

# DO SIBERIAN YOGA PRACTITIONERS RISK HEALTH IF THEY FOLLOW LACTO VEGETARIAN DIET?

Czy osoby uprawiające jogę na Syberii  
i stosujące dietę wysokobiałkową ryzykują utratę zdrowia?

LIUDMILA KLIMATSKAYA<sup>1 A-F</sup>  
OLGA ZAITSEVA<sup>2 A-F</sup>

- 1 Krasnoyarsk State Pedagogical University named after V.P. Astafiev, Krasnoyarsk, Russia
- 2 Science-Research Institute of Medical Problems of the North, Russian Academy of Medical Sciences, Siberian Branch, Krasnoyarsk, Russia

A – przygotowanie projektu badania | study design, B – zbieranie danych | data collection, C – analiza statystyczna | statistical analysis, D – interpretacja danych | data interpretation, E – przygotowanie maszynopisu | manuscript preparation, F – opracowanie piśmiennictwa | literature search, G – pozyskanie funduszy | funds collection

## SUMMARY

**Background:** Practicing yoga has become widely popular in Siberia and vegetarian diet constitutes one of its most important assumptions with a great impact on the human body. However, vegetarians are not the tradition in Siberia.

**Aim of the study:** To evaluate the diet and assess whether Siberian yoga practitioners risk health reducing some nutrients' intake.

**Material and methods:** 47 Siberian women practicing yoga (program "Art of Living"), aged  $31.9 \pm 7.4$  years and the residents of Krasnoyarsk city were examined. Their height and weight were recorded. Then, the values of height and weight were used to calculate their BMI. After that, their current food consumption was assessed using a 24-hour nutritional recall. The recall was the basis to assess the quantitative content, composition and nutritional value of their average daily nutrition ration. The mean energy values and the levels of basic food components were calculated with the use of the computer program. The studies were conducted in the winter-spring period.

**Results:** The data shows that, within the group of women examined in the study, over- or under-nutrition in accordance to the classification of BMI  $20.88 \pm 2.51$  kg/m<sup>2</sup> have not been found. Their daily diet includes milk and dairy products, grains, legumes, nuts, cereals, vegetables, fruit, dried fruit, berries, leafy greens, seeds and herbs. Lacto vegetarian sportswomen have 4–5 meals a day with the use of up to 2 liters of water. The diet contains a variety of products and takes energy from carbohydrates, proteins and fats. The diet provides quantitative protein content, but it should be designed to avoid the use of proteins as the energy source. The ratio of proteins vs. fats vs. carbohydrates was 1 : 1 : 3.96, which can

be considered as the norm for proteins and fats, but not for carbohydrates (recommendations for sportsmen 1 : 1 : 5). In our opinion, the energy goals were not met due to low intake of carbohydrates in women group practicing yoga in Siberia. The daily average consumption of vitamins in the group corresponds to the consumption of vitamins in the whole Russian population. Unfortunately, there is the imbalance between calcium (Ca), phosphorus (P) and magnesium (Mg) in the dietary habits which is not positive for the musculoskeletal system. We have also identified a high consumption of sodium (Na) and low of potassium (K), which can lead to some kidney and heart disorders.

**Conclusions:** The research has helped us to answer the question whether Siberian yoga practitioners risk health if they are lacto vegetarians. Here are the findings:

1. Among lacto vegetarian yoga practitioners from Siberia over- or under-nutrition in accordance to the classification of BMI have not been found.
2. Lacto vegetarian yoga practitioners have appropriate nutritional habits: 4–5 meals a day with the use of up to 2 litres of water.
3. Food set has plastic, energy and biologically stimulating regulatory value.
4. Siberian female yoga practitioners have low (2%) probable risk of osteoporosis caused by inadequate intake of Ca in their daily diet and medium-risk (16%) of anemia caused by iron (Fe) deficiency and, therefore, they should supplement their diet using mineral supplements from the pharmacy. Certainly, vegetarians are not the tradition from the point of view of Siberia where it is difficult to find fresh vegetables, but lacto vegetarian diet can be successfully used.

**Keywords:** women yoga practitioners, lacto vegetarian diet, probable health risk

## STRESZCZENIE

**Wstęp:** Uprawianie jogi stało się bardzo popularne w regionie Syberii, a wegetarianizm, który ma znaczący wpływ na organizm człowieka, jest uważany za jeden z ważnych elementów tej sztuki.

**Cel pracy:** Ponieważ wegetarianizm nie jest tradycją na Syberii, celem pracy było zbadanie i ocena diety syberyjskich kobiet uprawiających jogę oraz odpowiedź na pytanie, czy ryzykują one utratę zdrowia, zmniejszając spożycie niektórych składników odżywczych.

**Materiał i metody:** W badaniu wzięto udział 47 kobiet (średnia wieku wynosiła  $31,9 \pm 7,4$  lat (SD)), zamieszkałych w Krasnojarsku, uczestniczących jednocześnie w programie „Sztuka życia”. Na podstawie pomiaru wzrostu i wagi wyliczono ich BMI, 24-godzinna obserwacja nawyków dietetycznych kobiet była podstawą do oceny zawartości ilościowej, kompozycji i oceny wartości odżywczej dziennej porcji żywieniowej. Przy użyciu programu komputerowego obliczono również wartość energetyczną podstawowych produktów żywieniowych. Badanie przeprowadzono w okresie zimowo-wiosennym.

**Wyniki:** Zebrane dane pokazują, że w grupie badanych nie stwierdzono niedożywienia ani nadwagi, biorąc pod uwagę czynnik BMI. Codzienna dieta zawiera takie składniki jak: mleko i produkty mleczne, produkty wielozbożowe, rośliny strączkowe, orzechy, płatki owsiane, warzywa i owoce, w tym również owoce suszone, warzywa liściaste, nasiona i zioła. Kobiety spożywają od 4 do 5 posiłków dziennie i piją średnio 2 litry wody. Ich dieta jest zróżnicowana, a źródłem energii są węglowodany, białka i tłuszcze. Białka stanowią znaczną część ich diety, ale powinno się unikać sytuacji, w których stanowią najważniejsze źródło energii. Stosunek białka do tłuszczów i węglowodanów wyniósł 1 : 1 : 3,96, co może być uznane za normę dla białka i tłuszczu, ale nie stanowi normy dla węglowodanów.

**Słowa kluczowe:** kobiety uprawiające jogę, dieta wysokobiałkowa, ryzyko zdrowotne

Prawidłowo u osób uprawiających sport powinien on wynosić 1 : 1 : 5. Tak więc zauważamy nieznaczny niedobór węglowodanów w codziennej diecie. Średnie spożycie witamin odpowiada standardom przyjętym dla całej populacji rosyjskiej. Niestety, zauważono zachwianie równowagi pomiędzy spożyciem wapnia, fosforu i magnezu, co może mieć znaczący wpływ na rozwój i funkcjonowanie układu mięśniowo-kostnego. Zaobserwowano również wysokie spożycie sodu i niskie potasu – może to wpływać na zaburzenia i choroby serca oraz nerek.

**Wnioski:** Badanie stało się podstawą do odpowiedzi na pytanie, czy kobiety uprawiające jogę na Syberii i stosujące dietę wysokobiałkową ryzykują zdrowiem. Wśród wniosków możemy znaleźć następujące:

1. Nie stwierdzono niedowagi lub nadwagi w grupie badawczej.
2. Badane kobiety mają prawidłowe nawyki żywieniowe i spożywają prawidłową liczbę posiłków.
3. Spożywane produkty mają prawidłową biologiczną i energetyczną wartość.
4. Stwierdzono, że u kobiet w grupie badawczej prawdopodobieństwo wystąpienia osteoporozy wynosi 2%, co jest spowodowane niedoborem wapnia, a 16% prawdopodobieństwo pojawienia się anemii z powodu niedoboru żelaza, które powinny uzupełniać, stosując suplementy minerałów dostępne w aptece.
5. Wegetarianizm nie jest tradycją na Syberii, ale dieta wysokobiałkowa może być stosowana z powodzeniem wśród osób uprawiających jogę.

## Background

Practicing yoga has become widely popular in Siberia and vegetarian diet constitutes one of its most important assumptions with a great impact on the human body [1,2].

However, vegetarians are not the tradition in Siberia. The consumption and the kind of food chosen by people in Siberia may be determined not only by contemporary conditions such as the availability and the price of the products, but also by food preferences connected with the established national traditions (the recipes are handed down from generation to generation and, thus, they are still alive), culture and the life-style. The dietary history in Siberia is mostly based on meats, fish, peanuts and crops that can be grown in cold climate [3], such as grains (rye, barley, buckwheat, and wheat), root vegetables (beets, turnips, potatoes, onions), and cabbage.

## Aim of the study

The purpose of the study was to evaluate the diet of yoga practitioners in Siberia and assess the probable risk of nutrients' deficiency. To our knowledge, only one study has concentrated on the aspect of yoga nutrition and health in Siberia so far [4]. The analysis of these problems will help to improve the knowledge about nutrition and health among yoga practitioners in the region.

## Material and Methods

47 Siberian women practicing yoga (program "Art of Living"), aged  $31.9 \pm 7.4$  years and the residents of

Krasnojarsk were examined during the research. Their height and weight were recorded. The values obtained for height and weight were used to calculate their BMI (body mass index). The current food consumption was assessed using a 24-hour nutritional recall [5]. The recall was the basis for the assessment of the quantitative content, composition and nutritional value of the average daily nutrition ration. The mean energy values and the levels of basic food components were calculated with the use of the computer program (calorizator.ru/analyzer/products) and compared with the recommendations [6]. The values of probable risk of nutrients' deficiency was also calculated and assessed [6]. The studies were conducted in the winter-spring period.

## Results

### Body mass index (BMI) calculation

For the purpose of the study we examined the respondents for their height and weight and recorded the measurements. The obtained values for height and weight were, then, used to calculate their BMI (body mass index).

Table 1. Age and somatic variables

Parameter	n = 47	
	average	SD
Age, years	31.90	7.40
Height, m	1.67	0.05
Body weight, kg	58.10	7.85
BMI, kg/m <sup>2</sup>	20.88	2.51

The data shows that in the study group over- or under-nutrition in accordance to the classification of the body mass index (18.5–24.9 kg/m<sup>2</sup>) have not been found.

#### Diet assessment

The diet contains a variety of foods and takes energy from carbohydrates, proteins and fats. Fibers, vitamins and minerals are also required at differing levels for a healthy diet [7]. The food set of Siberian vegetarians includes: milk and dairy products, grains, legumes, nuts, vegetables, fruit, dried fruit, berries, leafy greens, herbs (herbs, seeds) (Table 2). Therefore, they are considered as lacto vegetarians.

Proteins seem to be the most important component of the diet, however, it is composed of proteins which come from different foods. The quantity of the biological variability of the proteins with a protein content of more than 3% (most dairy products, beans, cereals) ranges from 3–7%, while the biological variability of the proteins from products having a protein content of less than 3% (vegetable products) is approximately 2-fold higher and ranges 6–14%.

The distribution of foods and dishes for individual meals is very important for the effective functioning of the digestive organs and optimal digestion which normalizes the metabolism [8]. The lacto vegetarian sportswomen have 4–5 meals a day with the use of up to 2 liters of water which is considered most favorable.

The data of daily calories and macronutrients in the diet of Siberian yoga practitioners compared with the recommended range for women 30–39 years old with the coefficient of physical activity 1.6 (type of Training light intensity < 1 hour/every day) can be viewed in Table 3.

The diet provides quantitative protein content, but it should be designed to avoid the use of protein as the energy source. Therefore, the balance of macronutrients was determined. The ratio of «proteins: fats: carbohydrates» was 1 : 1 : 3.96, which can be considered as the norm for proteins and fats, but not for carbohydrates. Many yoga practitioners believe that carbohydrates will solve energy problems. In our opinion, the energy goals were not met due to low intake of carbohydrates in the research group. Table 4 and Table 5 show data of daily vitamins and minerals in the diet of the yoga practitioners.

Average daily consumption of vitamins in yoga group corresponds to the consumption of vitamins for the whole Russian population.

As Table 5 shows, there is an imbalance between Ca, P and Mg in the diet which is not positive, first of all, for the musculoskeletal system. We have also identified a high consumption of sodium and low of potassium, which can lead to the disorders of the kidneys and the heart.

The value of probable risk of improper nutrients' intake in Russia was also calculated. The calculation

**Table 2.** Food set and primary values of foods eaten by Siberian yoga practitioners

Plastic value	Energy value	Biologically stimulating, regulatory value
Milk and milk products (industrial processing), eggs, nuts	Bakery products, made from rye and wheat flour; pasta and cereals products, beans, honey, fats (vegetable oils were «cold» pressed)	Vegetables, fruit, berries and juices

**Table 3.** Daily calories and macronutrients in the diet of Siberian yoga practitioners compared with the recommended range in Russia for women 30–39 years with the coefficient of physical activity 1.6 (type of Training light intensity < 1 hour/every day)

Indicators	Kcal/day	Proteins g/day	Fats g/day	Carbohydrates g/day	Dietary fiber g/day
Recommended range	2150	65	72	311	20
Average in yoga practitioners	2007	81	82	309	21

**Table 4.** Daily vitamins in the diet of Siberian yoga practitioners compared with the average consumption and updated physiological need for adults in Russia (mg/day)

Indicators	C	B <sub>1</sub>	B <sub>2</sub>	B <sub>6</sub>	A	E
Average consumption	55–70	1.3–1.5	1.0–1.3	2.1–2.4	500–620	17.8–24.6
Updated physiological need	90	1.5	1.8	2.0	900	15.0
Average consumption in yoga practitioners	48–102	1.1–1.3	1.2–1.8	1.7–2.3	718–820	14.0–20.0

**Table 5.** Daily minerals in the diet of Siberian yoga practitioners compared with the recommended range in Russia (mg/day)

Indicators	Ca	P	Mg	Na	K	Zn	Cu	Fe
Average consumption	500–750	1200	300	3000–5000	3100	7.5–17.0	0.9–2.3	17
Updated physiological need	1000	800	400	1300	2500	12.0	1.0	18
Average consumption in yoga practitioners	648–850	2089	561	3204–3738	1617	11.0–15.0	0.79–1.93	13–18

data shows that women in the yoga group have low (2%) and medium (16%) probability of health risk caused by inadequate intake of daily nutrients, accordingly Ca and Fe (Table 6). They need to supplement iron and calcium deficiency as the form of prophylaxis.

When using the recommended range to estimate nutrient calculations we have in mind the following [6]:

- Indicators of individual needs in the population for food substances have a normal distribution, i.e. needs 95% of the respondents are within two standard deviations from the average needs;
- The average value of the needs means that one half of the respondents (50%) are below the individual needs and the other above the average needs. Actual consumption needs at the secondary level would indicate 50% probable risk of inadequate intake.

## Discussion

In the study, we have focused on the macronutrient needs in the diet, because there is no problem with over- or under-nutrition among Siberian yoga practitioners and they have 4–5 meals a day with the use of up to 2 liters of water.

The good news is that lacto vegetarians who consume adequate amounts of plant and vegetable proteins do not experience a severe protein deficiency. The protein needs of yoga practitioners are higher than those of most other people [9]. As a result, vegetarian athletes need to pay close attention to their protein choices and serving sizes. We, in Russia, recommended 0.75–1.0, max 1.6 g/kg body weight/day protein. The protein recommendation [10] for active athletes ranges from 1.2 to 1.4 g/kg/day (0.55–0.64 g/lb/day). During times of intensive training, including resistance exercise, the recommendation increases to 1.6–1.7 g/kg/day (0.73–0.77 g/lb/day). Regardless of whether they follow

an omnivore or a well-balanced herbivore diet, most athletes do not experience much difficulty in achieving these recommended amounts.

However, vegetarian diet should be high in mono- and polyunsaturated fats, such as nuts and nut butters; seeds; tahini; olives; avocados and plant oils, such as olive oil [11]. Fat provides necessary fuel and essential fatty acids; it is also vital for the absorption of fat-soluble vitamins. Athletes should aim to obtain 20–25% of their total calories from fat [11]. In fact, vegetarian diets tend to be higher in dietary fibers, phytochemicals, vitamins and lower in calories [10]. Unfortunately, uncontaminated plant foods do not provide vitamin B<sub>12</sub> and researchers agree that vegans should eat B<sub>12</sub>-fortified foods or take a supplement [12]. A diet based on plant sources and high in fruit and grains is naturally rich in carbohydrates. But in our case, yoga practitioners need higher carbohydrate intake as the energy value (in fact introduces specific Siberia climate [2,3]).

We have also identified a high consumption of sodium and low of potassium, which can lead to the disorders of the kidneys and the heart. Siberians have an imbalance between Ca, P and Mg in their dietary habits which is not positive, first of all, for the musculoskeletal system. Therefore, common micronutrients should be closely monitored [13].

The calculation data shows that yoga practitioners have the probability of low-risk (2%) by Ca criterion (possibility of osteoporosis) and probability of medium-risk (16%) by Fe criterion (possibility of anemia) and should be advised to supplement them by using minerals from pharmacy.

Well-planned vegetarian diets can reduce the risk of diseases [14,15,7], and are regarded as appropriate for all stages of the life-cycle by the American Dietetic Association, the Australian National Health and Medical Research Council, and Dietitians of Canada [11].

Table 6. Value of probable risk of inadequate intake of daily nutrients in the research group\* [6]

Nutrients	Value of probabilistic risk					
	no risk	2%	16%	50%	84%	98%
Protein, g/kg body weight/day yoga practitioners	0.75–1.0 max 1.6	0.75	0.675	0.60	0.525	0.45
	0.8–1.3*					
B <sub>1</sub> , mg/day yoga practitioners	1.1–1.5	1.1	1.0	0.9	0.8	0.7
	1.1–1.3*					
B <sub>2</sub> , mg/day yoga practitioners	1.1–1.8	1.1	1.0	0.9	0.8	0.7
	1.2–1.8*					
C, mg/day yoga practitioners	40–90	40.0	32.5	25.0	17.5	10.0
	48–102*					
A, mcg/day yoga practitioners	700–900	700.0	600.0	500.0	400.0	300.0
	718–820*					
Ca, mg/day yoga practitioners	700–1000	700.0	612.5	525.0	462.5	450.0
	648–850*	648				
Fe, mg/day woman yoga practitioners	14.8–18.0	14.8	13.1	11.4	9.7	8.0
	13–18*		13			

\*probable risk of inadequate intake in daily female nutrients in the research group



## Conclusions

The research has helped us to answer the question whether Siberian yoga practitioners risk their health if they are lacto vegetarians?

- Among lacto vegetarian yoga practitioners from Siberia over- or under-nutrition in accordance to the classification of body mass index (18.5–24.9 kg/m<sup>2</sup>) have not been found.
- Lacto vegetarian yoga practitioners have appropriate nutritional habits: 4–5 meals a day with the use of up to 2 liters of water.

- Food set has plastic, energy and biologically stimulating regulatory value.
- Siberian female yoga practitioners have low (2%) probable risk of inadequate intake in a daily diet by Ca criterion (possibility of osteoporosis) and medium-risk (16%) by Fe criterion (possibility of anemia) and should be challenged to supplement it through minerals from pharmacy. Of course, vegetarians are not tradition from the point of view of Siberia, where it is difficult for fresh vegetable diet, but the lacto vegetarian one can be successfully used.

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### Adres do korespondencji:

Liudmila Klimatskaya  
Krasnoyarsk State Pedagogical University named after V.P. Astafiev  
A. Lebedeva St., 89, Krasnoyarsk, 660017, Russia  
Department of Social Pedagogy and Social Work  
Tel. +7 (391) 2639521  
E-mail: klimatskaya47@mail.ru

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