INVESTIGATING LIFESTYLE, EATING BEHAVIORS, OBESITY, AND ORTHOREXIA NERVOSA AMONG MEDICAL STUDENTS

Oana-Mădălina Roșu[1], Lavinia-Maria Pop[2], Magdalena Iorga[1,2*], Raluca Iurcov[3]
"Grigore T. Popa" University of Medicine and Pharmacy Iasi, Romania
1. Faculty of Medicine
"Alexandru Ioan Cuza" University of Iasi, Romania
2. Faculty of Psychology and Education Sciences
University of Oradea, Romania
3. Faculty of Medicine
[*]Corresponding authors. E-mail: magdalena.iorga@umfiasi.ro

OBESITY AND ORTHOREXIA AMONG MEDICAL STUDENTS (Abstract). Lifestyle and eating behaviors change during the academic year. The aim of the study was to assess the lifestyle, eating behaviors, the presence of obesity, and orthorexia nervosa among students enrolled in medical studies in Romanian faculties. Data collected from 231 students gathered sociodemographic, medical, as well as anthropometric and psychological information. The statistical analyses were performed using IBM *Statistical Package for Social Sciences (SPSS)* for Windows, version 24.0 (SPSS Inc., Chicago, IL, USA). To identify the presence of orthorexia nervosa, the *Düsseldorf Orthorexia Scale* was used. The research identified that almost 70% of students have a normal status. Less than half of the students (42%, N = 97) consumed food supplements with the aim of improving cognitive performance during exam sessions. Students registered M = 3.02 ± 1.36 hours of physical activity per week. More than half of the students (53.7%, N = 124) estimated that they spent between 2 and 5 hours a day in front of screens. The collected data identified the presence of orthorexia nervosa in 6.1% of students, and 16.5% were evaluated as being at risk. More correlations were identified. Healthy lifestyles are difficult be maintained during academic years, and specific attention should be paid to dietary patterns and physical activity. Psychoeducation should be an important aspect of medical students' personal and professional development. **Keywords**: MEDICAL STUDENTS, HEALTHY LIFESTYLE, EATING BEHAVIOURS, OBESITY, ORTHOREXIA NERVOSA.

The 21st century is facing a global obesity epidemic, and this obesity crisis has become one of the greatest challenges of our time with widespread recognition as an important global public health issue. The prevalence of obesity has skyrocketed in these early years of the 21st century, affecting populations in both developed and developing countries, and this increase has rapidly become a public health problem (1).

Obesity entails a significant economic burden on individuals and their families, but also on health systems and society in general, both through direct healthcare costs for treating obesity-related complications and indirect costs through reduced productivity and job performance. It is

important that strategies to address obesity involve individuals and communities as well as health care providers and policy-makers and include creating supportive environments for at-risk populations, promoting healthy lifestyle habits, obesity prevention strategies, and improving access to health care treatment (2).

Obesity profoundly impacts health and is associated with numerous health risks and chronic non-communicable diseases. Thus, it is a risk factor for developing insulin resistance and type 2 diabetes, as excess adipose tissue influences the body's ability to regulate blood glucose levels. Visceral fat causes the accumulation of atheromatous plaques, narrowing arteries and restricting blood flow, thus increasing the risk of cardiovascular disease, high blood pressure and stroke. Certain cancers are thought to be closely linked to obesity, including breast, colorectal, ovarian, liver, kidney, and pancreatic cancers. Obesity also leads to the development of respiratory problems such as sleep apnea, hypoventilation syndrome, and asthma. Because of the extra stress on the bone system and joints, people with obesity are at risk of developing osteoarthritis and back pain. Mental health is influenced by obesity, as people with obesity have higher rates of depression and anxiety due to social stigma and compromised body image.

According to the World Obesity Federation, it is estimated that nearly 30% of men and women will develop obesity by 2030 (1). Furthermore, the Eurostat report for 2019 concluded that in Europe, 53% of adults are overweight or obese, depending on BMI, and the percentage of obesity is directly proportional to age, except for people over 75 (3).

In terms of the proportion of young adults who are obese, this varies from country to country and according to gender; thus, the European average of obese people in the 18–24 age group was, according to Eurostat, 25% in 2019. The lowest value was recorded in Italy (18%), and the highest value, 31%, was recorded in Hungary. Romania recorded 25.4%, a percentage close to the European average (4).

There are several factors that can affect the rise of obesity among students. Among them is changing eating habits by adopting eating patterns that are mainly characterized by frequent consumption of high-calorie foods, fast food, and snacks instead of meals, as well as sweetened carbonated drinks, all of which contribute to weight gain and obesity. Restricting access to nutritious food or skipping breakfast (5) may also be contributing factors to obesity.

The goal of the present study is to investigate the presence of eating behaviors, obesity, and orthorexia nervosa among medical students in Romania, and the factors that influence them. There is a gap in the data concerning obesity among medical students in Romania, so the research focused on identifying the underweight, normal, and overweight students enrolled in medical studies, but also, considering the specialization - medical studies – the research team took into consideration that students enrolled in medical studies should be more focused on eating healthy and maintaining a good physical and mental life (6). That is why the investigation also took orthorexia nervosa as a variable. This is defined as an obsession with healthy eating accompanied by restrictive behaviors, sometimes being associated with malnourishment, loss of relationships, and poor quality of life (6).

MATERIALS AND METHODS

Participants and data collection

The study was conducted between April and May 2023 among students from the "Grigore T. Popa" University of Medicine and Pharmacy of Iasi. The participants were informed about the purpose of the study, about the confidentiality of the data, and that they could withdraw from the study whenever they wanted, without consequences. The inclusion criteria were being students of the medical field and filling out the questionnaire before the deadline. The exclusion criteria were questionnaires that were incomplete or submitted after the deadline. Finally, 231 questionnaires were included in the research.

The online questionnaire was created using the Google Forms application (Alphabet, Mountain View, CA, USA).

The first part of the questionnaire gathered socio-demographic information (like age, gender, living environment, year of study, the faculty where they study, and if they have employee status), medical information (if they or another family member suffers from chronic diseases and follows any treatment for their disease), and anthropometric data (height, weight, abdominal circumference, following a diet).

The second part of the questionnaire includes several questions grouped by various lifestyle components and factors that can influence lifestyle:

- substance consumption (tobacco, alcohol, psychoactive substances, or food supplements),
- the perceived influence of emotional factors on food (frequently consumed foods and changes in appetite during states of nervousness, stress, boredom, eating without feeling hungry, the level of consciousness felt while chewing food etc.),
- the influence of family income on eating behavior (the source where the money comes from, the percentage of income invested in buying food, proximity to restaurants, supermarkets, agri-food markets)
- the behavior related to the carried out physical activity,
- sleep-related behavior and time spent in front of screens,
- acquired food patterns and the frequency of food and beverages consumed.

The final part of the questionnaire includes one instrument, which refers to assessing and screening orthorexia nervosa: Düsseldorf Orthorexia Scale. This instrument was developed in 2015 by Barthels *et al.* and consists of 10 items with proven reliability, ranging from satisfactory to good, with an internal consistency of $\alpha = 0.84$. This scale is based on a four-level scoring system from "this does not apply to me (1)" to "this applies to me" (4), with scores ranging from 10 to 40 points (7, 8).

Statistical analyses

The statistical analyses were performed using IBM *Statistical Package for Social Sciences* (*SPSS*) for Windows, version 24.0 (SPSS Inc., Chicago, IL, USA). The results for descriptive statistics were expressed as means and standard deviations (SD). The normality of the data distribution was assessed by using the Kolmogorov-Smirnoff test. Given the fact that all data are not normally distributed, bivariate analysis will be performed and non-parametric tests will be applied. To assess comparative results considering gender, employee status, and chronic disease diagnosis, the Mann-Whitney test was performed.

Comparative results considering sex, living environment, and changes in appetite depending on the emotional state following

a diet, were assessed by using the Kruskal-Wallis H test to determine if there were statistically significant differences between more than two groups of an independent variable on a continuous or ordinal dependent variable.

The Spearman correlation was used to test the relationship between variables. A p-value < 0.05 was considered statistically significant.

Ethical approval

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethical Committee of the University of Oradea, No. CEFMF/3, March 16th , 2023.

RESULTS

Socio-demographic, medical, and anthropometric data

Sociodemographic data were gathered, along with household-related information and medical information. The average age of participants was M = 23.61 ± 6.71. More than half of the students lived in a rented apartment (56.3%, N = 130), while the rest lived at home with their parents (16.5%, N = 38), or in a student dormitory (27.3%, N = 63).

Most of the participants (88.7%, N = 205) and their family members (70.1%, N = 162) did not suffer from chronic diseases, and a very small part took medication for chronic diseases (8.2%, N = 19). Additional information about anthropometric and medical data is presented in first table.

TABLE I.

Socio-demographic data[1]

Socio-demographic characteristics	M±S.D and %
Abdominal circumference	73.66 ± 15.15
Nutritional status	
Underweight	24 (10.4%)
Normal status	161 (69.7%)
Overweight	37 (16.0%)
Obesity	9 (3.9%)
Following a diet	
Yes, it was recommended to me by a health professional	9 (3.9%)
Yes, I chose it personally	31 (13.4%)
Yes, I tried but failed	24 (10.4%)
No, I didn't follow a diet	167 (72.3%)

[1]Means and standard deviations (M±D), frequency and percentages (%)

Lifestyle components and factors that can influence lifestyle

Substance consumption

The results of the study showed that more than half of the participants had never smoked (64.9%, N = 150), and a small part smoked daily (14.7%, N = 34) or occasionally (19.5%, N = 45). Moreover, more than half of the participants' family members had never smoked (59.7%, N = 138), while more than a third smoked daily (32.5%, N = 75).

Less than half of the students (42%, N = 97) consumed food supplements with the aim of improving cognitive perfor-

mance during exam sessions. Regarding the consumption of other substances, detailed results are presented in the table below.

TABLE II.

Substance consumption[1]

Substances	N, %
Alcohol	
never	52 (22.5%)
sometimes	173 (74.9%)
often	6 (2.6%)
daily	0
Psychoactive substances	
never	217 (93.9%)
sometimes	12 (5.2%)
often	1 (0.4%)
daily	1 (0.4%)

[1]Frequency and percentages (%)

The perceived influence of emotional factors on food

In terms of emotional eating, half of students (50.6%, N = 117) admitted that they ate more when they felt stressed, nervous, or bored, the most consumed foods like sweet puff pastry such as Fornetti products, doughnuts, strudel, etc. (20.3%, N = 47), cream cakes (18.6%, N = 43), salted foods - such as sticks, pretzels, breadsticks (18.6%, N = 43), or salted puff pastry (7.8%, N = 18), and very few (3.9%, N = 9) were those who consumed more fruits during these tense periods.

However, less than half of the participants admitted that their eating pattern had changed largely (32.5%, N = 75) or to a great extent (14.3%, N = 33) after admission to college. Additionally, less than half of the students (44.6%, N = 103) rarely ate without being hungry, and most of them (71.9%, N = 166) were moderately aware when chewing food.

In addition, more than a third of the participants (39.8%, N = 92) said that it was difficult for them to leave food on the plate, only when it came to their favorite food.

The influence of family income on eating behavior

More than half of the students had a source of income from their parents (69.3%, N = 160), with a few having a stable job (17.7%, N = 41). Regarding the income allocated to buy food, less than half of the students (42.4%, N = 98) said that they spent between 25 and 50% of their income on food. Similarly, less than half of the students (43.3%, N = 100) largely considered that the income they had was enough to ensure their daily lives.

Most students lived in areas close to supermarkets (73.2%, N = 169) or neighborhood stores (14.7%, N = 34), and fewer lived in the areas of agri-food markets (4.8%, N = 11) or fast-food stores (3.0%, N =7).

The behavior related to the physical activity carried out

Students performed an average of **M = 3.02 ± 1.36** hours of physical activity per week. However, 48.1% of them (N = 111) declared that they rarely conducted physical activities, and a third of them (33.3%, N = 77) conducted physical activities often. The most practiced physical activities were walking (57.1%, N = 132), fitness activities in the gym (22.1%, N = 51), jogging (4.8%, N = 11), or others (5.6%, N = 13).

Sleep-related behavior and time spent in front of screens

More than three-quarters of the students (75.8%, N = 175) declared that they slept between 6 and 8 hours a night. Most students (91.8%, N = 212) declared that they

never woke up at night to eat, with very few being those who did this sometimes (7.4%, N = 17). Regarding sleep during the day, more than half of the participants (57.6%, N = 133) declared that they rarely slept during the day.

Additionally, more than half of the students (53.7%, N = 124) estimated that they spent between 2 and 5 hours a day in front of screens, be it a TV, smartphone, tablet, video game, or laptop.

Acquired food patterns / frequency of food and beverages consumed

More than half of the students (63.2%, N = 146) cooked or ate cooked food daily. Regarding the main meals of the day, less than half of the participants (43.3%, N = 100) served breakfast daily, with lunch being the most consumed meal of the day (35.5%, N = 82).

Sometimes, the main meals were replaced with pretzel-type snacks, sweets, and puff pastry by the majority of students (75.3%, N = 174). Moreover, more than a third of the participants (38.1%, N = 88) declared that they rarely ate with family members.

Most students (67.5%, N = 156) ate fast food only 1-2 times a month. More than half of the participants (61.5%, N = 142) had never consumed sugar-free carbonated drinks. More than half of the students consumed fish only 1-2 times a month (55.0%, N = 127), fruits 2-4 times a week (56.3%, N = 130), and vegetables a few times a week (55.4%, N = 128). More than a third of the participants (39.0%, N = 90) had never consumed cereal products. Other detailed results are presented in third table.

Less than half of the students (41.6%, N = 96) often read the food label, with the most sought-after checked components being sugar (24.7%, N = 57), calories (24.2%, N = 56), or additives (13.0%, N = 30).

TABLE III.

Frequency of food consumed[1]

Food	N, %
Meat (chicken, beef, pork)	
daily	45 (19.5%)
5-6 times a week	40 (17.3%)
3-4 times a week	92 (39.8%)
1-2 times a week	46 (19.9%)
never	8 (3.5%)
Eggs	
daily	18 (7.8%)
5-6 times a week	12 (5.2%)
3-4 times a week	40 (17.3%)
1-2 times a week	152 (65.8%)
never	9 (3.9%)
Milk/dairy and cheese	
daily	58 (25.1%)
5-6 times a week	41 (17.7%)
3-4 times a week	56 (24.2%)
1-2 times a week	60 (26.0%)
never	8 (3.5%)
Fried food	
daily	11 (4.8%)
5-6 times a week	22 (9.5%)
3-4 times a week	67 (29.0%)
1-2 times a week	111 (48.1%)
never	20 (8.7%)

[1]Number of answers (N) and percentage (%)

Assessing and screening of orthorexia nervosa

Cronbach's alpha of 0.868 showed that the scale had a high level of internal consistency. The total score for the *Düsseldorf Orthorexia Scale* was on average M = 19.56 ± 6.08, the scores ranging from 10 (4.8%, N = 11) to 39 (0.4%, N = 1).

A small part of the students had a high

score on this scale, which would indicate the presence of orthorexia nervosa. No risk of developing ON was observed in 77.5% of the students in the present study, as shown in table IV.

TABLE IV.
Prevalence of ON among students[1]

DOS	N, %
Presence of ON (≥ 30)	14 (6.1%)
At risk of ON (25–29)	38 (16.5%)
No risk of ON (< 25)	179 (77.5%)

[1]Number of answers (N) and percentage (%)

Comparative and correlational analysis

Comparative analysis showed that students who had employee status (Mdn = 21.00) had a higher score on the Orthorexia Scale, being more fixated on health-conscious eating behavior ($p = 0.007$, $U = 2905.50$, $z = -2.720$) than students who were not employed (Mdn = 18.00). Similarly, the results of the Mann-Whitney test ($U = 1430.00$, $z = -2.055$, $p = 0.040$) showed that underweight students had a lower score on the Orthorexia Scale (Mdn = 17.00) than normal-weight students (Mdn = 18.00). No gender difference was identified.

The Kruskal-Wallis H test revealed that there were statistically significant differences in total Orthorexia Scale score among groups with different levels of physical activity: those who practiced physical activity daily ($n = 34$), those who practiced physical activity often ($n = 77$), those who practiced sports rarely ($n = 111$), or those who never did such activities ($n = 9$); $\chi^2(3) = 15.855$, $p = 0.001$. The Mann-Whitney U post hoc analysis ($p = 0.009$, $U = 65.50$, $z = -2.621$) showed that participants who had never done sports had a much lower score on the Orthorexia Scale (Mdn = 14.00), as opposed to those who did sports daily (Mdn = 22.00). Additionally, the Mann-Whitney analysis ($p = 0.021$, $U = 3428.00$, $z = -2.310$) showed that those who did sports often (Mdn = 18.00) had a higher score on the Orthorexia Scale, in contrast to those who rarely did sports (Mdn =17.00).

Comparative analysis ($p < 0.001$, $U = 1366.50$, $z = -4.230$) showed that students who smoked daily (Mdn = 14.50) had a lower score on the Orthorexia Scale than students who had never smoked (Mdn = 19.00). Similarly, students who never drank alcohol (Mdn = 21.00) had a higher score on the Orthorexia Scale than students who drank alcohol often (Mdn = 15.00) ($p < 0.007$, $U = 50.50$, $z = -2.701$).

Significant differences ($p = 0.011$, $U = 168.50$, $z = -2.534$) resulted between students who were not at all conscious when chewing food, being rather attentive to their laptop or phone (Mdn = 17.00) and those who were extremely conscious when eating, the latter having a higher score on the Orthorexia Scale (Mdn = 22.00).

Our results showed that there was a positive correlation between body mass index and abdominal circumference. Thus**,** we identified that the higher the abdominal circumference value of the students, the higher the BMI ($r = 0.61$, $p < 0.01$).

A strong negative correlation was identified between the consumption of tobacco and the frequency of consumption of carbonated drinks ($r = -0.27$, $p < 0.001$), in the sense that the more the students smoked, the more they tended to consume fewer soft drinks. Tobacco consumption was also negatively correlated with meat consumption, so that the more the students smoked, the more they tended to decrease the frequency of meat consumption ($r = -0.17$, $p = 0.09$).

Positive correlations were identified between the frequency of tobacco consumption and the frequency of alcohol consumption ($r = 0.36$, $p < 0.001$), respectively of

the consumption of psychoactive substances ($r = 0.28$, $p < 0.001$), in the sense that the more the students smoked, the more alcohol and psychoactive substances they consumed.

A negative correlation was identified between the level of self-consciousness that students had when chewing food and using tobacco. Thus, the more the students were aware of the way they ate, the less they tended to smoke ($r = -0.20$, $p = 0.002$). Significant results regarding various items and the score obtained on the Orthorexia Scale are presented in table V.

TABLE V.

Correlation analysis results

Variables	DOS
BMI	r = 0.187**, p = 0.004
Tobacco consumption	r = -0.254**, p = 0.000
Alcohol consumption	r = -0.270**, p = 0.000
How conscious are you when you chew your food?	r = -0.158*, p = 0.016
Performing physical activity	r = 0.255**, p = 0.000
Frequency of consumption of eggs	r = -0.189**, p = 0.004
Frequency of consumption of meat	r = 0.144**, p = 0.029
Frequency of consumption of fish	r = -0.138*, p =0.036
Frequency of consumption of cereal products	r = -0.194**, p = 0.003

* $p < 0.05$; ** $p < 0.001$.

DISCUSSION

Maintaining a healthy lifestyle throughout adulthood is crucial for ensuring a healthy life in old age. Academic years are very challenging because, due to the chaotic schedule, the increased fast-foot intake and less time to practice sports could lead to a lower quality of physical and mental life.

The present study identified that medical students were at some risk: underweight and overweight was registered in 30% of students, and the presence of orthorexia nervosa or the risk of developing it was identified in 22.5% of respondents. Orthorexia nervosa was identified in students, and results from the scientific literature revealed that it was linked to the cognitive domains affecting attention, verbal long-term memory, visuospatial functioning, and executive functioning (9, 10). For example, orthorexia nervosa was measured among undergraduate medical students, and the prevalence was between 21.1% and 69.93% (11). Other research conducted on students revealed that those studying health-related majors were characterized by more pronounced symptoms of orthorexia nervosa with evidently more pronounced symptoms among physicians, dieticians and athlete students (12).

We found that students with higher scores on orthorexia nervosa ate eggs and meat more frequently, avoided tobacco and alcohol, and had a higher level of physical activity compared to students with no orthorexia nervosa. The research identified no significant results between male and female students, with similar data being registered by other international studies (13).

The frequency at which physical activity is performed is an important indicator that has been identified in other studies. During the undergraduate period, the phys-

ical activity schedule is rather individual; there are no PE classes or other extracurricular activities organized systematically, and free time is rather spent watching TV or engaging in rather sedentary activities such as video games, or computer use (14, 15).

Moreover, during this period, parental involvements in healthy food choices and physical activity decreases, as only a small proportion of students still live with their parents. In addition, academic schedules are busy, further limiting contact between parents and students.

Students from lower socioeconomic backgrounds may face decreased access to nutritious food (16) as well as to the opportunity to attend gyms, which increases the risk of developing obesity. Economic constraints can lead to the consumption of cheap but energy-dense foods with low nutritional value.

Environmental factors such as the availability of unhealthy food options on or around campus and food marketing to students, coupled with the lack of safe and financially accessible spaces for physical activity, can influence students' weight (17, 18).

Last but not least, genetic predispositions influence an individual's susceptibility to weight gain and obesity. Hormonal imbalances, some medical conditions, and some pharmaceuticals can also contribute to weight-related problems among students (19).

It is important to note that these factors are bidirectional, demonstrating once again the complexity of the causes of obesity among students. Therefore, obesity needs to be addressed in a multidisciplinary manner and involve individuals, their families and friends, the university environment, the community, and policymakers to promote healthy eating, physical activity, and a supportive environment for students.

In terms of obesity among medical students, there are a few factors that differ from the general student population: the high level of stress and workload faced by medical students due to the demanding nature of medical studies, the long internship and lecture hours, and the intense workload. Poor stress management can lead to emotional eating, unhealthy food choices, and a lack of time for physical activity, potentially contributing to weight gain and obesity.

Medical students' irregular schedules, prompted by rigorous schedules and demanding medical school clinical rotations, can disrupt mealtimes and sleep patterns, and this irregularity can make it difficult to maintain a healthy eating routine and engage in regular physical activity, thereby increasing the risk of weight gain, especially through a preference for fast food options with low nutritional value.

Although medical students are knowledgeable about health, including the risks associated with obesity, the pressures and demands of medical school can lead to neglecting personal health and prioritizing academic activities over their own health.

Medical schools are characterized by a competitive environment and peer pressure, and consequently, long study hours and neglecting personal wellness to achieve academic success can contribute to stress eating, sedentary behaviors, and weight gain.

The lack of clinical exposure, which is prevalent in the early years of medical school, further contributes to the development of sedentary behavior as students spend more time in classes than in the clin-

ical environment.

Obesity has a significant impact on a person's quality of life at different stages of life. At the psychological level, negative body image, depression, and social stigma are commonly experienced by people with obesity, negatively affecting their social relationships, couple relationships, and quality of life (20, 21). At the same time, as their social life is also affected, they enter a vicious circle in which the person with obesity finds it increasingly difficult to form or maintain social relationships and adopts a social isolation that will further lower their self-esteem and deepen their depression. Economically, a person with obesity may face reduced productivity at work and increased medical expenses.

CONCLUSIONS

Addressing obesity among medical students requires specific attention and support from medical schools and institutions. Implementing programmes that promote healthy lifestyle behaviors, providing access to affordable nutritious food on campus, creating opportunities for physical activity, and offering free stress management support services could help medical students adopt healthy lifestyle habits despite the academic challenges they face.

CONFLICTS OF INTEREST AND FUNDING

The authors declare that there is no conflict of interest, and they received no specific funding regarding this scientific research.

REFERENCES

1. Action Plan on Obesity at World Health Assembly in May 2022, https://www.worldobesity.org/resources/resource-library/world-obesity-atlas-2022 (Accessed February 20, 2023)
2. World Health Organization. Obesity - prevention and control. 2. Child welfare. 3. Exercise. 4. Food habits. 5. Community health services. 6. Consumer participation. I. ISBN 978 92 4 150478 2. https://apps.who.int/iris/bitstream/handle/10665/80149/9789241504782_eng.pdf (Accessed January 18, 2023).
3. EUROSTAT. Overweight and obesity-BMI statistics https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Overweight_and_obesity_-_BMI_statistics (accessed March 16, 2023).
4. EUROSTAT. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210721-2 (accessed March 16, 2023).
5. Ma X, Chen Q, Pu Y, *et al*. Skipping breakfast is associated with overweight and obesity: A systematic review and meta-analysis. *Obesity research & clinical practice* 2020; 14(1): 1-8 / doi:10.1016/j.orcp.2019.12.002
6. Iorga M, Soponaru C, Muraru ID, Socolov S, Petrariu FD. Factors associated with acculturative stress among international medical students. *BioMed Research International* 2020, Article ID 2564725 / doi:10.1155/2020/2564725.
7. Barthels F, Meyer F, Pietrowsky R. Orthorexic eating behavior. A new type of disordered eating. *Ernahrungs Umschau* 2015; 62(10): 156-161.
8. Barthels C, Loesing S, Alonso G, Kossmann D. Rack-scale in-memory join processing using RDMA. In *Proceedings of the 2015 ACM SIGMOD International Conference on Management of Data*, 2015, 1463-1475.
9. Chamberlain SR, Blackwell AD, Fineberg NA, *et al.* The neuropsychology of obsessive-compulsive disorder: the importance of failures in cognitive and behavioral inhibition as candidate endophenotypic markers. *Neurosci Biobehav Rev* 2005; 29(3): 399-419.
10. Abbate-Dage G, Buzzichelli S, Amianto F, *et al.* Cognitive flexibility in verbal and nonverbal domains and decision making in anorexia nervosa patients: a pilot study. *BMC Psychiatry* 2011; 11(1): 162-169 / doi: 10.1186/1471-244X-11-162

11. Fidan T, Ertekin V, Işikay S, Kırpınar I. Prevalence of orthorexia among medical students in Erzurum, Turkey. *Comprehensive psychiatry* 2010; 1; 51(1): 49-54 / doi:10.1016/j.comppsych.2009.03.001
12. Tremelling K, Sandon L, Vega G.L, McAdams C.J. Orthorexia nervosa and eating disorder symptoms in registered dietitian nutritionists in the United States. *Journal of the Academy of Nutrition and Dietetics* 2017; 117(10): 1612-1617 / doi:10.1016/j.jand.2017.05.001.
13. Depa J, Schweizer J, Bekers SK, Hilzendegen C, Stroebele-Benschop N. Prevalence and predictors of orthorexia nervosa among German students using the 21-item-DOS. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity* 2017; 22: 193-199.
14. Cotten E, Prapavessis H. Increasing Nonsedentary Behaviors in University Students Using Text Messages: Randomized Controlled Trial. *JMIR mHealth and uHealth* 2016; 4(3): e99 /doi:10.2196/mhealth.5411
15. Dillon K, Rollo S, Prapavessis H. A combined health action process approach and mHealth intervention to reduce sedentary behavior in university students–a randomized controlled trial. *Psychology & health* 2022; 37(6): 692-711.
16. Headey DD, Alderman HH. The relative caloric prices of healthy and unhealthy foods differ systematically across income levels and continents. *The Journal of Nutrition* 2019; 149(11): 2020-2033 / doi:10.1093/jn/nxz158.
17. de Assis MM, Leite MA, do Carmo AS, *et al*. Food environment, social deprivation and obesity among students from Brazilian public schools. *Public health nutrition* 2019; (11): 1920-1927.
18. Anekwe CV, Jarrell AR, Townsend MJ, Gaudier GI, Hiserodt JM, Stanford FC. Socio-economics of obesity. *Current obesity reports* 2020; 9: 272-279.
19. Crowley J, Ball L, Hiddink GJ. Nutrition in medical education: a systematic review. *The Lancet Planetary Health* 2019; 3(9): e379-389.
20. Koven NS, Abry AW. The clinical basis of orthorexia nervosa: emerging perspectives. *Neuropsychiatr Dis Treat* 2015; 11: 385-394 / doi: 10.2147/NDT.S61665
21. Brown A, Flint SW, Batterham RL. Pervasiveness, impact and implications of weight stigma. *EClinicalMedicine* 2022; 47 / doi:10.1016/j.eclinm.2022.101408.