

# NUTRITIONAL AND BIOCHEMICAL ASPECTS OF A VEGETARIAN DIET ON A SAMPLE FROM ROMANIA

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This study aims is to realize a complex prospective study on an ovo-lacto-vegetarian population in order to find out on the one hand cultural parameters and personal motivation for adopting this diet and, on the other hand, the nutritional and biochemical effects of the medium and long term vegetarian diet. Weight, height, blood pressure, glycemia and cholesterolemia were measured and daily food intake for 3 days was recorded for 136 ovo-lacto-vegetarians (88 women and 48 men) and 208 omnivores (128 women and 80 men), as a control sample. Our data show that there are no significant differences between the two samples regarding gender, age and religion. We found that vegetarians have significant lower BMI, glycemia, cholesterolemia and sugary products daily intake than omnivores. For blood pressure, dairy products and eggs, cereals and dietary fat intake the differences between the two samples are not significant. Also, vegetarians have a statistically significant higher vegetables and fruits daily intake than omnivores ( $p < 0.001$ ).

*Key words:* Ovo-lacto-vegetarians; Diet, nutrients; Body mass index; Food categories.

## INTRODUCTION

Lately, in the large range of human nutritional behaviours, a very interesting phenomenon having diverse motivations but also diverse types of manifestation according to the residential cultural medium, has flourished. It is about vegetarianism, a phenomenon rather cultural and anthropological that has profound implications in the medical field due to its consequences in the organism.

Having roots in the old religious beliefs of Indian people, the vegetarianism concept is not new in the human culture, but nowadays many religious or secular communities adopt one of the multiple forms of this diet as a lifestyle recommendation or necessity in order to respect their own beliefs. In fact, as vegetarianism, are known many kinds of diets that avoid, more or less, the meat and other animal products according to personal motivation or the general cultural trends that promote it.<sup>1-3</sup>

The medical world was very interested in the varied effects that a long term vegetarian diet could have on the human metabolism, biochemical processes and health status. Therefore the most important problems approached in the scientific articles from the medical literature, and the most controversial ones, are the daily intake of calories, vitamins, amino acids and essential fatty acids. These nutritional elements are so important for the organism functionality that any disturbance in their equilibrium can generate negative effects on the health status. Thus many scientific papers pointed out a strong association between a diet rich in vegetables and fruits and a low risk of chronically diseases such as cardiovascular ones<sup>4-7</sup>, some types of cancer<sup>8-10</sup> and obesity<sup>11-13</sup>. They did not withdraw some clear conclusions about the positive or negative effects of a long term or permanent vegetarian diet so far. Even the World Health Organization analyzed those effects and the scientific literature but the evidence is not conclusive yet, because some of

the studied positive effects can be due to the aliments components or other implied factors such as lifestyle, physical effort, usual toxics (tobacco, coffee, alcohol), etc. Though, a correlation between a high daily intake of vegetables food and a low risk of ischemic heart disease is accepted also cerebrovascular accident, hypertension and some types of cancer, especially colorectal and pancreatic<sup>14</sup>.

In our country the vegetarian diet is recently known and not very spread and detailed studies on this nutritional behavior were not realized. For that reason specific data about vegetarian populations and cultural/religious characteristics of their beliefs were not available. This study aims to realize a complex prospective study on an ovo-lacto-vegetarian population in order to find out on the one hand, the cultural parameters and personal motivation for adopting this diet and, on the other hand, the nutritional and biochemical effects of the medium and long term vegetarian diet.

## MATERIALS AND METHODS

In order to realize this study we identified 161 ovo-lacto-vegetarians from Bucharest but only 136 of them (88 women and 48 men) responded to our call for collaboration. Also, from the same geographical and social area we selected 208 subjects (128 women and 80 men) with an omnivorous nutrition, and they were included in this study as a control sample.

To collect data we used an interview method based on a questionnaire with free answers or the possibility to choose from the given answers.

The questionnaire was separated in 4 parts:

1. Personal and social data (age, gender, educational level, religion);
2. Data about the nutritional behavior (diet type, length of the specific diet, personal reason for changing the diet);
3. Physical, physiological and biochemical parameters (weight, height, blood pressure, glycemia, cholesterolemia);
4. Diet and nutrition data (daily nutrient intake for 3 non consecutive days from a week, one of them being a day from the week-end or a day off for the subject).

For dietary data all subjects were taught how to keep accurate food records. The first day of the record consisted of a 24 hours recall completed by an interviewer in order to instruct participants about the degree of detail needed for the record and in quantitative approximation of food and beverages consumed for 1 weekday and 1 weekend day (or the day off). Thus, for each subject a 3-days dietary records were analyzed according to Public Health Institute recommendations.

For clinical records, fasting, peripheral blood samples were collected in the morning between 07:00 and 9:30 and analyzed by glycemia and cholesterolemia tests.

For data processing and statistical analysis relative frequencies, minimal (MIN) and maximal (MAX) values, mean values, standard deviations ( $\sigma$ ) were calculated. Also, for some parameters were calculated t and  $\chi^2$  test.<sup>15</sup>

## RESULTS

### Personal and social data

Our data show that there are no significant differences between the two sample regarding gender, age and religion. Thus, the mean values for age are 37.26 years for ovo-lacto-vegetarians (OLV) and 40.93 years for omnivores. The difference is not statistically significant.

Concerning the subjects' religion, 93.38% for the vegetarians are orthodox Christians and the rest is represented by 3 Catholic believers and 3 Muslims. In the control sample 99.04% of subjects are also orthodox Christians (the rest being represented by 1 Catholic believer and 1 Jehovah's Witness).

A very interesting difference between the two studied samples was found concerning the educational level. In the control sample, from the general population, 42.31% of subjects have a medium educational level (high-school), 31.25% have a high educational level (college) and 26.44% attended only the classes of an elementary school. In the ovo-lacto-vegetarian sample the highest percent is for the high educational level (73.53%), 23.53% graduated a high school and only 2.94% of them graduated only an elementary school. The differences between the two distributions are statistically significant for  $p < 0.01$ .

### Data about the nutritional behavior

Concerning the diet length for the vegetarian subjects our data show a mean value of 7.14 years with a standard deviation of 4.4. As we can see in the Figure 1, 54.17% of women and 30.68 % of men adopted this diet for 6-10 years. For both men and women the diet length category of 1–5 years and 11–15 years are well represented, with higher values for women. 4.17% of men chose to change their diet and becoming vegetarians for more than 15 years.

The personal motivations declared by the subjects as reasons to become vegetarians are the following:

- Improving their own health status: 53.68%;
- Healing of some specific diseases: 30.88%;

- At the physician’s request: 10.29%;
- In order to lose weight: 3.68%;
- Respect for animal life/ecological reasons: 10.29%;
- Religious/spiritual group interdiction: 1.47%;
- Improving their own psychical and spiritual status: 54.41%;
- Other reasons: 4.41%;

- Do not respond: 3.68%.

As we can see the main reasons to adopt vegetarianism in our studied sample are improving their own health or psychical and spiritual status.

In order to point out the nutritional status of the subjects, we calculated the body mass index (BMI) values for all the studied subjects according to WHO recommendation and the obtained data are shown in Figure 2.

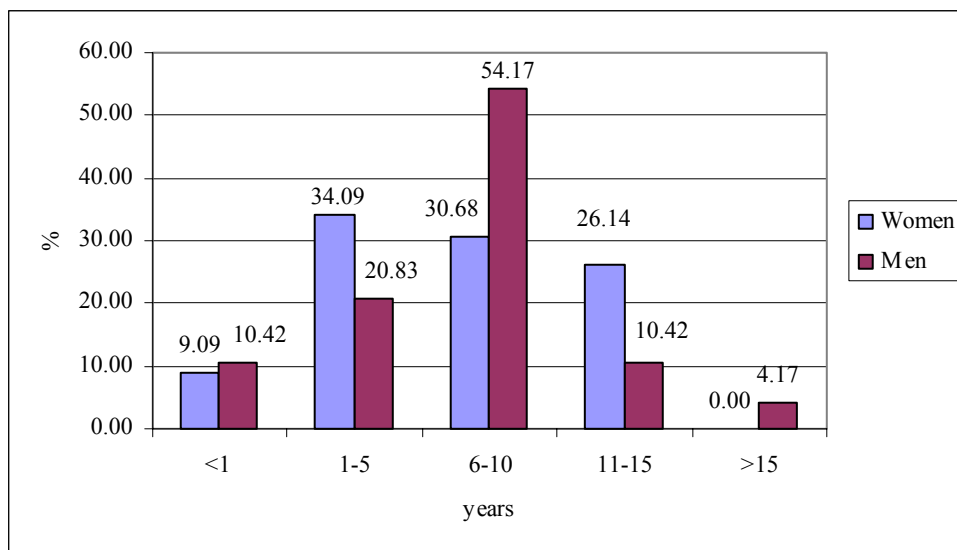


Fig. 1. Sample distribution according to the length of the vegetarian diet, on gender, comparatively.

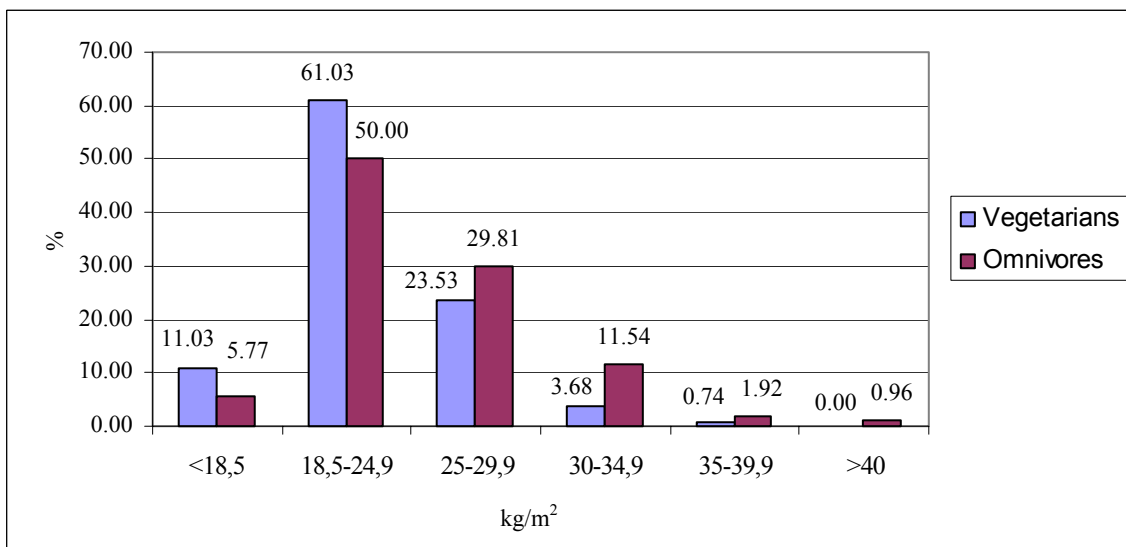


Fig. 2. Distribution according to BMI values, comparatively.

As we can see 61.03% of vegetarians and 50% of omnivores have a BMI value between 18.5 kg/m<sup>2</sup> and 24.9 kg/m<sup>2</sup> that represent the normal range values according to WHO recommendations. It is important to notice an important percent of vegetarians that have a BMI values smaller than 18.5 kg/m<sup>2</sup> that means they are included in the “underweight” class with a high risk of subnutrition, deficiencies and some others nutritional diseases.

Only 74% vegetarians are in class II obesity (BMI values range: 35–39.9 kg/m<sup>2</sup>) and none of them exceeded the critical value of 40 kg/m<sup>2</sup> in order to enter in the class I of obesity. 0.96% of subjects from the control sample have a higher BMI value than 40 kg/m<sup>2</sup>, meaning that they are exposed to a higher risk of cardiovascular diseases, hypertension and some other chronic diseases associated with obesity. The differences between the two samples distribution according to BMI values are statistically significant for  $p < 0.001$ , fact that attest the association between the ovo-lacto-vegetarian diet and a low BMI value.

Concerning the blood pressure situation, our data show that the mean values, both systolic and diastolic are higher for omnivorous subjects (12.8, respectively 7.8 mm Hg) than those of the vegetarians (11.8, respectively 6.9 mm Hg). There are similar differences when the samples are separated according to gender, but are not statistically significant.

Blood glycemia was measured for all the subjects and the obtained data are presented in Figure 3. 50.00% of vegetarians and 53.37% of omnivorous people have a normal value of glycemia but over 40% of subjects of the two studied samples are hypoglycemic. The differences are statistically significant for  $p < 0.01$ .

Concerning the cholesterol measured values, the obtained data are shown in Table 1. It is important to note that the cholesterol test used in this study has a minimum limit of 150 mg/dl. Therefore, blood cholesterol values smaller than 150 mg/dl are written in the table as “<150”.

The mean value of blood cholesterol is 173.29 mg/dl for vegetarians and 183.12 mg/dl for omnivores. When the two samples were separated according to gender, the mean values for both man and women remained similar to the value for the entire sample, for both vegetarian and omnivorous subjects. The differences between the mean values are statistically significant for  $p < 0.01$  according to test.

### Diet and nutrition data

Daily nutrients intake of the subjects of the two samples were analyzed and the obtained data are shown in Table 2, according to food categories (dairy products, eggs, cereals, vegetables, fruits, dietary fat, sugary products).

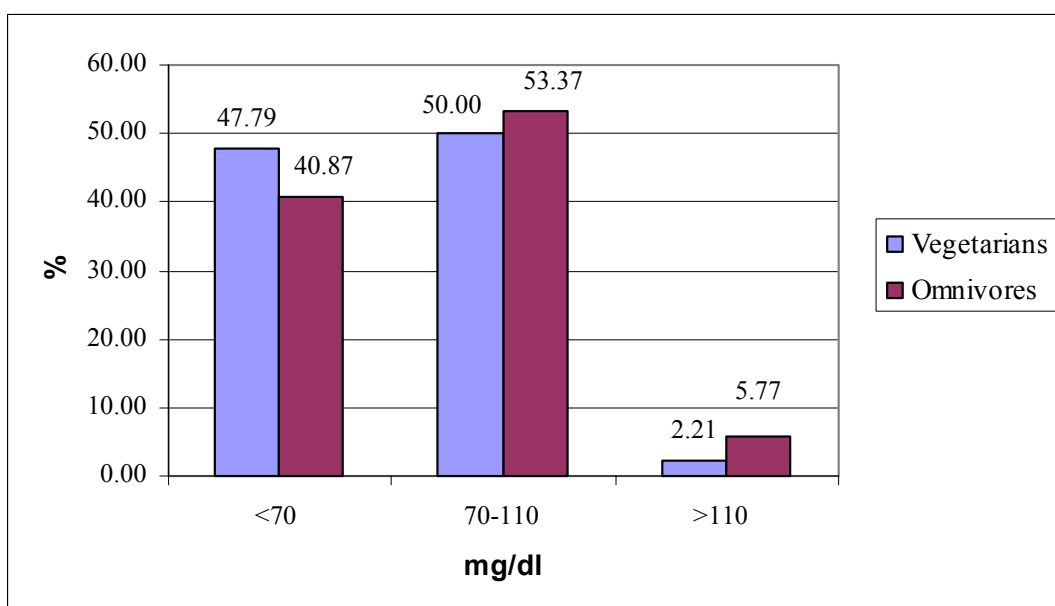


Figure 3. Distribution according to glycemia values, comparatively

Table 1

Total seric cholesterol values comparatively according to gender, for the two studied samples

Sample	Vegetarians				Omnivores			
	Min	Max	Mean	Standard deviation	Min	Max	Mean	Standard deviation
Women	<150	253	173,52	18,79	<150	240	180,38	22,38
Men	<150	202	172,83	17,38	<150	255	187,43	23,32
Total	<150	253	173,29	18,21	<150	255	183,12	22,93

Table 2

Daily intake for the two samples on food categories

Food category	Recomended daily intake* (g)	Vegetarians daily intake	Omnivores daily intake	Statistically, the difference is:
Dairy products	100–110	<b>135.14</b>	<b>101.84</b>	Not significant
Eggs	30–40	<b>15.07</b>	<b>18.56</b>	Not significant
Cereals	300–400	<b>282.29</b>	<b>271.06</b>	Not significant
Vegetables	350–400	<b>544.87</b>	<b>356.85</b>	Significant for p<0.001
Fruits	150–200	<b>248.87</b>	<b>133.95</b>	Significant for p<0.001
Dietary fat	45–55	<b>28.09</b>	<b>28.19</b>	Not significant
Sugary products	60–70	<b>8.24</b>	<b>19.83</b>	Significant for p<0.01

\* Values recommended in Romania.

There are many differences concerning the daily intakes of different categories of food between the two types of diet studied in this research, but not all of them are statistically significant. Thus, the two groups seem to consume similar quantities of dairy products, eggs, cereals and dietary fat. Vegetarians have a daily intake of vegetables and fruits higher than omnivorous subjects (544.87 g vegetables and 248.97 g fruits for vegetarians; 365.85 g vegetables and 133.95 g fruits for omnivores).

Moreover, probably due to the higher consume of vegetables and fruits, both rich in carbohydrates, vegetarian subjects have a daily intake of sugary products significant lower than omnivores.

## CONCLUSIONS

The data presented in this paper suggest that the subjects from the two studied samples are people from general population not from one of social or professional categories. There are not significant differences between the two samples

concerning age, gender, civil status, etc. They are orthodox Christians (over 90% of them, from both samples) in an orthodox country but there are few subjects with other religions/beliefs (Catholic, Muslims, Jehovah's Witness).

It is important to notice an important difference between the two samples concerning the educational level. Thus, among vegetarians are more subjects with a high educational level (college graduation) than in the control sample (73.53% respectively, 31.25%). A higher capacity to access the information and probable a greater willingness to dietary change of those subjects could be the explanation for this situation.

Our data show that vegetarianism is a complex phenomenon that can't be associated to a certain religion or spiritual group, a specific religious or medical doctrine or culture. It is a nutritional behaviour adopted by several people because of different reasons, usually because of their care for health status or their psychical welfare retrieving or developing, who can be young or aged, workers or intellectuals, religious or even atheist.

Concerning the nutritional status, analyzed on BMI values, the present research attests an

association between this restrictive diet and lower values of the body mass index. In the era of the fight against the obesity and its comorbidities, this news is very good. Of course, those who adopt this diet for a short or long term have to take care of daily intake of nutrients because there are studies that attest the possibility of deficiency diseases for strictly vegetarians or a very low calories intake diets.

Our data show that for vegetarians there are lower values of blood glycemia and cholesterolemia, also good news for diabetes or ischemic cardiovascular diseases. Vegetarianism is not a treatment is a diet and further studies are required to make the data reliable and applicable.

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