POLISH JOURNAL OF FOOD AND NUTRITION SCIENCES
Pol. J. Food Nutr. Sci. 2006, Vol. 15/56, SI 2, pp. 83-86

INTAKES OF MACRONUTRIENTS AND SELECTED MICRONUTRIENTS BY PATIENTS WITH ESSENTIAL HYPERTENSION

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Key words: hypertension, nutritional status, nutrition

A total of 147 patients (73 men and 74 women) with a mean age of 56.9±11 years participated in the study. All hypertensive subjects were medically treated and their average BP was 131±8 mmHg systolic and 81±6 mmHg diastolic. An average BMI was 32.7±3.1 kg/m^2 and 35.3±3.8 kg/m^2 among men and women respectively. Only 33% of patients had BMI of <25 kg/m^2. Daily energy intake did not reach 80% of recommended value in both, men and women group. An average intake of protein was 17% of total energy, and carbohydrates amount was 48-46% of total energy. Fat consumption averaged 36.9±9% of total energy in men and 34.8±9% of total energy in hypertensive women. Daily intake of SFA, amounting to 11% of total energy, was higher than recommended value. Low intakes of calcium and potassium, as well as an appropriate sodium amount were observed. Besides vitamin E, the intakes of other vitamins, especially vitamin C, were below current recommendations. To improve nutrition of hypertensive patients, comprehensive dietary changes should be advised.

INTRODUCTION

Chronic essential hypertension, widely prevalent worldwide, is a major risk for cardiovascular disease (CVD). WHO reports that the number of people suffering from hypertension is estimated at 600 millions. In all hypertensive patients nonpharmacological treatment, including diet, weight loss and physical activity, is a first-line approach in the management of hypertension [JNC 7 Report, 2003].

For decades dietary approaches in the management of hypertension have emphasized restrictions of sodium intake [Kokkinos *et al.,* 2005]. Recent research suggests that a diet high in fruits, vegetables, whole grains and low-fat dietary products is associated with reduction in blood pressure [Appeal *et al.,* 1997; Sacks *et al.*, 2001], and dietary changes other than sodium restriction alone play an important role in the prevention and treatment of hypertension [McCarron, 2003].

The aim of our investigation was to assess intakes of energy, macronutrients and selected micronutrients by patients witch essential hypertension and to verify their adherence to the recommendation.

MATERIALS AND METHODS

The study population consisted of 73 men (mean age 55.8±12 years) and 74 women (mean age 57.2±9 years) with established and medically treated essential hypertension (HTN) in the Outpatient Clinic of Hypertension of National Institute of Cardiology (Anin, Warsaw). The research was conducted during the period between June 2005 and June 2006. Athropometric measurements including weight, height, and abdominal circumference were carried out according to WHO recommendations [WHO, 1995]. Body weight was measured to the nearest 0.1 kg, height and abdominal circumference were measured to the nearest 0.5 cm. Body mass index (BMI) was calculated as weight (kg) divided by height (m^2). Individuals were considered overweight when their BMI was ≥25 kg/m^2 and obese when their BMI was ≥30 kg/m^2 [WHO, 2000].

Twice measurements of blood pressure (BP) were taken by physician, after 5 minute sitting rest, at 2 minutes intervals, using standard mercury sphygmomanometers with appropriate bladder size. BP measurements were averaged and gave as a single value per individual. Food intake data were collected using the 3-day food record method. Daily energy intake and intakes of macronutrients and selected micronutrients were calculated on the basis of Food Composition Tables [Kunachowicz *et al.,* 1998] and compared with reference values [Ziemlański, 2001; JNC 7 Report, 2003]. Statistical analysis was performed using Student *t* (for parametric data) and Mann-Whitney (for nonparametric data) tests. A probability value of $p<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Characteristics of the patients is presented in Table 1. A total of 147 patients (73 men and 74 women) with a mean age of 56.9±11 years participated in the study. Twenty five percent of patients were under 50 years old, and 10% of them were over 70 years. All hypertensive subjects were medically treated and their average BP was 131±8 mmHg systolic and 81±6 mmHg diastolic. The primary objective in hypertension management is to decrease blood pressure to less than 140/90 mmHg (in patient without diabetes or renal disease)

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TABLE 1. Characteristic of patients.

Baseline characteristic	N (%)
Gender:	
Male	73 (50)
Female	74 (50)
Age:	
≤ 50	37 (25)
> 50	112 (75)
Weight status:	
Not overweight	33 (22)
Overweight	106 (72)
Obese	8 (6)
Systolic BP on drug therapy: (mmHg)	
≤130	95 (64)
>130	52 (36)
Diastolic BP on drug therapy: (mmHg)	
≤ 90	124 (84)
> 90	23 (16)

[JNC 7 Report, 2003]. In all, 9% of patients had SBP >145 mmHg and 27% had DBP >85 mmHg.

An average BMI was 32.7±3.1 kg/m^2 and 35.3±3.8 kg/m^2 among men and women respectively. Only 33% of patients had BMI of <25 kg/m^2. All patients received general nutrition advice from physician, but they were not counseled by dietitian. In all patients with HTN management treatment should begin by lifestyle modification and start by considering energy balance and weight reduction. A diet high in fruits, vegetables, low-fat dairy products, fiber, potassium, calcium and magnesium; low in saturated fatty acid and total cholesterol is recommended [Appeal *et al.,* 1997; Sacks *et al.,* 2001]. Results on the Trials of Hypertension Prevention (TOHP II) have shown that a reduction in body mass results in a modest reduction in BP [Kumanyika *et al,* 2005]. Weight loss to achieve and maintain BMI close to 25 kg/m^2 (rather than "ideal body weight") should be the goal in overweight patients.

Energy and macronutrient intakes by patients with hypertension were presented in Table 2. Daily energy intake in the present study was low in both men and women group and did

TABLE 2. Energy and macronutrients intakes by patients with hypertension.

Nutrient	Men	Women
Energy[a] (kcal)	1829 ± 596†	1536 ± 508
Protein[b] (g/day)	73 (59 – 89)‡	63 (48 – 78)
Fat[a] (g/day)	74 ± 33†	59 ±27
Cholesterol[b] (mg/day)	220 (148 – 337)	179 (125 – 303)
Carbohydrates[a] (g/day)	227 ± 80†	203 ± 76
Fiber[a] (g/day)	18.7 (14 – 24)	17.7 (13 – 22)

[a] values given as mean ± standard deviation, [b] values given as median (25th and 75th centiles); † *versus* women t test for independent samples, p<0.05, ‡ *versus* women Mann-Whitney test, p<0.05

not reach 80% of the recommended value. An average intake of protein was close to the recommended value (17% of total energy) and carbohydrates amount was 48-46% of the total energy in men and women, respectively. Fat intake averaged 36.9±9% of the total energy in men and 34.8±9% of the total energy in the hypertensive women. National Cholesterol Education Program [NECP, 2001] recommends limiting total fat to ≤30% of the total energy and Dietary Approach to Stop Hypertension diet [Appeal *et al.,* 1997; Sacks *et al.,* 2001] recommends for hypertensive patients fat intake reduction to 27% of the total energy. When dietary fat is restricted, calories are usually replaced by carbohydrates. These diets may increase serum trygliceride (TG) concentration and decrease HDL-C concentration [Shikany, 2000], thus any diet should be individualized according to patient's nutritional status and eating habits.

In the dietary management of hypertension, a reduction of Saturated Fatty Acids (SFA) is recommended. An average daily intake of SFA by hypertensive patients in the reported study, amounting to 11% of the total energy, was much higher than the recommended value (Figure 1). NCEP [2001]

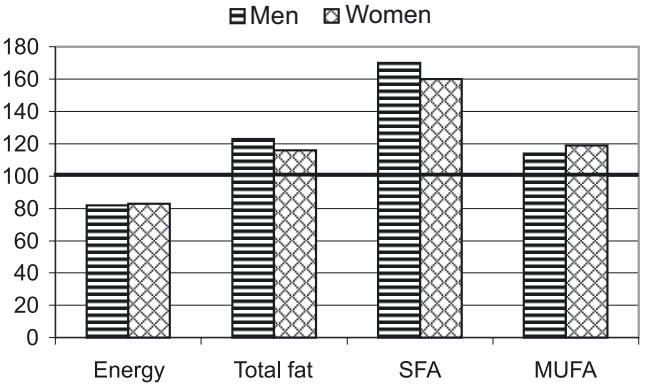

FIGURE 1. Energy and fat intake in comparison to recommendation. Recommended dietary fatty acids composition: Saturated Fatty Acids (SFA) - 7 % of total energy, and Monounsaturated Fatty Acids (MUFA) - 13 % of total energy, Total Fat-30 % of total energy [JNC 7 Report, 2003].

recommends limiting saturated fat intake to 8-10% of energy and to < 7% in patients with an inadequate serum cholesterol response. Shikany [2000] concluded that applying 7% limit at all individuals may help to maximize cardiovascular benefits Monounsaturated Fatty Acids (MUFA) are recommended as cardioprotective and decreasing the susceptibility of LDL to oxidative modification, but adherence to a low-SFA and high-MUFA diet may be difficult for most patients.The mean dietary fiber intake in diet of hypertensive patients was about 18-19 g/day. Most authorities recommend the intake of fiber to range from 25 to 30 g/day or from 10 to 13 g/1000 kcal [Shikany, 2000]. Dietary fiber was inversely associated with the risk of hypertension in the Health Professionals Follow-up Study [Ascherio *et al.,* 1992] and it has been suggested that a higher intake of water-soluble fiber may have a beneficial effect on blood pressure [Shikany, 2000].

An average daily sodium intake was 2.3±1.3 g and 1.6±0.8 g in diets of hypertensive men and women, respectively (Table 3). According to DASH [Appeal *et al.,* 1997; Sacks *et al.,* 2001], a diet reducing sodium intake to not more than 100 mmol (2.4

TABLE 3. Minerals and vitamins contents (mean ± sd) in diet of patient with hypertension.

Nutrient (mg/day)	Men	Women	Nutrient (mg/day)	Men	Women
Calcium[a]	485 (329 – 746)	476 (293 – 722)	Vitamin E[a]	8.7 (5.7 – 11.8)‡	7.6 (5.2 – 10.7)
% RDI	58 (33 – 75)	58 (29 – 94)	% RDI	95 (56 – 117)	106 (66 – 133)
Potassium[a]	2808 (2243 – 3476)	2647 (2131 – 3289)	Vitamin B_1[a]	1.0 (0.7 – 1.4)	0.8 (0.6 -1.2)
% RDI	83 (64 – 99)	81 (61 – 94)	% RDI	60 (41 – 78)	52 (37 – 69)
Sodium[b]	2287 ± 1257†	1643 ± 880	Vitamin B_2[a]	1.8 (1.0 – 1.7)	1.3 (0.9 – 1.7)
% RDI	95 (64 – 114)	68 (44 – 83)	% RDI	63 (41 – 73)	88 (58 – 106)
Magnesium[a]	251 (204 – 320)	231 (178 – 287)	Vitamin B_6[a]	1.8 (1.0 – 2.2)	1.5 (1.2 – 2.0)
% RDI	78 (58 – 91)	93 (63 – 102)	% RDI	86 (60 – 102)	94 (69 – 111)
Iron[a]	10 (7.9 – 12.6)	9 (7.1 – 12.2)	Vitamin C[a]	35 (20 – 60)	42 (23 – 66)
% RDI	99 (72 – 115)	71 (51 – 85)	% RDI	77 (33 – 100)	83 (38 – 109)

[a] values given as mean ± standard deviation, [b] values given as median (25^{th} and 75^{th} centiles); %RDI – % of Recommended Dietary Intake, value given as mean ((25^{th} and 75^{th} centiles); † *versus* women t test for independent samples, $p<0.05$; ‡ *versus* women Mann-Whitney test, $p<0.05$

g, equivalent to 6 g NaCl) is rational. Mulrow [2001] suggested that very-low-sodium diets are very difficult to achieve and maintain and there is no reason to move salt restriction to the top of the list of items to be discussed with hypertensive patients. The role of sodium in the pathogenesis of hypertension is still being discussed. Several studies showed a positive correlation between sodium intake and systolic and diastolic BP but not all individuals respond to excess sodium with an increase in blood pressure [Kokkinos *et al.,* 2005; Midgley *et al*., 1996]. It has been estimated that approximately 30% to 50% of hypertensive patients are salt-sensitive. Several studies indicate that the relationship between sodium intake and blood pressure may be stronger among overweight subjects [He *et al.*, 1999] and salt sensivity may be more prevalent among older population [Midgley *et al*., 1996].

Low potassium intake may increase BP, and the effect appears to be more pronounced in the individuals exposed to a high dietary sodium intake [Whelton *et al.,* 1997]. Reducing sodium and increasing potassium intake are both beneficial for blood pressure control. In the present study, the adequate sodium intake was associated with low potassium and calcium intakes. WHO report [2003] concluded that an adequate dietary potassium intake lowers blood pressure and protects against stoke and cardiac arrhythmias, and that sodium to potassium ratio should be close to 1.0.

Epidemiological data reported that magnesium deficiency may lead to the pathogenesis of hypertension [Chakraborti *et al.,* 2002]. An average daily intake of this mineral in the reported study was 273±111 mg among men and 260±136 mg among women. Calcium/magnesium intake ratio in the diet of hypertensive patients was 2:1, but calcium intake did not exceed 600 mg/day. Rowe [2006] suggested that an adequate total intake of calcium (1000-1200 mg/day) requires a daily total magnesium intake of 500–600 mg and it is far from recommended Polish dietary allowance of 300–370 g/day for adults [Ziemlański, 2001].

Besides vitamin E, the intakes of other vitamins, especially vitamin C, were below current recommendations (Table 3), which could have been due to low consumption of fruits and vegetables.

CONCLUSIONS

Comprehensive dietary changes should be advised to hypertensive patients. The focus of these changes should be given to the intake of such nutrients as SFA, MUFA, calcium, potassium, magnesium, sodium and vitamins, as well as to adequate intakes of vegetables, fruits, and low-fat diary products. Weight loss plan guidelines should be tailored to individual subject.

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OCENA SPOŻYCIA MAKROSKŁADNIKÓW I WYBRANYCH MIKROSKŁADNIKÓW DIETY PRZEZ PACJENTÓW Z NADCIŚNIENIEM TĘTNICZYM PIERWOTNYM

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Celem badań była ocena sposobu żywienia chorych z nadciśnieniem tętniczym pierwotnym leczonych ambulatoryjnie w poradni Nadciśnienia Tętniczego Instytutu Kardiologii w Aninie. Badaniami objęto 147 pacjentów, w tym 73 mężczyzn i 74 kobiety, w wieku od 32 do 81 lat. Wartości BMI <25 kg/m^2 stwierdzono jedynie u 33% pacjentów. Całodzienne racje pokarmowe badanych osób charakteryzowały niska wartość energetyczna, prawidłowy udział energii z białka i węglowodanów oraz dość wysoki udział energii z tłuszczu, w tym około 11% z nasyconych kwasów tłuszczowych. Stwierdzono niską podaż wapnia i potasu oraz prawidłową podaż sodu. Wykazano także niskie spożycie witaminy C oraz niektórych witamin z grupy B. Aby poprawić jakość żywienia chorych z nadciśnieniem tętniczym pierwotnym, należy edukować pacjentów w zakresie prawidłowego żywienia.