home based on season of the year.

Material and methods: The study included 40 menus offered in four seasons of the year for the residents of the Social Welfare Home in Lower Silesia. The mineral content of the foods on the menus were assessed. We considered the physical activity of the elderly (1.4—*Physical Activity Level*) using norms developed by the Food and Nutrition Institute, and calculated the average norms of the analysed nutrients for people over 60 years of age.

Results: The diets were low in minerals such as calcium and potassium, and contained an excessive amount of phosphorus, sodium, iron and zinc in all seasons. Although magnesium levels in the spring and summer were appropriate, deficits appeared in autumn and winter diets.

Conclusions: The evaluated menus showed inadequate supplies of the assessed mineral salts. More analysis and adjustments to planned meals is recommended.

KEYWORDS: aged, nutrients, sodium, dietary, zinc, magnesium, food

Background

The aging of the Polish and global populations has increased interest in nutrition of the elderly, also partly due to the realization that proper nutrition can prevent diseases occurring in this age group. Proper nutrition has a strong impact on bodily functions and the natural processes involved [1].

It is widely believed that the diets of older people have serious deficits. It should be underlined that bad eating habits are well-rooted, therefore change may be difficult. Each modification should be introduced gradually, due to reduced adaptability. This is important in hospital settings, sanatoriums or social care homes, where patients have no alternative choices. In many cases these diets' composition or taste are not acceptable by older people [2].

A frequent problem in the geriatric population is limited food and liquid intake. Their diets are also deficient in important vitamins and minerals, resulting in a serious threat to health, because these deficiencies may exacerbate already existing diseases and increase the risk of nutrition-dependent diseases [3].

The elderly is particularly vulnerable to nutrient deficiencies. Loneliness, depression, social isolation and limited income further aggravate inappropriate nutrition [4]. The elderly's diet greatly influences biological aging, and physiological and pathological changes. Significant changes accompanying aging include deterioration of the physiological activities of all organs,

manifested by a gradual loss of water, calcium and phosphorus with simultaneous progressive bone demineralization and deposition of cholesterol and lipid deposits on the walls of blood vessels [5]. Recommendations for adequate consumption of minerals for healthy elderly people are similar to those for younger people with the exception of iron, for which the demand in women after menopause significantly decreases [2].

The nutrition of seniors is often inconsistent with principles of rational nutrition. They require regular consumption of a variety of meals, properly selected and prepared [6].

Aim of the study

To evaluate the content of mineral salts in the selected ten-day menus applied at the Social Welfare Home depending on the season of the year.

Materials and methods

We assessed 40 menus prepared at the Social Welfare Home in Lower Silesia region. Meals were prepared in the facility's canteen. Due to the use of ten-day menus, we examined 10 randomly chosen ones from each season of the year. The research covered the years 2016 and 2017.

We used Diet 5 software to analyse 40 daily meals prepared for the residents of the nursing home consisting of breakfast, dinner, and supper. The mineral salt content was studied. Considering the physical activity of the elderly (1.4 *pal- Physical Activity Level*), using the norms developed by the Food and Nutrition Institute [7], the average norms of the analysed nutrients were calculated for people over 60 years of age. For this purpose, the formula was used, where K is the norm for women, and M the norm for men. The results were compared with the calculated mean values of the norm for the elderly at the level of average consumption (EAR) for the energy value and nutrient content, and an adequate intake (AI) of dietary fibre. The results were statistically analysed giving the mean value (X), median and coefficient of variation (CV). Calculations were made using Microsoft Excel.

Results

The analysis showed significant calcium deficiencies in all seasons. The highest average values were achieved in summer (607.2 ± 135.9 mg) at 61% of requirements.

Table 1. Selected mineral contents in menus from four seasons

SEASON	ASSESSMENT PARAMETERS	MINERAL						
		CALCIUM [mg]	PHOSPHORUS [mg]	MAGNESIUM [mg]	SODIUM [mg]	POTASSIUM [mg]	IRON [mg]	ZINC [mg]
SPRING	X ± SD	588.6 ± 139.4	1223.9 ± 144.9	281.1 ± 64.4	3818.0 ± 888.1	3027.9 ± 652.3	10.8 ± 2.6	10.2 ± 3.1
	Min	413.5	979.0	200.5	2563.6	2045.6	8.9	8.2
	Max	843.6	1448.8	426.9	5256.5	3754.6	17.3	18.8
	Median	565.2	1212.1	272.7	3832.6	3346.2	9.7	9.3
	% of norm	59	211	91	294	64	180	126
SUMMER	X ± SD	607.2 ± 135.9	1245.2 ± 186.6	286.3 ± 59.3	3663.1 ± 773.5	3003.9 ± 544.2	11.8 ± 4.2	10.7 ± 3.6
	Min	312.8	967.9	219.2	2010.7	2206.9	8.2	7.0
	Max	855.9	1615.3	420.6	4387.9	3698.8	22.3	20.2
	Median	605.5	1219.7	279.9	3790.9	3129.7	11	10.3
	% of norm	61	215	93	282	64	197	132
AUTUMN	X ± SD	519.9 ± 114.7	1145.2 ± 187.1	254.4 ± 35.2	6713.0 ± 14.2	2910.2 ± 674.3	9.9 ± 1.1	9.2 ± 1.3
	Min	316.7	889.4	187.9	2141.8	1865.9	8.2	7.7
	Max	754.7	1430.2	313.5	33854.7	3941.5	11.5	11.5
	Median	518.2	1136.7	260.5	3892.2	2866.5	10.0	8.5
	% of norm	52	197	83	516	62	165	114
WINTER	X ± SD	495.5 ± 221.7	1141.2 ± 78.5	260.5 ± 32.1	3939.1 ± 644.2	2934.6 ± 612.5	10.9 ± 2.9	10.1 ± 1.5
	Min	65.1	1008.3	221.9	2911.1	2133.1	8.8	8.0
	Max	845.3	1243.4	313.6	4801.2	3715.5	18.5	12.3
	Median	479.5	1150.4	257.6	4000.6	3139.4	10.2	10.1
	% of norm	50	197	85	303	62	182	125

X-average, SD-standard deviation

In winter, the menu only provided 50% (495.5 ± 221.7 mg) of requirements.

Potassium was also inadequate. In all seasons, consumption was about 60% of daily needs.

Magnesium was provided adequately in spring and summer. However, in autumn (254.4 ± 35.2 mg) and winter (260.5 ± 32.1 mg) deficits were noted, with daily consumption being 80% of daily needs.

Average phosphorus content in the diet was exceeded in four seasons. The highest supply was recorded in the summer (1245.2 ± 186.6 mg), and the lowest in winter (1141.2 ± 78.5 mg).

The recommended amount of sodium was exceeded five times in autumn (6713 ± 14.2 mg), and three times in winter (3939.1 ± 644.2 mg). The lowest average values were observed in summer (3663.1 ± 773.5 mg), which covered 282% of norm.

From the calculated data, we observed that iron and zinc exceeded the requirements for the examined age group. Average iron consumption in summer (11.8 ± 4.2 mg) was highest and amounted to 197% of daily needs, while the lowest amounts were recorded in autumn (9.9 ± 1.1 mg), accounting for 165% of recommended consumption.

Similarly, zinc's highest average consumption also occurred in the summer (10.7 ± 3.6 mg, 132% of norm), and consumption was lowest in the autumn (9.2 ± 1.3 mg) at 114% of requirements.

Discussion

Our quantitative assessment of the examined menus for the selected minerals identified calcium to be significantly deficient during all seasons of the year. Our analysis showed that the residents' diet covered only 50–61% of recommended calcium needs. Studies by many authors analysing food rations and diet [8–11] support this thesis on the insufficient supply of calcium in senior diets. Calcium is not only the basic building block of bones and teeth, but also plays important roles in nerve conductivity, muscle contractility and blood clotting. Therefore, long-term calcium deficiency leads to the development of osteoporosis and the risk of fractures, as well as increased incidence of pain, muscle cramps, and neurological disorders [12].

Phosphorus, like calcium, participates in bone and tooth mineralization. It also plays a significant role in the regulation of the calcium-phosphate economy. We found excessive phosphorus in the menus. Other researchers [10,13,14] have also noted this in their analyses of nutrition of the elderly. Excessive dietary phosphorus limits absorption of calcium, copper, zinc and magnesium, and thus increases further the risk of osteoporosis [12].

Potassium regulates the body's water and electrolyte balance as well as proteins and carbohydrates necessary for metabolism. Our analysis found potassium shortages in the examined menus. Research carried out by Różańska et al [15], Malczyk et al [13], Całyniuk et al [8] and Goluch-Koniuszy et al [14] on elderly nutrition also found insufficient dietary potassium. Long-term potassium deficiency may lead to general muscle weakness and persistent constipation [16].

On the other hand, sodium was excessive in the menus, exceeding norms in all seasons. A similarly high supply of this component was observed by Malczyk et al [13], Goluch-Koniuszy [14] and Całyniuk et al [8]. Excessive sodium leads to disruption of sodium-potassium metabolism of the body, frequently manifesting as oedema. Excessive consumption of sodium chloride further increases the risk of hypertensive disease [16].

Average iron content in the evaluated menus, in turn, was insufficient. In a study evaluating nutrition of retirees for six months by Goluch-Koniuszy et al [14] noted an excess of iron. Excessive dietary iron reduces absorption of zinc and copper, in turn leading to deficiencies [12]. Also, excessive dietary iron contributes to the formation of free radicals, increasing the risk of cancer development [7]. Long-term iron deficiencies further lead to anaemia, that can manifest as cavities in the corners of the mouth, nail fragility and pale skin [12]. Inadequate iron consumption in the ≥60 population was observed by Malczyk et al [13] and Jodłów and Nadziejów.

Zinc is responsible for cell membrane stability, the immune system and taste and smell. Zinc content in the menus exceeded recommended norms. Similar results were reported by Goluch-Koniuszy et al [12]. However, Malczyk et al [13] and Leszczyńska et al [17] found deficient zinc in analysed food rations. Both excessive and deficient dietary zinc may contribute to health deterioration in older people. Insufficient zinc leads to impaired wound healing, taste and smell disorders, and lowers immune responsiveness. On the other hand, excessive zinc may negatively influence iron metabolism of iron and result in iron deficiency [7].

In the examined group of elderly people, dietary magnesium was appropriate in spring and summer, but low in autumn and winter. Markiewicz [1] found similar results in assessment of calcium and magnesium in the diet of elderly people from the Podlasie region. Other authors [8,9,13–15] assessments of both food rations and elderly feeding practices found insufficient dietary magnesium. Insufficient magnesium may contribute to nervous system disorders, impaired absorption and insulin resistance [12].

Conclusions

Elderly diets were generally mineral-poor, particularly for calcium and potassium. They also were excessive in phosphorus, sodium, iron and zinc in all seasons. Although magnesium levels were appropriate in spring and summer, they were deficient in autumn and winter. The evaluated menus showed faulty supplies of assessed mineral salts. Therefore a reassessment of nutritional ingredients in diets for the elderly is required.

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