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Dietary patterns among university students in Central Europe: a comparison between Slovakia and Poland

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Authors' contribution:
A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
D. Data interpretation
E. Preparation of manuscript
F. Literature analysis/search
G. Funds collection

Abstract

Background. Dietary habits formed during university years influence long-term health, yet evidence comparing gender-specific and cross-country patterns in Central Europe is limited. This study assessed differences in dietary intake between Polish and Slovak university students using standardized FFQ-6 daily intake conversions.

Material and methods. A cross-sectional survey was conducted in February-March 2025 among 574 Polish and Slovak students (77% female; mean age 22.5±2.68 years). Dietary intake was evaluated using the FFQ-6. Gender and country differences were analyzed using Mann-Whitney U tests with effect sizes (r).

Results. Female students reported a higher intake of vegetables and fruits, while males consumed significantly more red and processed meat, refined grains, animal fats, and energy drinks (p<0.05). In international comparisons, Polish females showed higher consumption of whole grains, vegetables, fruits, and nuts but also a higher intake of red meat, added fats, and energy drinks. Slovak students reported a higher dairy intake and slightly lower consumption of sweets and sugar-sweetened beverages. Effect sizes were small to moderate.

Conclusions. Our findings show meaningful gender-specific and cross-country differences in the dietary patterns of Polish and Slovak university students, highlighting several areas – especially meat, fats, and vegetable intake – where improvements in everyday dietary routines may be beneficial.

Keywords: Slovakia, university students, dietary habits, gender differences, Poland

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Introduction

Eating habits of university students play an important role in their physical and mental health. Food intake has been linked to students' ability to function, concentrate, and study effectively, highlighting the importance of access to adequate and nourishing foods during this period of life [1]. University years are a time when many young adults begin making independent decisions about

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what they eat, often influenced by their living arrangements, schedules, and available resources [2]. Because of this transition, understanding what students eat and how their choices form broader dietary patterns is essential for evaluating potential implications for health and academic performance.

Dietary patterns refer to the combinations, proportions, types, and frequencies of foods habitually consumed in a diet; these patterns develop over one's lifespan, are shaped early on, and can have long-term consequences for health [3]. Research increasingly focuses on dietary patterns rather than individual nutrients, as foods contain multiple interacting components that jointly influence health outcomes [3-5]. Studying dietary patterns therefore offers a broader insight into the overall diet and its potential associations with lifestyle factors [4,6].

Dietary habits and patterns among university students have been widely investigated in various contexts [1,2,5-9]. The university stage represents an opportunity to adopt habits that may shape future lifestyle practices [10], while students' food choices can be influenced by a range of factors including media, globalization, peer pressure, and body image concerns [11]. Previous work has identified a wide variety of dietary patterns, such as convenience-oriented, vegetarian, snacking-focused, health-conscious, traditional or Westernized patterns, demonstrating substantial diversity influenced by cultural and environmental factors [2,10-12]. Other studies have shown that many students do not meet recommended intakes of fruits, vegetables, dairy products, or other key food groups, despite the importance of establishing healthy dietary behaviors in young adulthood [2,5,9,12-14].

While most of this existing research focuses on university students in regions outside Central Europe, the underlying mechanisms that shape dietary choices, such as lifestyle transitions, social influences, and adherence to or deviation from recommended food group consumption, are relevant across different cultural and geographical settings [9,10,15]. Because of this, there is a need to explore dietary patterns in Central European university populations as well [14,16].

Aim of the work

University students represent a population undergoing major lifestyle transitions that often influence their eating behaviors, food choices, and long-term health trajectories. International research has shown that academic demands, changing living conditions, and social pressures can contribute to suboptimal dietary patterns; however, evidence from Central Europe remains comparatively scarce. Understanding dietary behaviors in this region is important, as cultural food traditions, economic factors, and differences in food availability may interact with the common challenges faced by students across countries.

Against this background, the aim of the present study was to assess dietary intake patterns among university students in Slovakia and Poland using detailed daily consumption estimates. A further objective was to identify gender-specific and country-specific differences in the intake of major food groups and unhealthy dietary components. By comparing these two neighboring Central European populations, the study sought to determine how closely students adhere to recommended dietary patterns and to highlight behavioral tendencies that may inform targeted nutrition interventions in young adults.

Material and methods

Study design and setting

This cross-sectional study was conducted among university students in two Central European academic institutions: Pavol Jozef Šafárik University in Košice (Slovakia) and University of Applied Sciences in Nowy Sącz (Poland). Data collection took place between February and March 2025. Students were recruited during scheduled university classes, where they were informed about the study and invited to participate voluntarily. The questionnaire was completed online using the Tivian/Unipark survey platform, which allowed secure and standardized administration across both sites.

Participants

A total of 574 university students participated in the study. The sample consisted of 77% females and 23% males, with 52% of respondents from Slovakia and 48% from Poland. The mean age of participants was 22.5±2.68 years. All the participants were full-time university students enrolled in bachelor's or master's programs and provided informed consent prior to completing the questionnaire.

Measures

Dietary intake was assessed using the 62-item FFQ-6 questionnaire [17]. The FFQ-6 is a semi-quantitative food frequency questionnaire designed to assess habitual dietary intake across major food groups. It contains 62 items that capture the frequency of consumption of commonly eaten foods in Central and Eastern Europe. Respondents indicate their usual intake using predefined frequency categories, allowing estimation of long-term dietary patterns rather than short-term variability. The FFQ-6 has undergone validation in previous research, demonstrating acceptable reproducibility and moderate agreement with alternative dietary assessment methods such as 24-hour recalls or food diaries. The instrument has been applied particularly in Polish cohorts, where its reliability and internal consistency were evaluated, supporting its use in cross-sectional and comparative studies [17].

For analytical purposes, individual items were aggregated into broader food groups to enable structured analysis of dietary patterns. The grouping framework was informed by the food categories used in the EAT-Lancet Commission [18] (e.g. grains, vegetables, fruits, legumes, nuts and seeds, plant oils, fish) and was extended to include additional food categories represented in the FFQ-6, such as refined grain products, dairy items, animal fats, processed meat products, sweets, snacks, and various beverage types. Frequency-corrected variables were used for fruit, vegetable, legume, and nut/seed items. For each food group, a composite intake value was computed as the sum of all items assigned to that category. The same aggregation rules were applied to both Slovak and Polish datasets to ensure methodological consistency. For each category, a composite intake score was calculated as the sum of all FFQ-6 items assigned to that group. Details about aggregation are provided in Table 1.

Table 1. Aggregation of FFQ-6 items into dietary categories

Dietary category	FFQ-6 items (codes)	Description
Whole grains	FFQ6_14, FFQ6_16	Whole-grain or seeded bread, non-refined groats
Starchy vegetables	FFQ6_45	Potatoes
Vegetables	FFQ6_37, FFQ6_38, FFQ6_39, FFQ6_40, FFQ6_41, FFQ6_42	Cruciferous, yellow-orange, leafy greens, tomatoes, cucumber/zucchini/ pumpkin, root and other vegetables
Fruits	FFQ6_26, FFQ6_27, FFQ6_28, FFQ6_29, FFQ6_30, FFQ6_31, FFQ6_32, FFQ6_33, FFQ6_34, FFQ6_35	Stone fruits, citrus fruits, tropical fruits, berries, bananas, apples/pears, avocado, olives, dried/preserved fruits
Dairy and dairy products	FFQ6_8, FFQ6_9, FFQ6_10, FFQ6_11, FFQ6_12	Milk, sweetened dairy drinks, cottage cheese, flavored cottage cheese, cheese
Protein sources		
Eggs	FFQ6_13	Eggs and egg dishes
Fish and seafood	FFQ6_54, FFQ6_55	Lean and fatty fish
Red meat	FFQ6_51, FFQ6_53	Beef, pork, veal, game
Chicken and other poultry	FFQ6_52	Poultry and rabbit
Legumes	FFQ6_43, FFQ6_44	Fresh and dry legumes
Added fats		
Oil	FFQ6_19	Plant-based culinary oil
Animal fats	FFQ6_20, FFQ6_22, FFQ6_23	Butter, cream, lard, tallow, bacon fat
Refined fats/oils	FFQ6_21, FFQ6_24	Margarine, mayonnaise and dressings
Unhealthy diet indicators		
Processed meat	FFQ6_48, FFQ6_49, FFQ6_50	Sausages, cold cuts, processed and organ meats
Salty snacks	FFQ6_7	Savory snacks
Sweets	FFQ6_1, FFQ6_2, FFQ6_3, FFQ6_4, FFQ6_5, FFQ6_6, FFQ6_35	Sugar, honey, chocolates, candies, biscuits, ice cream, candied fruit
Refined grains	FFQ6_15, FFQ6_17, FFQ6_18	Refined bread, refined groats, ready-to-eat cereals
Sugar-sweetened beverages	FFQ6_56, FFQ6_57, FFQ6_59	Fruit juices, vegetable/fruit juices, sugar-sweetened soft drinks
Energy drinks	FFQ6_58	Energy drinks

Statistical analysis

All statistical analyses were conducted using IBM SPSS Statistics (Version 29). Prior to analysis, the ordinal FFQ-6 frequency categories were converted into continuous daily intake equivalents using the standardized FFQ-6 transformation coefficients (0.00; 0.025; 0.10; 0.571; 1.00; 2.00). Dietary items were subsequently aggregated into predefined dietary categories.

Data distribution was examined using the Shapiro-Wilk test, as well as inspection of histograms, Q-Q plots, and skewness/kurtosis values. Because most dietary variables showed clear non-normality, non-parametric tests were applied.

Group comparisons between genders and between countries (Poland vs. Slovakia) were performed using the Mann-Whitney U test. For each comparison, effect sizes (r) were calculated using the formula $r = |Z| / \sqrt{N}$ and interpreted according to Cohen's criteria (0.1 small, 0.3 medium, 0.5 large).

Descriptive statistics are presented as means of daily intake equivalents, standard deviations, and minimum-maximum values. For non-parametric comparisons, mean ranks, Z-values, *p*-values, and effect sizes are reported. Statistical significance was set at $p<0.05$ (two-tailed).

Results

Several significant gender differences in dietary intake were observed across the full sample (Table 2). Females reported higher consumption of whole grains, although the difference did not reach statistical significance. Intake of refined grains was significantly higher among males (Z=-2.150, $p=0.032$, $r\approx0.090$).

Female students consumed more vegetables (Mean Rank: 292.1 vs. 270.1), but the difference was not statistically significant. Females also showed a tendency toward higher fruit intake (Z=-1.852, $p=0.064$). Intake of starchy vegetables did not differ between males and females. No gender differences were found for dairy products.

For protein sources, males reported significantly higher intake of eggs (Z=-2.349, $p=0.019$, $r\approx0.098$). While legumes, nuts and seeds showed slightly higher mean ranks among females, neither difference reached significance.

Marked gender differences were observed in the consumption of animal protein foods: males consumed considerably more poultry (Mean Rank: 338.5 vs. 270.8; Z=-4.557, $p<0.001$) and red meat including game (365.0 vs. 262.9; Z=-6.292, $p<0.001$). Similarly, the intake of processed meat was higher among males (Z=-6.354, $p<0.001$).

Regarding dietary fats, females had higher mean ranks for healthy plant oils, although not statistically significant. Males consumed significantly more animal fats (Mean Rank: 335.7 vs. 272.3; Z=-3.878, $p<0.001$) and more refined fats/oils (Z=-3.446, $p=0.001$).

For unhealthy diet indicators, females consumed significantly more sweets (Z=-2.832, $p=0.005$). No difference was found in the intake of salty snacks. Consumption of sugar-sweetened beverages was significantly higher in males (Z=-2.393, $p=0.017$).

Males also consumed significantly more energy drinks (Z=-5.188, $p<0.001$).

Table 2. Comparison of dietary intake categories between female and male university students

Dietary category	N	Females			Males			Z	*p*	r
		N	Mean*	MR	N	Mean*	MR			
Whole grains	573	440	0.6	289.35	133	0.62	279.22	-0.621	0.535	0.026
Starchy vegetables	572	440	0.19	285.34	132	0.36	290.36	-0.306	0.76	0.013
Vegetables	573	440	0.65	292.11	133	0.7	270.09	-1.344	0.179	0.056
Fruits	573	440	0.7	294.04	133	0.66	263.71	-1.852	0.064	0.077
Dairy and dairy products	573	440	1.6	286.42	133	1.94	288.92	-0.152	0.879	0.006
Nuts and seeds	572	440	0.09	286.7	132	0.09	285.84	-0.052	0.959	0.002
Protein sources										
Eggs	572	439	0.43	278.11	133	0.52	314.18	-2.349	0.019	0.098
Fish and seafood	573	440	0.14	281.87	133	0.23	303.98	-1.368	0.171	0.057
Red meat	572	440	0.12	262.94	132	0.33	365.04	-6.292	<0.001	0.262
Chicken and other poultry	572	439	0.33	270.75	133	0.49	338.5	-4.557	<0.001	0.19
Legumes	573	440	0.07	292.75	133	0.06	267.98	-1.513	0.13	0.063

Dietary category	N	Females			Males			Z	*p*	r
		N	Mean*	MR	N	Mean*	MR			
Added fats										
Oil	573	440	0.31	291	133	0.32	273.76	-1.116	0.265	0.046
Animal fats	573	440	0.68	272.27	133	1.05	335.72	-3.878	<0.001	0.162
Refined fats/oils	573	440	0.27	273.99	133	0.46	330.04	-3.446	0.001	0.144
Unhealthy diet indicators										
Processed meat	573	440	0.52	262.87	133	0.87	366.83	-6.354	<0.001	0.264
Salty snacks	572	439	0.16	286.09	133	0.2	287.86	-0.115	0.909	0.005
Sweets	573	440	1.38	297.77	133	1.17	251.37	-2.832	0.005	0.118
Refined grains	573	440	0.88	278.84	133	1.18	314	-2.15	0.032	0.09
Sugar-sweetened beverages	573	440	0.5	277.92	133	0.67	317.05	-2.393	0.017	0.1
Energy drinks	571	438	0.17	267.65	133	0.23	346.44	-5.188	<0.001	0.217

Notes: MR = Mean Rank; Z = Mann-Whitney test statistic; r = Effect Size; r = |Z| / √N.

*Original FFQ-6 ordinal frequency categories were converted to continuous daily intake equivalents using the standard FFQ-6 transformation coefficients: 0.00 (never or almost never), 0.025 (once a month or less), 0.10 (a few times per month), 0.571 (a few times per week), 1.00 (once per day; reference value), 2.00 (several times per day). These coefficients were applied uniformly across all FFQ-6 items prior to aggregation into dietary categories.

Country comparison – females

Among female university students, several significant cross-country differences in dietary intake were observed (Table 3). Polish female students reported higher consumption of plant-based categories, including whole grains (Z=-2.455, p=0.014, r=0.117), starchy vegetables (Z=-5.389, p<0.001, r=0.257), vegetables (Z=-3.472, p=0.001, r=0.166), and fruits (Z=-2.822, p=0.005, r=0.135). These differences consistently favored Poland with small-to-medium effect sizes. The intake of nuts and seeds did not differ significantly between the countries.

Table 3. Cross-country comparison of dietary intake patterns among female university students (Poland and Slovakia)

Dietary category	N	Poland			Slovakia			Z	*p*	r
		N	Mean*	MR	N	Mean*	MR			
Whole grains	440	199	0.66	236.8	241	0.55	207	-2.455	0.014	0.117
Starchy vegetables	440	199	0.21	256.4	241	0.14	190.8	-5.389	<0.001	0.257
Vegetables	440	199	0.74	243.7	241	0.61	201.4	-3.472	0.001	0.166
Fruits	440	199	0.8	239.3	241	0.66	205	-2.822	0.005	0.135
Dairy and dairy products	440	199	1.6	210.1	241	1.81	229.1	-1.557	0.120	0.074
Nuts and seeds	440	199	0.1	227.4	241	0.08	214.8	-1.037	0.300	0.049
Protein sources										
Eggs	439	198	0.43	220.9	241	0.44	219.3	-0.136	0.892	0.006
Fish and seafood	440	199	0.14	218.5	241	0.17	222.1	-0.302	0.763	0.014
Red meat	440	199	0.12	190.9	241	0.22	244.9	-4.493	<0.001	0.214
Chicken and other poultry	439	198	0.33	212.5	241	0.38	226.2	-1.227	0.220	0.058
Legumes	440	199	0.07	205.6	241	0.09	232.8	-2.235	0.025	0.107

Dietary category	N	Poland			Slovakia			Z	*p*	r
		N	Mean*	MR	N	Mean*	MR			
Added fats										
Oil	440	199	0.31	200.7	241	0.39	236.9	-3.172	0.002	0.151
Animal fats	440	199	0.68	205.2	241	0.76	233.2	-2.3	0.021	0.11
Refined fats/oils	440	199	0.27	239.7	241	0.17	204.7	-2.899	0.004	0.138
Unhealthy diet indicators										
Processed meat	440	199	0.52	219	241	0.57	221.7	-0.223	0.823	0.011
Salty snacks	439	199	0.16	213.5	240	0.19	225.4	-1.043	0.297	0.05
Sweets	440	199	1.38	213.4	241	1.56	226.4	-1.065	0.287	0.051
Refined grains	440	199	0.81	218.5	241	0.85	222.1	-0.295	0.768	0.014
Sugar-sweetened beverages	440	199	0.5	223.5	241	0.53	218.1	-0.446	0.656	0.021
Energy drinks	438	199	0.17	242.7	239	0.09	200.2	-3.86	<0.001	0.184

Notes: MR = Mean Rank; Z = Mann-Whitney test statistic; r = Effect Size; $r = |Z| / \sqrt{N}$.

*Original FFQ-6 ordinal frequency categories were converted to continuous daily intake equivalents using the standard FFQ-6 transformation coefficients: 0.00 (never or almost never), 0.025 (once a month or less), 0.10 (a few times per month), 0.571 (a few times per week), 1.00 (once per day; reference value), 2.00 (several times per day). These coefficients were applied uniformly across all FFQ-6 items prior to aggregation into dietary categories.

In contrast, Slovak female students showed higher intake of several animal-derived and fat-related categories, including red meat (Z=-4.493, $p<0.001$, r=0.214), legumes (Z=-2.235, $p=0.025$, r=0.107), oil (Z=-3.172, $p=0.002$, r=0.151), animal fats (Z=-2.300, $p=0.021$, r=0.110), and refined fats/oils (Z=-2.899, $p=0.004$, r=0.138). Although mean dairy intake was higher in Slovakia, this difference was not statistically significant.

Regarding unhealthy dietary indicators, Slovak female students reported a significantly higher consumption of energy drinks (Z=-3.860, $p<0.001$, r=0.184). No significant differences were observed between Polish and Slovak females for processed meat, salty snacks, sweets, refined grains, or sugar-sweetened beverages.

Overall, female students in Poland displayed a more plant-forward dietary pattern, while female students in Slovakia tended to consume more animal-based foods, fats, and energy drinks, indicating a relatively more energy-dense dietary pattern.

Country comparison – males

Among male university students, several significant between-country differences in dietary intake were identified (Table 4). Polish males reported a higher intake of starchy vegetables, compared with Slovak males (Z=-4.953, $p<0.001$, r=0.43). Polish males also consumed more vegetables (Z=-3.654, $p<0.001$, r=0.317) and more fruits (Z=-1.974, $p=0.048$, r=0.171).

In terms of plant-based fats, Polish males showed higher consumption of refined fats/oils (Z=-2.379, $p=0.017$, r=0.206), whereas the intake of oil and animal fats did not differ statistically between the countries.

For protein sources, Polish males consumed significantly more red meat than Slovak males (Z=-2.936, $p=0.003$, r=0.255). The intake of poultry, eggs, fish and seafood, and legumes did not significantly differ.

Regarding unhealthy diet indicators, Polish males reported a higher intake of refined grains (Z=-3.036, p=0.002, r=0.263), whereas the intake of processed meat, salty snacks, sweets, sugar-sweetened beverages, and energy drinks did not significantly differ between the two countries.

Overall, the most pronounced differences between Polish and Slovak males were observed in the intake of starchy vegetables, vegetables, refined grains, and red meat, with Polish males showing systematically higher consumption levels in these categories.

Table 4. Cross-country comparison of dietary intake patterns among male university students (Poland and Slovakia)

Dietary category	N	Poland			Slovakia			Z	*p*	r
		N	Mean*	MR	N	Mean*	MR			
Whole grains	133	78	0.62	68.9	55	0.55	64.3	-0.672	0.501	0.058
Starchy vegetables	132	77	0.36	80.4	55	0.09	47	-4.953	<0.001	0.43
Vegetables	133	78	0.7	77.3	55	0.45	52.5	-3.654	<0.001	0.317
Fruits	133	78	0.66	72.5	55	0.54	59.1	-1.974	0.048	0.171
Dairy and dairy products	133	78	1.94	68.3	55	1.71	65.2	-0.464	0.643	0.04
Nuts and seeds	132	77	0.1	72.5	55	0.09	58.2	-2.115	0.034	0.183
Protein sources										
Eggs	133	78	0.52	67.2	55	0.51	66.6	-0.093	0.926	0.008
Fish and seafood	133	78	0.23	66.5	55	0.3	67.7	-0.174	0.862	0.015
Red meat	132	77	0.33	58.3	55	0.52	78	-2.936	0.003	0.255
Chicken and other poultry	133	78	0.49	67.9	55	0.51	65.7	-0.378	0.705	0.033
Legumes	133	78	0.06	64.3	55	0.07	70.8	-0.95	0.342	0.082
Added fats										
Oil	133	78	0.32	64.7	55	0.4	70.3	-0.861	0.389	0.075
Animal fats	133	78	1.05	71.2	55	0.83	61	-1.511	0.131	0.131
Refined fats/oils	133	78	0.46	73.6	55	0.25	57.6	-2.379	0.017	0.206
Unhealthy diet indicators										
Processed meat	133	78	0.87	64.5	55	1.01	70.5	-0.891	0.373	0.077
Salty snacks	133	78	0.2	67.7	55	0.19	66.1	-0.243	0.808	0.021
Sweets	133	78	1.17	65.7	55	1.17	68.8	-0.461	0.644	0.04
Refined grains	133	78	1.18	75.5	55	0.88	54.9	-3.036	0.002	0.263
Sugar-sweetened beverages	133	78	0.67	67.2	55	0.59	66.7	-0.064	0.949	0.006
Energy drinks	133	78	0.23	65.8	55	0.25	68.7	-0.45	0.653	0.039

Notes: MR = Mean Rank; Z = Mann-Whitney test statistic; r = Effect Size; r = |Z| / √N;.

*Original FFQ-6 ordinal frequency categories were converted to continuous daily intake equivalents using the standard FFQ-6 transformation coefficients: 0.00 (never or almost never), 0.025 (once a month or less), 0.10 (a few times per month), 0.571 (a few times per week), 1.00 (once per day; reference value), 2.00 (several times per day). These coefficients were applied uniformly across all FFQ-6 items prior to aggregation into dietary categories.

Discussion

This study provides a detailed comparison of dietary intake patterns among university students in Poland and Slovakia, revealing several notable cross-country and gender-specific differences. The cross-country differences observed in our sample align partially with the patterns described in the only recent study comparing Polish and Slovak (among others) university students [16]. Similar to our findings, that study reported generally unhealthier eating patterns among Polish male students, characterized by a higher

intake of refined grain products, processed meats, and energy drinks – behaviors that we also observed, particularly among Polish males. At the same time, the earlier study suggested more favorable consumption of vegetables, fruits, and legumes among Slovak students, whereas our results indicate a more nuanced picture: Polish females showed a higher consumption of whole grains, vegetables, and fruits than Slovak females, while Polish males demonstrated a higher intake of vegetables and fruits compared with Slovak males. One possible explanation for this divergence is methodological differences: the previous study used the Pro-Healthy Diet and Non-Healthy Diet indices, which aggregate foods differently than our FFQ-6-based daily intake estimates. Another factor may be changes in food availability and dietary behaviors over time, as well as institutional or regional differences between the universities sampled.

Nevertheless, both studies point to important commonalities. Polish students consistently exhibit a higher intake of refined grains and red or processed meat, while Slovak students tend to consume less unhealthy, high-fat foods, such as fried items and butter, and, according to both datasets, consume fewer energy drinks. Moreover, in both studies, certain categories, such as fish, sweets, and sweetened beverages, show no meaningful differences between countries, suggesting shared dietary norms across the Central European region. Taken together, the convergence of findings indicates that while some aspects of student diets differ between Poland and Slovakia, their overall dietary profiles remain broadly comparable, shaped by similar cultural, economic, and food-system environments.

When examining the dietary patterns of Polish and Slovak university students within a broader European context, notable similarities with reported trends across various European nations can be identified [5,7,16,19]. Significant findings indicate that university students often display low adherence to plant-forward diets, particularly the Mediterranean diet, highlighting a concerning prevalence of insufficient fruit and vegetable intake [20]. This is corroborated by findings from Detopoulou et al. [13], which noted that among university students, low adherence to the Mediterranean diet correlates with lower fruit and vegetable consumption and higher stress levels, factors often associated with unhealthy lifestyle choices, including increased alcohol intake.

Moreover, a survey conducted in Italy revealed that a significant number of university students frequently consumed high levels of sweets and processed foods while demonstrating limited adherence to the Mediterranean diet – similar to observations made in Poland and Slovakia [12]. This pattern aligns with studies in other European contexts, where students favor convenience foods, many of which are ultra-processed and nutritionally poor [7]. As noted by Repella and Jakobsdottir, improving dietary habits among university students necessitates effective nutrition education strategies that can enhance cooking skills and promote healthier food choices [1].

Additionally, variability in red and processed meat intake is common across Europe. Franchini et al. documented that adherence to diets such as the Mediterranean diet is often lower among students who consume significant amounts of red and processed meats, reflecting a transition away from traditional diets high in plant-based foods towards more Westernized eating patterns [2]. This observation is further supported by other studies which reported that many tertiary students exhibit a high consumption of meats yet a low frequency of vegetable and fruit intake, indicating an imbalance that diverges from plant-forward dietary recommendations [1,6,7].

A theme that emerges across these studies is the emphasis on the impact of lifestyle choices and educational background on dietary habits. There is evidence suggesting that higher levels of physical activity correlate with better dietary adherence among students, including those from Spain and Italy, who tend to exhibit healthier eating practices when engaged in regular physical activities [8,21].

Taken together, the diets of Polish and Slovak students resemble those of many European peers, indicating that suboptimal dietary habits in early adulthood are not country-specific but reflect wider continental patterns influenced by food affordability, student lifestyles, and limited access to healthy meals on university campuses.

Several limitations should be considered when interpreting the findings of this study. First, the sample was not randomly selected; the participants were recruited voluntarily from university settings in Poland and Slovakia, which may introduce participation bias and limit generalizability beyond these institutions. The gender distribution was also imbalanced, with a predominance of female students, reflecting typical enrolment patterns in health- and education-related study programs [3]. Second, dietary intake was assessed using the FFQ-6, a retrospective, self-report instrument susceptible to recall bias and social desirability bias. Although the FFQ-6 is validated and widely used, it does not allow for the calculation of total energy intake, which restricts interpretation of the dietary patterns in relation to overall diet quality or energy balance [22]. Third, the transformation of ordinal frequency categories into continuous daily intake equivalents, while methodologically consistent with FFQ-6 standards, relies on fixed coefficients that may oversimplify true consumption variability [23]. Fourth, the cross-sectional nature of the study prevents establishing causal relationships between sociodemographic factors and dietary behaviors [3]. Fifth, although food items were aggregated into conceptually and nutritionally coherent categories, differences in food culture and product availability between Poland and Slovakia may influence item interpretation despite using identical questionnaires [24].

A key strength of this study is that it provides rare, detailed, and methodologically consistent comparative data on the dietary patterns of Polish and Slovak university students, a population combination that has been almost completely missing from nutritional epidemiology literature. Existing cross-country studies in this region are scarce and rely on broader "healthy/unhealthy diet indices", which limit the ability to detect nuanced differences between specific food groups [16].

Conclusions

This study identified clear cross-country and gender-based differences in dietary intake among university students in Poland and Slovakia. Polish students reported higher consumption of whole grains, vegetables, fruits, and nuts and seeds, while Slovak students showed higher intakes of red meat, legumes, added fats, and energy drinks. Male students consistently consumed more red meat, refined grains, processed meat, and energy drinks, whereas female students reported slightly higher intakes of plant-based foods.

Although overall dietary patterns were broadly comparable, several specific food groups differed substantially and represent potential targets for nutrition-oriented interventions on university campuses. These findings provide timely evidence from a region with limited contemporary data and highlight the importance of continued monitoring of student dietary behaviors using harmonized assessment tools.

Disclosures and acknowledgements

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