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PHYSICAL ACTIVITY AND NUTRITIONAL VALUE OF DIETS IN A SELECTED POPULATION OF LACTO-OVOVEGETARIAN WOMEN

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ABSTRACT

The purpose of study was to compare the 24h physical activity and nutritive value of diets (NVD) in lacto-ovovegetarian (LOV) and nonvegetarian women. The study was conducted on a group of 24 LOV women (BMI: 21.2 kg/m² ± 2.5) at the age of 25 ± 6.3 years and on a group of 30 women of the control group (CG) at the age of 23 (±2) years who consumed a mixed diet (BMI: 20.7 kg/m² ± 2.8). Physical activity was assessed by the non-invasive method of 24h monitoring of heart rate. The evaluation of the NVD was conducted in all subjects by 24-hour dietary recall. The analysis of body composition was carried out by bioelectrical impedance technique. The 24h distribution of time devoted to various types of activity demonstrated no statistically significant differences between groups in regard to the amount of time used for sleep and low physical activity. Vegetarians compared with nonvegetarians (CG) devoted significantly less time to physical activity of moderate intensity (220 min ± 84 vs. 271 min ± 95; p<0.05). Diets in both groups exhibited low content of PP and B₁ vitamins, and of iron and calcium but an excess of phosphorus. The lacto-ovovegetarian diet demonstrated better supply of C and A vitamins, magnesium, fibre and plant protein in comparison with the nonvegetarian diet. No differences were noted in the anthropometric parameters and body composition in the studied women.

Key words: energy expenditure, heart rate monitoring, physical activity, energy balance, lacto-ovovegetarians

INTRODUCTION

Among the so called alternative diets the most popular is the vegetarian diet, both in Poland and in other European countries. In Great Britain, as reported by Kernthe, 7% adult persons are vegetarians, 10% consume no red meat and 25 to 30% live on a diet of reduced meat content [13]. There are many reports in the scientific literature describing nutritional benefits of vegetarianism and showing both beneficial and detrimental effects of that diet on health status. However, the final conclusions are dependent, to a great extent, on the form of vegetarianism [1, 2, 3, 5, 7, 10, 11, 15, 18, 19, 20, 25, 27, 28, 29]. The studies on vegetarianism concentrate in most cases on the supply of nutrients in the diets as well on the assessment of biochemical markers that demonstrate the nutritional status. Numerous studies suggest [3, 26] that individuals on vegetarian pattern of eating are less susceptible to “civilisation diseases” but it can be dependent not only on the diet. There is a common opinion that vegetarians follow more health promoting lifestyles since they avoid smoking, alcohol and caffeine and pay more attention to their physical fitness. However, no data could be found in the literature on the mode of life of vegetarians and describing their physical activity level.

The purpose of this study was therefore the comparison of 24h physical activity, body composition and nutritional value of diet in two groups of women. One of them maintained on a mildly restrictive diet most popular in Poland, i.e. the lacto-ovovegetarian diet and the second being the control group on a normal (mixed) diet.

MATERIALS AND METHODS

The study was carried out on 54 female volunteers and among them 24 where lacto-ovovegetarians (LOV), i.e. they excluded from the diet certain food products of animal origin (meat, fish) but with retention of eggs and dairy products. The control group (CG) consisted of 30 women without any restrictions in regard to diet composition.

The LOV group comprised women who responded to the announcements left by the authors of study in the shop selling vegetarian food or they were informed by other female vegetarians. Recruitment of volunteers to the control group was conducted according to the suggestion of Appleby [3]. That means the vegetarians were requested to indicate women of similar age, educational and social status and maintained on mixed (normal) everyday diet.

The vegetarians have continued their diet for more than four years declared good health status, occasional consumption of alcohol only and they were non-smoker. All of them lived in the city of Poznań or its neighbourhood. The characteristic of the studied populations is shown on [Table 1](#).

Table 1. Characteristic of population

	Vegetarians	Control group
n	24	30
Age (years)	25±6.3	23±2.0 ^{NS}
Weight (kg)	57.0±6.7	56.8±8.5 ^{NS}
BMI (kg/m ²)	21.2±2.5	20.7±2.8 ^{NS}
Skinfold thickness (mm) [#]	8.9±2.3	10.4±3.4 ^{NS}
WHR	0.73±0.04	0.72±0.03 ^{NS}

*Average value of TRC, SSC, SIC

Anthropometry

The skinfold thickness was measured by Harpenden caliper, and included triceps (TRI), suprailiac (SIC), subscapular (SSC) measurements. Body weight and height were determined with the use of Rad Wag WPT 150.0 electronic balance and an anthropometer.

Body Composition

The analysis of body composition – percentage of adipose tissue (FM) and lean body mass (FFM) was performed by bioelectric impedance technique using BIA 101S, AKERN – RJL bioanalyser, under the conditions recommended by Lukaski et al. [17], Schwingshandl and Borkenstein [22], and with the equations proposed by Schafer [21]. The measurements were conducted in morning hours.

Monitoring of heart rate

The physical activity level was evaluated by 24h monitoring of heart rate (HR) using the Polar Sport Tester 4000 ENG produced in Finland. That technique has been widely used in other studies on that subject [4, 6, 12, 23]. Heart rate was recorded continuously for 24h at one-minute intervals, and each woman was subjected to such monitoring on one day at weekend and on two working days. The examined women were obliged to record with the accuracy of 15 minutes all their activities being carried out.

Based on heart rate (HR) the following) categories of physical activity were specified: sleep, low physical activity (\leq HR FLEX – office work, use of a computer, reading, watching TV, driving); moderate physical activity ($>$ HR FLEX $<$ 139 HR – work in a standing position, shopping, preparation of meals, walking) and high physical activity ($>$ 139 HR lasting for minimum 20 minutes – intensive physical exercises, sport training). HR FLEX was determined as the average of the highest HR, ie standing, during the resting measurements and the lowest HR while exercising on the treadmill, according to the procedure proposed by Ekelund and Livingstone [8, 16].

Dietary status

Dietary intake of nutrients was assessed by 24 hours dietary recall, with the use of Photographic Album of Dishes. The interview was carried out each time on the day of heart rate monitoring. Energy content as well as nutritional value of daily food rations were calculated on the basis of "Food composition tables" [14] with the application of "Dietetyk" computer programme.

The nutritive density of the diets was expressed as Index of Nutritional Quality (INQ), which provides an overall figure for the nutrient content of a diet. It is the ratio between the percentage of the reference intake (RDA) of each nutrient and the percentage of the average requirement for energy provided by the diet [11].

All women gave their consent to the participation in this study and the local Committee of Ethics approved the final report.

Statistical Analysis

The experimental data were subjected to statistical analysis using Student's test.

RESULTS AND DISCUSSION

[Table 1](#) presents the anthropometric characteristics of vegetarian group and the control group. In both groups a similar, and proper BMI was noted which simultaneously corresponded to the findings of other authors ($21.2 \text{ kg/m}^2 \pm 2.5$) [11]. Slightly higher values of skinfold

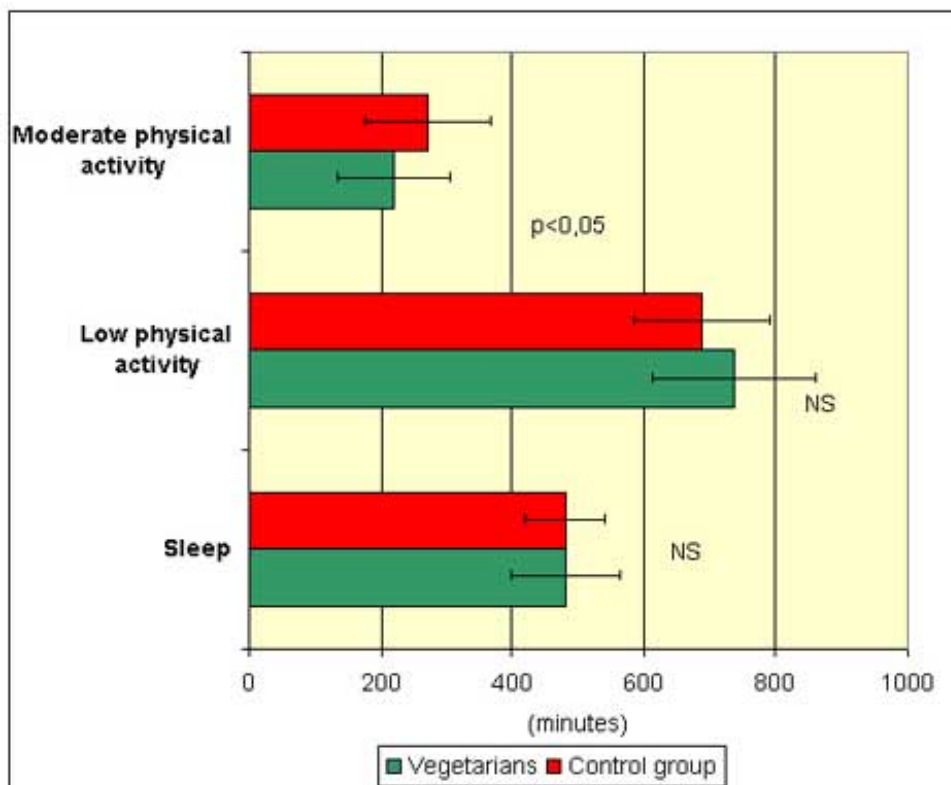
thickness were found in the control group, however the difference was statistically non-significant. Similar results among LOV were reported by Liebman (TRC: 10.4 mm; SSC: 14.2 mm) [15]. Body composition in both groups of women, evaluated by BIA technique was very similar too ([Table 2](#)).

Table 2. Body composition

		Vegetarians	Control group
FM	%	28,4± 4,6	29,2± 5,7 ^{NS}
	kg	16,4± 4,4	17,0± 5,8 ^{NS}
FFM	%	71,6± 4,7	70,8± 5,7 ^{NS}
	kg	40,4± 2,9	39,7± 3,6 ^{NS}
FFM/FM		2,6± 0,6	2,6± 0,7 ^{NS}

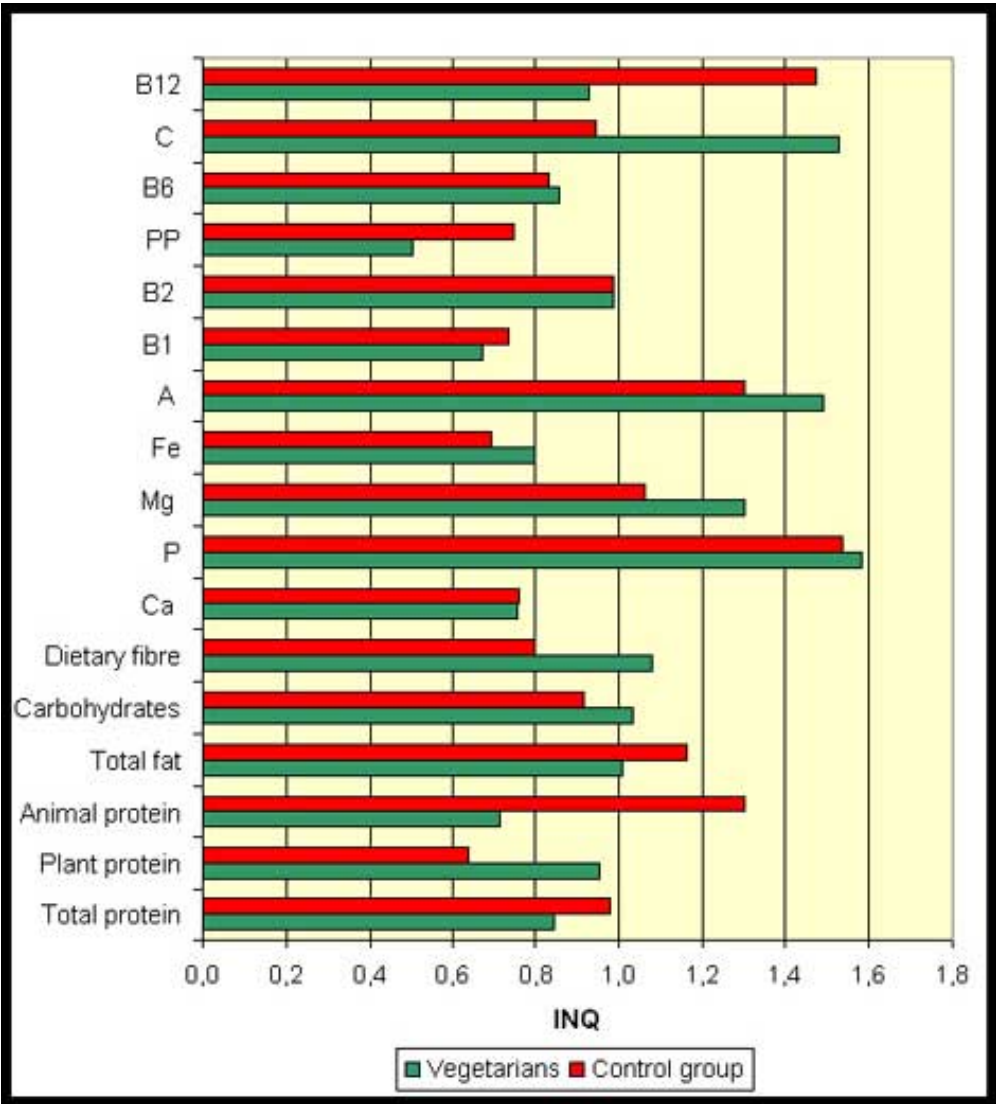
The control group demonstrated slightly higher fat content in the body but the difference was statistically non-significant. The evaluation of physical activity level in groups of vegetarians and control groups revealed that no periods of high physical activity were noted during 24h in any of the examined women. For that reason only sleep and periods of low and moderate physical activity were distinguished in the daily programmes. In both groups, sleep was found to take practically the same time during 24h. Vegetarians compared with controls devoted more time for tasks of low physical activity (738 min ± 124 vs. 688 min ± 102) as shown in [Table 1](#), but the difference was statistically non-significant. Lower amount of time was noted, however, in the group of vegetarians in the tasks of moderate physical activity (220 min ± 84 vs. 271 ± 95) as given in [Figure 1](#), and the difference was statistically significant (P < 0.05).

Figure 1. Duration of particular forms of physical activity in the studied groups



The nutritive value of diets (NVD) was estimated by 24h dietary recall. The obtained content of the particular nutrients in the diets was not compared with the RDA but the nutritive density of the diets was expressed as Index of Nutritional Quality (INQ) [9]. It is known that diets well balanced in regard to the particular nutrient show INQ close to 1. It was found in this study that diets of both groups were not adequately balanced in a number of nutrients and that concerned, PP and B₁ vitamins, and iron, calcium and phosphorus. Lacto-ovovegetarian pattern of eating secured high supply of C and A vitamins, magnesium and fibre. As it could be expected, the diets of vegetarians were unbalanced in protein content in comparison with the mixed diets of the control group (Figure 2). Those results correspond to the evaluation of nutritional value of LOV diet reported by other authors [1, 11, 24].

Figure 2. INQ values for daily diets of lacto-ovovegetarian and control groups of women



Summing the study up it can be stated that it has not revealed the vegetarians lead physically more active mode of life in comparison with women of the control group. Women on LOV diet were slightly less physically active during 24h, and they did practise neither sport nor recreational activities. The elimination of red meat, poultrymeat and fish from the diet did not affect the parameters of the nutritional status of the vegetarian women. Both studied populations demonstrated adequate and uniform values of both anthropometric parameters and body composition. Lacto-ovovegetarian diet was found to be a better source of certain

vitamins and minerals and contained less fat. The diets of vegetarians could not be regarded as much better balanced from the nutritional point of view. It has to be mentioned, however, that the study was conducted on a relatively narrow group of young women who preferred the mildest form of vegetarianism. For that reason it seems justified to conduct further studies on the physical activity level and nutritive value of diet of vegetarians preferring other, more restrictive forms of vegetarianism and to enlarge the studied population by persons in older age and with longer experience in that way of nutritional pattern.

CONCLUSIONS

1. Physical activity of young women on lacto-ovovegetarian diet was not significantly different from that in the group of women on normal (mixed) diet.
2. Nutritional status expressed by anthropometric parameters of women in the lacto-ovovegetarian and control groups did not differ substantially and was found within the range regarded as adequate.
3. Diets in both groups demonstrated a low supply of PP and B1 vitamins, iron and calcium but a surplus of phosphorus. Lacto-ovovegetarian diet secured better supply of C and A vitamins, magnesium, fibre and plant proteins in comparison with the normal diet.

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