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The occurrence of abnormal body weight values and selected eating habits and physical activity of nurses

Wioletta Waksmańska[a], Halina Woś[b], Rafał Bobiński[c]

Faculty of Health Sciences, University of Bielsko-Biala, Poland
[a] https://orcid.org/0000-0001-7141-5981
[b] https://orcid.org/0000-0002-4274-1689
[c] https://orcid.org/0000-0002-3649-5653

ABSTRACT

Aim. The aim of the research was to analyze the incidence of abnormal body weight values and to assess eating habits and physical activity of nurses.
Material and Methods. The studies involved all first-year nursing students of the second degree daily studies, working as a nurse. The women's eating habits were analyzed based the diet. The questionnaire allowed the researchers to determine daily consumption of each particular dietary component (proteins, carbohydrates, fats, fatty acids, vitamins) as well as the women's calorie consumption.
Results. The analysis showed that the group of underweight participants was comprised of 5 students (group I), the group of participants with normal body weight — of 43 students (group II), and the group of participants with excessive body weight — of 10 students (group III). Group II students spent the longest time on (moderate and intense) physical activity (on average 378 minutes/week), whereas group III students — the shortest (on average 203 minutes/week). While analyzing the average protein intake, it was found that all groups exceeded its daily requirement. The intake of sodium and cholesterol was exceeded more than twice of the recommended amount. A very low intake of vitamin D — covering from 40 to 48% of the daily requirement — was observed in all groups.
Conclusions. Despite the fact that the nurses' diet includes all nutrients necessary for the body, it is not properly balanced which obliges to raising awareness of types of consumed food.

Keywords: BMI; lifestyle; nutrition; public health; vitamin.

Introduction

Contemporary lifestyle is the subject of numerous studies and discussions. Rush, excessive responsibilities, stress as well as lack of sleep or physical activity are factors affecting health [1, 2]. Other negative factors also include poor eating habits, such as: low consumption of vegetables and fruit, eating highly processed products, high consumption of fast food products, excessive coffee drinking, complementing nutrient deficiencies by means of dietary supplements. Such a lifestyle leads to occurrence of abnormal, especially excessive, body weight values, cardiovascular diseases including hypertension, lipid disorders, diabetes, and even cancer [3]. An important element of prevention of the irregularities is health education which should start as early as in childhood and result in positive behaviors later in life [4]. However, numerous studies indicate that the above statements are far from real practice. The level of students' knowledge about healthy

lifestyle is very low. This applies both to students of technical departments, the humanities, and often also to students of medical departments, including nursing [3, 5, 6]. Nurses are expected to take positive actions contributing to health, such as risk assessment of unhealthy lifestyle, health education and disease prevention [7, 8]. However, the number of responsibilities including work and professional training as well as irregular sleep prevent nurses from leading a healthy lifestyle themselves and make them set a bad example to others and risk their own health and life.

Aim

The aim of the research was to analyze the incidence of abnormal body weight values and to assess eating habits and physical activity of nurses who work and enhance their professional skills at second degree studies.

Material and Methods

The studies involved all first-year nursing students of the second degree daily studies, working as a nurse, in the academic year 2016/2017. The students of second degree studies are nurses with *Bachelor's degree in nursing* who improve their qualifications pursuing Master's degree studies. Altogether, 58 women aged 22–41 were involved in the study.

The study exclusion criteria included not being employed as a nurse and taking dietary supplements with vitamins and minerals in the period of 6 months preceding the study.

The women's eating habits and dietary composition were analyzed based the diet. Portion sizes were verified using "The Album of Photographs of Food Products and Dishes" [9]. The women filled in the questionnaire on the basis of the album, specifying the quantity and quality of the food consumed. The questionnaire allowed the researchers to determine daily consumption of each particular dietary component (proteins, carbohydrates, fats, fatty acids, vitamins) as well as the women's calorie consumption. The questionnaire included a list of products grouped according to the following food groups: milk and dairy products, eggs, meat, sausages, offal, fish, seafood, animal and vegetable fats, vegetables, fruit and fruit-products, potatoes and potato-based products, seeds, legumes, cereals and cereal-products, pre-cooked ready-meals, salty snacks, nuts and grains, sugar and sweets, soft drinks, alcohol, soup concentrates, sauces and spices. The study participants had to record how frequently they consumed each product, with the options being: daily, several times a week, once a week, 2–3 times a month or never.

The DIETA FAO program, which includes data on 1067 typical Polish dishes or food products, was used to estimate the quantity of the aforementioned components. Dietary consumption was validated via the 'Food Intake Frequency Questionnaire', a 7-day nutritional survey. The method employed consisted in writing down all the products and dishes which were consumed each day, for a period of 7 days. The DIETA FAO program allows to specify the vitamin and mineral content in particular components of a diet. Energy and nutrient requirement was determined for women weighing 65 kilograms. The obtained average intake values were compared with United States Department of Agriculture dietary guidelines for people with moderate physical activity and with *Normy żywienia dla populacji polskiej* (Nutrition standards for Polish population) [10, 11]. The research consisted in conducting measurement of body weight and height of each student and calculating the BMI value which was categorized in accordance with WHO recommendations: underweight < 18.5, norm 18.5–24.9, overweight 25.0–29.9, obesity ≥ 30.0.

The measurement of physical activity was conducted on the basis of the Polish version of the *International Physical Activity Questionnaire* — IPAQ, approved by the IPAQ Committee, which was filled in by the respondents. The duration of physical activity was presented as the weekly number of minutes (MET — minutes/week) [12].

Excel v. 2010 spreadsheet was used for statistical analysis, the Pearson correlation coefficient was calculated. The statistical significance was determined at $p < 0.05$.

Ethical Consideration

According to the Polish legal system this research did not require the approval of the Bioethics Review Board. All participants gave the informed consent for taking part in the research, the participation in this study was voluntary and the anonymity of the participants was preserved.

Results

The average age of the tested subjects was 25 years and 8 months. The conducted analysis showed that the group of underweight participants was comprised of 5 students (group I), the group of participants with normal body weight — of 43 students (group II), and the group of participants with excessive body weight — of 10 students (group III).

In group I — participants with underweight — the average BMI value was 17.6. The diet of students of this group contained on average 2005.7 kilocalories which accounted for 90% of the energy requirement standard. In group II — comprised of students with normal body weight — the caloric value of a daily food intake was 2430.7, which accounted for 110% of the norm, while the average BMI value was 21.62. In the case of group III — students with excessive body weight — the average BMI value was 27.91 and the caloric value of daily food intake was 3116.94 kilocalories, which accounted for 141% of the energy requirement standard.

Group II students spent the longest time on (moderate and intense) physical activity (on average 378 minutes/week), whereas group III students — the shortest (on average 203 minutes/week). Group I students spent the last time travelling by car. All students consumed an amount of water which only covered 64–76% of the daily requirement. While analyzing the average protein intake, it was found that all groups exceeded its daily requirement. At the same time, the

Table 1. Average values of selected nutrients intake and coverage of the daily demand in the analyzed groups of students

Tested variable/ tested group	Group I		Group II		Group III	
MET-min./week	average	coverage of norms	average	coverage of norms	average	coverage of norms
BMI	17.6	-	21.62	-	27.91	-
Energy [kcal]	2005.7	90%	2430.7	110%	3116.94	141%
Moderate activity [MET-min/week]	210	-	245	-	189	-
Intense activity [MET-min/week]	126	-	133	-	14	-
Driving time [MET-min/week]	340	-	575	-	360	-
Water [l]	1.73	64%	1.83	68%	2.05	76%
Total protein [g]	94.49	205%	97.56	212%	107.99	234%
Animal protein [g]	67.48	ND	66.98	ND	74.79	ND
Vegetable protein [g]	27.01	ND	30.48	ND	32.97	ND
Fat [g]	82.85	71%/	101.3	87%/	127.41	111%/
Carbohydrates [g]	240.29	184%	300.93	231%	413.06	317%
Sodium [g]	3.27	218%	4.04	269%	4.6	307%
Potassium [g]	3.17	68%	3.64	77%	3.83	82%
Calcium [mg]	697.01	87%	691.41	86%	929.41	116%
Phosphorus [mg]	1478.75	254%	1565.68	269%	1793.72	309%
Magnesium [mg]	303.3	114%	335.43	126%	390.64	147%
Ferrum [mg]	11.9	110%	13.6	136%	14.93	149%
Zinc [mg]	11.41	165%	13.18	193%	15.87	233%
Copper [mg]	1.04	148%	1.27	181%	1.49	212%
Vitamin A [µg]	928.09	185%	1297.9	259%	1738.24	347%
Vitamin B6 [mg]	2.07	159%	2.43	186%	3.11	239%
Vitamin B12 [mg]	3.57	178%	4.18	209%	5.77	288%
Vitamin C [mg]	46.87	78%	57.18	95%	70.56	117%
Vitamin D [µg]	4.77	48%	4.08	40%	4.36	44%
Vitamin E [mg]	9.61	80%	11.01	93%	14.86	123%
Iodine [µg]	126.43	132%	132.62	138%	143.31	150%
Folates [µg]	271.89	85%	310.98	97%	309.87	97%
Saturated fatty acids [g]	35.09	ND	40.32	ND	53.46	ND
Monounsaturated fatty acids [g]	28.91	ND	39.33	ND	46.91	ND
Polyunsaturated fatty acids [g]	12.27	ND	14.63	ND	18.91	ND
Cholesterol [mg]	575.39	246%	508.21	220%	468.48	202%
Dietary fibre [g]	21.07	84%	23.33	93%	36.73	146%

amount of animal protein intake exceeded the amount of vegetable protein intake twice. The intake of sodium and cholesterol was exceeded more than twice of the recommended amount. It was observed that in group III the recommended intake was exceeded by more than 300% in the case of sodium (307%), phosphorus (309%) and vitamin A (347%). The average intake value of fat, potassium and calcium in groups I and II was below standard. A very low intake of vitamin D — covering from 40 to 48% of the daily requirement — was observed in all groups (**Table 1**).

Statistical analysis revealed existence of both positive and negative correlations in the analyzed variables. In group I there are negative correlations between moderate and intense physical activity, and the BMI value as well as positive correlations between total protein intake and animal protein, and the BMI value. Negative correlation means that the BMI value decreases along with

Table 2. Value of the Pearson correlation coefficient showing the correlation between physical effort and the amount of protein consumed and the BMI value in the tested group (I) of students with p below 0.05

Value of the correlation coefficient in the group of students	Moderate physical activity and the BMI value	Intense physical activity and the BMI value	The overall amount of protein consumed and the BMI value	The amount of animal protein consumed and the BMI value
Group I	-0.822	-0.655	0.536	0.618

Table 3. The Pearson correlation coefficient value showing the relation between the amount of monounsaturated and saturated fatty acids intake and the BMI values in the I groups of students. p below 0.05

Value of the correlation coefficient in the group of students	The amount of saturated fatty acids consumed and the BMI value	The amount of monounsaturated fatty acids intake and the BMI value
Group I	0.763	0.905
Group II	0.594	0.830
Group III	0.682	0.904

Table 4. The Pearson correlation coefficient value showing the average consumption of selected nutrients in given groups of students. p below 0.05

Correlation coefficient value	Group I/Group II	Group II/Group III	Group I/Group III
Moderate activity [MET-min/week]	-	-	-0.59
Intense activity [MET-min/week]	0.73	-	-
Driving time [MET-min/week]	-	-	-0.65
BMI	-	0.58	-
Energy [kcal]	-	-	0.55
Animal protein [g]	0.75	-	-0.54
Vegetable protein [g]	-	-	0.76
Fat [g]	0.53	-	0.63
Carbohydrates [g]	-0.69	-0.69	-
Potassium [g]	-0.66	-	0.54
Calcium [mg]	-	-	-0.72
Magnesium [mg]	-	-	0.93
Copper [mg]	-	-	0.61
Vitamin B6 [mg]	-	-	0.68
Vitamin B12 [mg]	0.67	-	-0.65
Vitamin C [mg]	-0.55	-	-0.67
Vitamin D [µg]	0.75	-	-
Vitamin E [mg]	-0.67	-	0.51
Iodine [µg]	-0.68	-	-
Saturated fatty acids [g]		-	0.79
Polyunsaturated fatty acids [g]	-	-	0.97
Cholesterol [mg]	-	-0.72	-
Dietary fibre [g]	-0.78	-	-
Financial situation	-	-	0.97

the increase of physical activity, whereas positive correlation means that the BMI value increases along with the increase of the amount of protein intake (**Table 2**).

In all three analyzed groups there is positive correlation between the intake of saturated and monounsaturated fatty acids and the BMI value, which means that along with the increase of the above mentioned fatty acids intake the BMI value also increases (**Table 3**).

The conducted statistical analysis also examined the existence of a correlation between particular groups of students. While comparing group I with group II 11 correlations were found — among others: positive correlations of intense physical activity, average animal protein and fat intake, and negative correlations referring to average carbohydrate intake. When comparing group II and III only 3 correlations were observed. The highest number of correlations (17) were found when comparing group I and group III. They include positive correlations pertaining to average vegetable protein and fat intake, and negative correlations of moderate physical activity, the time spent on moving by car, average animal protein intake (**Table 4**).

Discussion

Polish research conducted in 2009 showed that 38.4% of women were overweight and 29.1% were obese [13]. The WOBASZ II (the abbreviation of Polish: Multicenter National Research on Health Status of the Population) research conducted in the years 2013–2014 demonstrated BMI above 30 (obesity) in 23.4% of women, and BMI above 25 (overweight) in 29.5% of women. Compared to the WOBASZ 2003–2004 research the distribution of body weight shifted to higher values in the case of obesity by 1.1% and overweight by 1.8% [14]. On the basis of the analysis of data on prevalence of excessive body weight from the period 1995–2010 it was stated that the percentage of obese women in Poland amounted to 23.3%. Thus, unless any changes are implemented, the percentage will increase to 27.3% of women in 2020, and to 31.4% in 2030 [15]. No occurrence of obesity was observed in the authors' own research.

The American National Health and Nutrition Examination Survey (NHANES) conducted in the years 1999–2008 revealed an average BMI value of 27.7 in the United States in women aged 16–49, which indicates the occurrence of overweight [16]. Research on a group of Warsaw students conducted at the turn of 2008 and 2009 revealed an average BMI value of 24.19 [17], i.e. a lower value than the one revealed by American studies. The average BMI value in the authors' own research was 22.38, which is even lower than the value in the group of Warsaw students. Research carried out in Calcutta in India in the years 2011–2012 on a group of students aged 20–22 found that 69.23% of the participants were overweight [2]. In the authors' own research overweight was observed in 17.2% of respondents, however, underweight was relatively common and concerned 8.6% of the tested women. It should also be noted that the average age of respondents was higher and amounted to 25 years and 8 months. Moreover, the tested group was selected according to particular criteria — it was comprised of nurses developing their professional skills pursuing second degree studies.

The European Health Interview Survey (EHIS) was carried out in Poland in 2014 in accordance with recommendations of the European Union. The survey revealed that 30.1% of women were overweight, 15.6% were obese and 4.2% were underweight. These results indicate that body weight of Polish women continues to increase [18]. No occurrence of obesity was observed in the authors' own research. However, the increase of the number of people with excessive body weight is considerable and pertains to most of the European countries [15].

The increase in the number of people with excessive body weight is connected with positive energy balance. It should be noted, however, that while determining the size of consumed portions — and thus the number of consumed nutrients — it is crucial to check whether the whole portion was eaten. The analysis of publications covering the period of 1995–2010 conducted by Krzysztoszka et al. demonstrated that factors which may affect the positive energy balance — and thus the excessive body weight — include stress and lack of sleep both resulting in an increased appetite for high-energy products, especially for carbohydrates [15]. The authors' own research demonstrated that the level of coverage of daily energy requirement was exceeded in the group of women with excessive body weight and the group of

women with the correct BMI value. Whereas daily carbohydrate requirement was exceeded in all analyzed groups. It confirms that an excessive carbohydrate intake results in positive energy balance.

Research carried out in Portugal on a group of students aged 18–25 demonstrated that most of the students had correct body weight values. The students also had relatively good eating habits and were physically very active [19]. Physical activity is a significant element of human life. People devoting their time to physical activity have greater work motivation and life satisfaction. Activity at an appropriate level prevents occurrence of the so called metabolic syndrome. Public health campaigns aiming at promoting and increasing physical activity are held. However, studies show that attempts at making the adult part of the society more active are not very effective. It is thus important to raise awareness of the benefits of physical activity as well as of increasing physical activity to a recommended level [1].

In 2010, while conducting research on a group of 100 students, Ślusarska et al. concluded that 23% of the tested students were overweight, 3% obese and 7% underweight. Despite all of the participants being students, the group was not homogenous because the tested subjects studied both at medical and non-medical departments. It might be assumed that medical students, as future health educators, should demonstrate a greater concern for their own health status and, at the same time, correct body weight. Although the research authors point out that the majority of respondents (84–94%) were aware of the factors causing obesity, including lack of physical activity, regardless of the department they studied at, the students were totally unaware of the role of regulation of the caloric value of meals in obesity prevention [6].

The authors' own research conducted among nurses pursuing second degree studies revealed that participants with correct BMI value devoted the largest proportion of time to physical activity and, at the same time, spent the largest proportion of time on moving by car. Even though the tested group included 100% of students of a given year, the group was relatively small. Subjective determination of time devoted to physical activity also seems to be problematic.

A study conducted in Bydgoszcz in the group of 230 participants demonstrated that the lowest level of activity was characteristic for students of pedagogy and computer science. The more often physical activity was taken up, the more attention was paid to proper nutrition. At the same time, the authors of the research concluded that the level of physical activity decreased along with age [20]. Research carried out among students of Gdańsk University of Physical Education demonstrated that students had lower BMI values in 2000 than in 2010. Motivation to take up physical activity was different — in 2000 it was the concern for health and in 2010 — the need for self-realization. The reason for lack of physical activity remained the same — lack of money and time, despite the fact that, for example, running does not require any significant expenditure of funds [21]. Research on physical activity of nursing students of the second degree studies conducted in Biała Podlaska revealed that 73.2% of students were very active physically and 26.8% — moderately active physically. However, 76.4% of the respondents pointed to an insufficient amount of time and only 12.2% of them declared to have enough free time to engage in physical activity [22].

In the authors' own research the analyzed group included studying and working people, i.e. people who do not have a large amount of free time. In spite of this, the tested subjects took up physical activity, which may be connected with the awareness of the importance of the activity for health, not only with the desire to lose weight. In fact, a crucial reason for avoiding physical activity is the inability to quickly lose weight which results in the loss of motivation [13].

According to the studies conducted by Biernat and Tomaszewski no instances of obesity occurred among Warsaw students, overweight was observed in 10.3% and underweight, much more frequently, in 20.3% of the tested subjects. Average time devoted to moderate physical activity in the group of students with underweight was 69.2 minutes/week, with the correct BMI value — 68.1 minutes/week and in the group with overweight — 61.7 minutes/week, which in each case is a very small amount of time [23]. In the authors' own research 210 MET (minutes/week) was observed in the case of moderate activity in people with underweight, 245 MET in people with correct body weight and 189 MET in people with

overweight. It can thus be concluded that the Warsaw students spend significantly less time on physical activity.

Correct eating habits, i.e. proper nutrition and hydration of the organism constitute an important element of a healthy lifestyle. The studies show that replacing sweetened drinks and juices with water results in the reduction of daily caloric value of meals by 10–13% [24]. According to the authors' own research too little amount of water is drunk per day. The basis of the diet is protein — building material of muscles and immunoglobulins. Deficiencies in protein, concerning primarily people with underweight, may cause decrease in respiratory muscles strength leading to ventilation disorders and reduction of the immune response of the organism [25]. According to the authors' own research, protein intake in all tested groups exceeded daily requirement by more than 100%. In the case of the average daily fat intake, daily requirement was exceeded only in the group of people with overweight. Standards of polyunsaturated fatty acids intake are not defined in literature but a deficiency of the acids in the diet may result in fat tissue atrophy and humoral response disorders [25]. On the basis of the authors' own research it was found that the average daily polyunsaturated fatty acids intake was between 12.27 grams in the group of women with underweight and 18.91 grams in the group of women with overweight.

Important elements of nutrition are also dietary supplements which are to complement deficiencies in vitamins and minerals. Poznań studies conducted in 2011, which were aimed at assessment of vitamin and minerals intake, including dietary supplements, demonstrated improvement only in vitamin consumption [26]. In the authors' own research the analyzed group did not apply dietary supplements, therefore the supplements portions were not defined. Due to universal access to vitamin and mineral supplements the risk of overdosing or even poisoning increases [27, 28].

But in people who want to complement deficiencies supplements may cause even greater deficits as the analysis of selected preparations showed that none of them included the declared quantity of active substances [29].

The amount of consumed vegetables and fruit influences the vitamins and minerals intake. Adults consume vegetables and fruit relatively seldom. Only 2/3 of women eat them every day [18]. According to the authors' own research, all women ate fruit or vegetables at least once a day.

The study conducted in Wrocław, aiming at demonstrating differences in vitamins and minerals intake among students depending on a place of residence (family house, rented apartment, campus) did not show significant differences. All students demonstrated low intake of vitamins B1, B2, B6 and niacin (50–75% of daily requirements) and low intake of calcium and ferrum (51% and 63% of daily requirements respectively). Too high intake of sodium (250%) and phosphorus (118%) was found [22].

Exceeding of daily intake standards was observed in the case of vitamins B6 and B12, whereas vitamin B1 intake was not determined. In the case of calcium intake, its deficiency was noted in the diet of students with low or proper body weight. Intake of sodium and phosphorus was very high, it exceeded daily requirements by more than 100%, and in the group of students with overweight — even by 200%.

The results of the Poznań research showed exceeding of the daily standard of vitamin A intake by 76% and of vitamin E by 26%. Similarly, in the case of vitamins of the B group: intake of thiamine was exceeded by 8%, of niacin by 12% and of riboflavin by as much as 46%. The intake of vitamin B12 and folic acid was very low — the former covered 32% of the daily requirement and the latter — only 17%. Vitamin D was consumed in the amount covering 29% of the daily requirement. Vitamin C intake covered 153% of the daily requirement [30].

Vitamin D intake was also very low in the authors' own research — it covered only 40–48% of the daily requirement, whereas the amount of consumed vitamin C covered the daily requirement only in the group of students with overweight. It is worth remembering that both vitamin D and vitamin C are crucial dietary elements. Vitamin D demonstrates pleiotropic effect, reduces the risk of lung cancer and reduces the risk of developing colorectal cancer. High doses of vitamin D and low doses of retinol reduce the risk of colorectal cancer. Vitamin C is also important for the body as it, among others, affects wound healing process, causes tumor apoptosis and is a cofactor of numerous reactions occurring in the body [28].

An important element of female nutrition, especially in the reproductive period, is the intake of folates. It was demonstrated that a low level of folates is associated with an increased risk of neural tube defects in the offspring [30]. In the authors' own research no tested group reached the recommended value in the diet. Both deficiency and excess of vitamins and minerals in the diet have adverse effects on health. Vitamin A - which is essential in the human body owing to its influence on the proper condition of skin and hair, as well as diminishing the risk of lung and digestive tract cancer — if consumed in excess can cause poisoning whose symptoms can be nausea, vomiting or liver disorders [28]. In the research on Poznań students a recommended daily intake of vitamin A was not shown [30]. According to the authors' own research the vitamin A intake in the group of students with overweight exceeded the norm by 200%. In the other groups the average daily intake was also at a high level (185% and 259% of the daily requirement). Results of the authors' own research in the scope of cholesterol intake are also alarming — they exceed from 102% to 146% (depending on the tested group) of the daily intake norm, which significantly increases the risk of developing atherosclerosis. While analyzing the intake of selected nutrients, Przysławski et al. considered losses resulting from thermal treatment — they assumed 10% loss of vitamin D, 15% of vitamins of the B group, 20% of vitamins A and E, 55% of vitamin C and 65% of folic acid [30]. Such losses were not included in the authors' own research. However, taking the losses into consideration in the case of vitamins with exceeded norm of daily intake would nonetheless not result in the intake below 100% of the daily requirements. In the case of vitamins with daily intake below the norm, the intake level would have been significantly decreased. The Poznań research carried out at the turn of 2009 and 2010 demonstrated that 41–47% of students were aware of their lack of knowledge on proper nutrition, which indicates the necessity to introduce educational activities directed to students of both non-medical and medical departments [13, 31, 32].

Conclusions

1. The body weight of studying nurses is in most cases appropriate, whereas in the group with overweight both reduction of caloric intake and increase of physical activity are recommended.
2. Despite the fact that the nurses' diet includes all nutrients necessary for the body, it is not properly balanced which obliges to raising awareness of types of consumed food.
3. Medical studies education curricula pertaining proper qualitative and quantitative nutrition should definitely be broadened.

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Conflict of interest statement
The authors declare no conflict of interest.

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Correspondence address:
Wioletta Waksmańska
University of Bielsko-Biala
Faculty of Health Sciences
2 Willowa Street, 43-300 Bielsko-Biala, Poland
phone: +48 33 279349, fax: +48 33 8279347
email: wwaksmanska@ath.bielsko.pl