

ANALYSIS OF THE INTAKE OF BASIC NUTRIENTS IN SUBJECTS WITH PRIMARY ARTERIAL HYPERTENSION

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Key words: primary arterial hypertension, eating habits, basic nutrients

A total of 162 persons, aged from 30 to 60, participated in the study. The examined group comprised patients suffering from the primary arterial hypertension (AH), while healthy subjects were treated as the control. The participants were subjected to a triple 24-h diet recall in which they were asked details concerning their diets. The analysis of the results obtained revealed an excessive proportion of fats in the total energetic value of their daily food rations (DFR) including, in particular, saturated fatty acids (SFA). An excessive supply of cholesterol and total protein as well as a deficit of dietary fibre were observed in the male diets of both groups. A significantly higher content of animal protein was determined in the DFR of subjects suffering from AH in comparison with healthy persons. Numerous irregularities concerning the eating habits favouring the development of the arterial hypertension were observed.

INTRODUCTION

Diseases of the cardiovascular system, including arterial hypertension, constitute the main health risk of the populations living in developed countries. Despite years of investigations, both experimental and clinical, the cause of the primary arterial hypertension has not been conclusively established yet. The factors believed to contribute to the development of arterial hypertension include: genetic preconditioning, hemodynamic disturbances, insulin-resistance, elevated leptin level, hyperhomocysteinemia, oxidative stress [Kulik-Rechberger, 2003; Redon *et al.*, 2003]. Also nutritional factors are believed to play an important role in the development of hypertension. Prolonged consumption of diets characterised by the excessive energetic value leads to overweight and obesity which, in turn, are treated as one of the independent factors conducive to the development of metabolic diseases, including arterial hypertension [He *et al.*, 2004]. It was found that high-protein diets characterised by excessive quantities of fat and reduced content of dietary fibre enhance the development of this disease entity [He *et al.*, 2004; Hodgson, 2004]. Therefore, it seems appropriate to search for new and verify the existing nutritional risk factors leading to the development of the primary arterial hypertension.

MATERIALS AND METHODS

The performed investigations included a total of 162 subjects. The experimental group (A) comprised 91 patients (46 women and 45 men) aged from 30 to 60 suffering from the primary arterial hypertension, whereas the control group (B) consisted of 71 healthy persons (41 women and 30 men) of

the same age who did not show symptoms of this disease. Persons with concomitant diseases (ischemic heart disease, post myocardial infarction, renal insufficiency, diabetes, gout, and hyperlipidemia) were excluded from investigations. A 24-h diet recall was carried out three times among the participants of investigations (according to the instruction of the Institute of Food and Nutrition). The nutritive value of the consumed daily food rations was assessed on the basis of the database prepared in the Microsoft program Access 2000 which is an enlarged version of the "Tables of the nutritive value of food products" [Kunachowicz *et al.*, 1998]. The results obtained were reduced taking into account culinary and technological losses. They were reduced by 10% in relation to the energy values and nutrient constituents. With the assistance of the Statistica 6.0 program, the authors applied the Mann-Whitney test to carry out the statistical analysis of the significance of differences between mean values.

RESULTS AND DISCUSSION

Results obtained in this study was shown in Tables 1 and 2.

The observed excessive intake of fat, SFA and cholesterol in both healthy and sick men can exhibit atherogenic action. Numerous experiments indicate that the high intake of saturated fatty acids (above 10% share of energy) and cholesterol (above 300 mg/day) leads to an increased total cholesterol concentration in the blood serum, as well as to increased LDL and VLDL fractions, increased blood clotting capability, diffusion of the vascular endothelium and increased arterial tension and irregularities of the heart rhythm [Kozłowska-Wojciechowska, 2003].

According to some researchers, a typical diet of many

TABLE 1. Percent of recommended intake of energy and share of total energy for basic dietary components.

Component	%	Group					
		A	Aw	Am	B	Bw	Bm
Energy	RDA	95.8 ± 29.9	88.9 ± 27.6 ^{a, b}	102.4 ± 30.9 ^a	99.9 ± 35.0	99.8 ± 36.9 ^b	99.9 ± 31.1
Carbohydrate	energy	50.1 ± 8.9	52.7 ± 9.4 ^c	47.6 ± 7.4 ^c	52.2 ± 10.1	54.5 ± 8.7 ^d	49.2 ± 11.4 ^d
Fat	energy	36.1 ± 7.5	33.5 ± 7.1 ^e	38.6 ± 7.1 ^e	34.6 ± 8.8	33.3 ± 7.8	36.3 ± 9.9
Protein	energy	14.1 ± 3.6	13.9 ± 4.2	14.3 ± 2.9	13.0 ± 3.2	12.5 ± 2.7	13.6 ± 3.8

A – study group, B – control group, w – women, m – men; ^{a, b, c, d, e} – significant differences

TABLE 2. Percent of recommended intake of basic dietary components and supply of selected amino acid (mg/kg b.m.).

Component	Group					
	A	Aw	Am	B	Bw	Bm
Carbohydrates	85.7 ± 26.6	78.9 ± 22.7 ^a	92.1 ± 28.7 ^a	85.0 ± 27.7	80.3 ± 22.8	92.0 ± 32.9
Fibre	64.0 ± 22.9	57.5 ± 19.8 ^b	70.2 ± 24.2 ^b	64.9 ± 28.2	58.7 ± 22.9	73.9 ± 32.9
Fat	118.5 ± 46.7	102.9 ± 42.3 ^c	133.5 ± 46.3 ^c	110.6 ± 50.4	99.3 ± 36.0	127.3 ± 63.4
SFA (% energy)	12.9 ± 3.7	12.0 ± 3.4 ^{d, e}	13.8 ± 3.8 ^d	13.0 ± 4.3	13.1 ± 3.6 ^e	13.0 ± 5.2
PUFA (% energy)	5.6 ± 2.6	5.5 ± 2.6	5.8 ± 2.4	5.3 ± 3.1	5.0 ± 2.4	5.9 ± 3.1
CHOL	142.4 ± 110.4	96.5 ± 57.7 ^f	186.3 ± 129.9 ^f	127.8 ± 98.6	100.0 ± 69.4 ^g	169.1 ± 38.0 ^g
Total protein	103.0 ± 43.9	84.0 ± 30.3 ^h	121.2 ± 47.5 ^h	90.3 ± 35.5	76.6 ± 24.1 ⁱ	110.7 ± 40.2 ⁱ
Animal protein (%)	65.2 ± 11.4 ^k	63.6 ± 12.3 ^m	66.7 ± 10.4	61.0 ± 11.4 ^k	60.1 ± 9.5 ^m	62.5 ± 13.8
Arginine (mg/kg b.m.)	51.4 ± 26.0	50.8 ± 24.8	60.0 ± 25.8	49.5 ± 23.5	55.4 ± 26.2	48.5 ± 23.3
Methionine (mg/kg b.m.)	20.2 ± 11.1	24.5 ± 11.6	23.8 ± 11.3	21.5 ± 10.4	23.4 ± 9.2	22.1 ± 9.7

A – study group, B – control group, w – women, m – men; ^{a, b, c, d, e, f, g, h, i, k, m} – significant differences

Poles supplies, on average, 38% of energy from fats, of which 15% comes from SFAs, and approximately 420 mg/day of cholesterol [Kozłowska-Wojciechowska, 2003]. The above values are not much higher than those determined for the participants of this experiment. According to nutritional recommendations, the diet of healthy adults should supply up to 30% energy from fats, 8% energy from SFAs and 300 mg cholesterol [Ziemlański *et al.*, 1998]. In the case of subjects suffering from the AH participating in the described experiment, it would be particularly important for them to restrict fat supply due to the frequent overweight observed among them. There are suggestions that in the case of obese persons, the dietary fat should not supply more than 25% of the total energy [Wing & Hill, 2001]. It is believed that obese persons suffering from the AH should be recommended low-caloric diets due to their hypotensive action. It was found that the reduced food energetic value in the case of these patients leads to a drop in the arterial blood pressure (preceding the reduction of the body weight), among others, by reduced activity of the sympathetic nervous system [Esler, 2003].

The observed excessive intake of animal protein by patients with the AH could lead to the intensification of undesired changes in their health condition and should be reduced and replaced by an increased supply of plant protein. This was confirmed, among others, by the results of experiments conducted by Anderson and co-workers which confirmed

that the replacement of the dietary animal protein by soybean protein decreased the concentration of the LDL fraction of cholesterol in the blood serum [Anderson *et al.*, 1995]. An adverse effect of large quantities of animal protein on the human organism is associated mainly with the fact that it is a rich source of methionine. This amino acid – a precursor of homocysteine – plays a significant role in the etiopathogenesis of atherosclerosis [Szostak-Węgierek, 1991].

The cause of the high methionine content in the DFRs of the examined subjects was the consumption of considerable quantities of animal protein. It is evident from numerous investigations that a high intake of this amino acid may result in elevated concentrations of homocysteine in blood which is often accompanied by increased arterial tension as well as intensification of the oxidation stress in the organism [Robin *et al.*, 2004].

The performed investigations also estimated the intake of another amino acid – arginine – considered important in the development of diseases of the cardiovascular system. It was investigated since it is considered to act as a substrate essential for the formation of nitrogen oxide – a factor regulating blood pressure – in the endothelium of blood vessels. The concentration of arginine – a relatively exogenous amino acid – in the examined rations amounted, on average, to 3 grams (ranging from 43 to 58 mg calculated per 1 kg body weight of the examined subjects) and was lower than

that determined in the DFR in adults from Finnish (about 5 g) [Venho *et al.*, 2002], Dutch (about 4 g) [Oomen *et al.*, 2000], or American (about 5 g) experiments [Visek, 1986]. However, no correlations were shown in the above-mentioned research between the amount of the consumed arginine and the occurrence of the diseases of the cardiovascular system. Despite the absence of such an interrelationship, the hypotensive effect of arginine supplements was confirmed in numerous reports [Huynh & Tayek, 2002; Oomen *et al.*, 2000]. It is believed that the advantageous influence of the discussed amino acid on the functions of the blood vessel endothelium is observed only when it is consumed at doses exceeding significantly the level which occurs in the commonly consumed food rations.

The determined low intake of dietary fibre by patients with the AH is consistent with observations of other researchers. Many studies reported, similarly to our results, that the content of this constituent in DFRs of patients suffering from the AH was below the recommended values [Zhao *et al.*, 2004; Lancaster *et al.*, 2004]. It should be emphasised that one of the recommendations of the antiarteriosclerotic diet is the consumption of products rich in dietary fibre because of the capability of its soluble fractions, such as pectins and gums, to reduce the concentration of the LDL cholesterol in blood. It has also been suggested that the high supply of dietary fibre in the diet may contribute to reduced arterial blood pressure [Hodgson, 2004].

The results obtained in this study are confirmed by data derived from other investigations carried out in our country, albeit on subjects who did not suffer from the AH. It is evident from these studies that food rations of adult persons and persons in advanced age are characterised by a high proportion of fat-derived energy, derived primarily from animals, an excessive content of cholesterol and a low supply of complex carbohydrates, including dietary fibre [Ostrowska *et al.*, 2003; Waśkiewicz, 2003]. Similar eating habits are also characteristic for populations of other industrialised countries [Mancia *et al.*, 2004]. The results of the above-mentioned studies also indicate differences in the consumption of the discussed food components between women and men. With regard to men, these differences are connected mainly with the higher supply of fats, SFA, cholesterol in their daily food rations and result, most probably, from the increased quantities of food articles consumed by them [Ascherio *et al.*, 1992]. Also the presented investigations confirmed the occurrence of similar trends in subjects suffering from the AH.

CONCLUSIONS

1. Eating habits of persons suffering from the arterial hypertension are characterised by the excessive supply of fats and proteins of animal origin as well as cholesterol (in the case of men from this group).
2. The observed irregularities in the nutrition of patients suffering from the arterial hypertension, when combined with certain genetic predispositions with regard to many of them, can be regarded as a significant cause of the development of this disease.

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ANALIZA SPOŻYCIA PODSTAWOWYCH SKŁADNIKÓW ODŻYWCZYCH U OSÓB Z PIERWOTNYM NADCIŚNIENIEM TĘTNICZYM

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W badaniu uczestniczyły łącznie 162 osoby, w wieku od 30 do 60 lat. Grupę badaną stanowili pacjenci z pierwotnym nadciśnieniem tętniczym (NT), grupę kontrolą osoby zdrowe. Wśród uczestników przeprowadzono badanie ankietowe dotyczące sposobu żywienia, obejmujące trzykrotny wywiad żywieniowy. Analizując wyniki stwierdzono nadmierny udział tłuszczu w ogólnej wartości energetycznej całodziennych racji pokarmowych (crp), w tym zwłaszcza nasyconych kwasów tłuszczowych. Wykazano zbyt dużą podaż cholesterolu, białka zwierzęcego oraz niedobór błonnika pokarmowego. W przypadku białka zwierzęcego ustalono istotnie wyższą jego zawartość w crp osób z NT aniżeli osób zdrowych.