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The Effect of the Medical University Studying on the Eating Habits and the Health of Slovak Students

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Methods: We made the questionnaire and distributed it to medical students at the Faculty of Medicine in Bratislava, Slovakia. A total of 587 students from the 1st to 6th year completed self-report measures of BMI, academic stress, eating habits and the occurrence or development of digestive problems during the study.

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THE EFFECT OF THE MEDICAL UNIVERSITY STUDYING ON THE EATING HABITS AND THE HEALTH OF SLOVAK STUDENTS

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The Effect of the Medical University Studying on the Eating Habits and the Health of Slovak Students

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Results: Our results showed that most respondents were of normal range weight and their eating habits were omnivorous (90%); more than half of the participants had breakfast regularly, and almost half of the students ate junk food a few times per week. Our participants consumed less food but more junk food and energy drinks during the exam period, which can cause obesity and digestive problems.

Conclusion: Our findings confirm that subjective academic feelings of stress play an important role in eating habit changes and in the origin of digestive disorders in our medical students.

Keywords: academic stress; eating habit; gastrointestinal disorders; students.

I. INTRODUCTION

Healthy eating habits are essential in preventing the occurrence of non-communicable diseases (NCDs), including diabetes mellitus, cardiovascular diseases, stroke and cancer. An unhealthy diet and lack of physical activity lead to global health risks. The World Health Organization (WHO) suggests an optimally balanced diet to prevent unhealthy weight gain. Caloric intake should be balanced with its expenditure; total intake of fats should not exceed 30%, and total intake of sugar should not exceed 10% of daily energetic intake, and salts should be kept to a maximum of 5 g per day in order to prevent arterial hypertension, cardiovascular diseases and stroke in adults [1]. WHO's member states signed off on reducing salt intake in the global population by 30% by 2025 and agreed to stop growth in the incidence of diabetes mellitus in adults and adolescents and obesity in children by 2025 [2].

Diet is not only affected by social and economic aspects (e.g. income, food prices, individual preferences, cultural traditions and geographical) and environmental factors (including climatic changes) but also by a person's psychological state [3]-[4].

The interaction between stress and eating habits is known. Authors Adam and Epel, (2007) have written about situations when individuals choose unhealthy food under stressful conditions. Stress is also linked with higher consumption of sweets and fats [5], salts [6], but also with a reduction in a well-balanced diet (e.g., meat, fruits, vegetables) [7]. Students are often exposed to stressful, competitive academic conditions, and exam periods have been shown to be extremely demanding psychologically [8]. Negative stress effects could lead to the disruption of a healthy lifestyle and to the occurrence of non-communicable diseases [9].

II. OBJECTIVES

It is well known that stress is an essential factor affecting food selection and intake and impacts the origin and development of digestive problems. Stress is

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a subjective emotion, and every student can feel the stress of another possibility.

The objectives of this study were to compare the eating habits and their changing of the Medical students studied at the Faculty of Medicine in Bratislava. We analysed the students of all six years of the Faculty studying. We had two hypotheses. The first one was that the eating habits changed during the exam period compared to other parts of the academic year (the exam period vs the holiday or teaching period). The second hypothesis was that students in the first and two last academic years feel more stress than in the other academic years.

III. MATERIALS AND METHODS

a) Participants

A cross-sectional questionnaire study was conducted during the academic year 2019/2020 before the COVID pandemic began. Five hundred eighty-seven students from all 1948 medical students (137 men (23.3%) and 450 women (76.7%)) from the 1st to the 6th year took part in the study. The Faculty of Medicine in Bratislava has approximately 350 students (1 male to 3 female) every year. We analysed participants' numbers and gender using the R statistics software.

We were asked to complete a health survey questionnaire on their eating habits through social media. We were inspired by the Eating habits Questionnaire [10].

This study was carried out in accordance with the Code of Ethics of the World Medical Association, Declaration of Helsinki (WMA Declaration of Helsinki, 2013), and The University Board approved the project in terms of its ethical aspects.

The inclusion criteria were – actual study at the Faculty of Medicine in Bratislava, Slovak students (not the international students – their eating habits are different from the Slovak eating habits) and the willingness to voluntarily answer the questions. The exclusion criteria were the blank answers.

All questionnaires were completed, and no participants were excluded from the study. The questionnaire was completed anonymously, and the participants were assured of data confidentiality. All participants provided consent to participate after being debriefed about the true nature of the study.

Eating habits during the examination period of the academic year (according to the study plan schedule) and the rest of the academic year (teaching and holiday) were compared.

b) Questionnaire

The questionnaire included four parts. The first contained personal data: gender, age and anthropometric parameters (height and body weight).

The second part of the questionnaire included questions focused on the type of diet; evaluation of

eating habits, how often they eat breakfast, where they are used to having lunch, how often they eat snacks (sweet, salty), and how much water they drink daily, how often they drink sweetened drinks and beverages for increasing energy/attention and what nutritional supplements they take.

The next part of the questionnaire focused on changes in body weight, food intake, snacks and energy drinks during the exam period. The final questions concerned the incidence of chronic gastrointestinal tract (GIT) disorders during university studies, changes in the frequency of their occurrence during the examination period, and ways of dealing with GIT disorders.

c) Body Mass Index (BMI)

Body Mass Index (BMI – weight/height²) was calculated by measuring the weight in kilograms and dividing it by height in squared metres[11].

d) Statistical analysis

For statistical analysis, we used Microsoft Excel and GraphPad Prism 9.4.0 (descriptive statistics, absolute values, means, standard deviation, percentages) and the R Statistics Software for the sample size.

IV. RESULTS

Five hundred eighty-seven of all 1948 students completed the questionnaire –137 men (23.3%) and 450 women (76.7%) – between the ages of 18 and 32 years old (mean ages= 22.16±2.58 years). In accepting or rejecting our hypotheses, we received when more than 50% answers were to one question.

Body Mass Index (BMI) is a statistical index using a person's weight and height to estimate body fat in males and females of any age. It defines a person as underweight, normal weight, overweight and obese. In our study, 60.6 % of men (N=83) had normal BMI values, but more than 31.4% (N=43) were overweight. Among women, 77.2% (N=347) of those monitored had normal BMI; however, 15.1% (N=68) were underweight, and 7.3% (N=33) were overweight. The mean value of men's BMI was 34.3±3.32 kg/m² and women's mean BMI was 20.99±2.6 kg/m². Most participants (89.6%) ate a well-balanced diet, including meat products, and only 1.4% of the students were vegans. The option pescatarian was selected by 3.4% of students, Lacto-vegetarian by 2.7% and a special diet for health reasons (gluten-free, low histamine, lactose-free, dairy-free) by 3.6% of students.

a) Eating habits outside the examination period

During the semester, more than half of students (56.9%) self-evaluated their healthy eating habits as positive. The other answers are in Table 1.

Table 1: Self-evaluation of having healthy eating habits

Rate	N (%)
Yes	70 (11.9)
Rather yes	334 (56.9)
Rather not	150 (25.5)
Not	33 (5.7)

More than half of the participants - 66.6%- ate breakfast daily, and more than half of the students (56.5%) ate lunch in the canteen (Table 2).

Table 2: Frequency of participants having breakfast and their place of eating lunch

Frequency of having breakfast N (%)	
Every day	391 (66.6)
Irregularly	91 (15.5)
Seldom	55 (9.4)
Never	50 (8.5)
Place of lunch	
Place	N (%)
Canteen	332 (56.5)
Cooking by myself	53 (9)
Restaurant	130 (22.1)
Fast-food restaurant	60 (10.2)
Nocooked meal	12 (2.2)

Almost half of participants ate junk food a few times per week, drank 1 – 2 litres of water per day (48.4%) and rarely drank sweetened drinks (49.5%); the majority of students (75.3%) drank coffee to increase their attention (Table 3).

Table 3: Frequency of eating fast/fried food/or daily drinking habits and kind of drinks

Frequency of eating fast/fried food N (%)	
Never	7 (1.3)
Seldom	126 (21.5)
2 – 3 times a week	287 (48.8)
Every day	167 (28.4)
Daily water intake (litres/day)N (%)	
Less than 0.5 L	16 (2.7)
0.5 – 1.0 L	138 (23.5)
1.0 – 2.0 L	284 (48.4)
More than 2 L	149 (25.4)
Frequency of drinking sugar-sweetened beverages N (%)	
Never	156 (26.5)
Seldom	291 (49.5)
2 – 3 times a week	134 (22.8)
Every day	6 (1.2)
Drinks to increase energy/an attention N (%)	
Coffee	442 (75.29)
Tea	295 (50.25)
Cola-cola and others	73 (12.43)
Energy drinks	99 (16.86)
None	78 (13.28)

Women took vitamins more often (69.5%) in comparison to men (60%) (Table 4).

Table 4: Dietary supplements

Dietary supplement	Men N (%)	Women N (%)
Vitamins	82 (59.85)	313 (69.55)
Magnesium	55 (40.14)	231 (51.3)
Probiotics	14 (10.21)	72 (16)
Fibre	10 (7.29)	35 (7.77)
Zinc	3 (2.18)	18 (4.0)
Iron	3 (2.18)	7 (1.55)
None	42 (30.65)	85 (18.8)

b) *Eating habits during the exam period*

Another part of the questions focused on changes in eating habits during the exam period, which is characterised by higher exposure to stress. Half of the

women (53.3%) monitored a reduced food consumption under stress exposure (Table 5). Almost half of respondents (47.8%) ate less compared to 25.2% of students who ate more during the exam.

Table 5: Eating habit changes depending on academic year period.

	N (%)
Without changes	158 (27)
During the exam period eating less	281 (47.8)
During the exam period eating more	148 (25.2)
During the exam period eating less – women	240 (53.3)

Almost half of the students (48.8%) eat more junk food during the exam period, and more than half (55.2%) of participants drink more energy drinks.

Approximately the same number of students maintained their weight (49.4%) as the lost weight from the study at the medical faculty (50.6%) (Table 6).

Table 6: Changes in eating junk food, drinking energy drinks and changes in body weight depending on the academic year period

Changes in eating junk food depending on academic year period N (%)	
Without changes	280 (47.7)
Increased during exam period	287 (48.8)
Decreased during exam period	20 (3.5)
Changes in appetite depending on academic year period N (%)	
Without changes	250 (42.5)
Increased during exam period	324 (55.2)
Decreased during exam period	13 (2.3)
Changes in body weight from the study at the medical faculty N (%)	
No changes in body weight	290 (49.4)
Weight loss always during exam periods	297 (50.6)

i. *Gastrointestinal problems during exam periods*

The final questions on the questionnaire focused on the incidence of gastrointestinal tract (GIT) disorders and on ways of solving these health issues. Less than half of men (42.3%) and less than one-third of women (26.9%) had no digestive problems. Almost half of the women had diarrhoea (45.55%), abdominal

cramps (42.22%) and nausea (37.11%), vomiting (15.33%), gastroesophageal reflux (GER) (7.74%) and constipation (14.8%). Among male students digestive problems occur less often: diarrhoea (26.2%), abdominal cramps (16.7%), nausea (19.7%), vomiting (9.48%), GER (16.05%) and constipation (6.56%) (Table 7).

Table 7: Occurrence of gastrointestinal tract disorders in participants during their study at university

Gastrointestinal disorders	Men (N/%)	Women (N/%)
None	58 (42.3)	121 (26.9)
Diarrhoea	36 (26.2)	205 (45.55)
Abdominal cramps	23 (16.7)	190 (42.22)
Nausea	27 (19.7)	167 (37.11)
Vomiting	13 (9.48)	69 (15.33)
Gastroesophageal reflux (GER)	22 (16.05)	35 (7.74)
Constipation	9 (6.56)	67 (14.8)

Two-thirds of female students (66.6%) and almost half of male students (46.72%) noted an increased frequency of digestive problems during exam periods (Table 8). Among the students with lower

appetite during exam periods, 75.08% had digestive problems more often precisely in this period. Among the students with the same appetite during the academic year, 60.1% noted some form of digestive problems

during the exam period. Half of the respondents (50.6%) with a greater appetite during the exam period also had a higher frequency of digestive problems (Table 6).

Among students with a higher energy drink consumption frequency, two-thirds (67.6%) had digestive problems more often (Table 6).

Table 8: The frequency of gastrointestinal tract disorders depends on the academic year period.

	Men (N/%)	Women (N/%)
Without changes	73 (53.28)	168 (37.34)
Increased during exam period	64 (46.72)	282 (66.66)
Decreased during exam period	-	-

Among students with digestive problems, 63.2% did not solve their problems, 13.28% decided on a change of diet, 11.75% took over-the-counter drugs,

10.2% visited a doctor, and 9.2% drank digestive tea (Table 9).

Table 9: Solving gastrointestinal tract disorders by the participants

	N (%)
Did not solve the GIT disorder	371 (63.2)
Diet	78 (13.28)
Taking an over-the-counter drug	69 (11.75)
Drinking digestive tea	54 (9.2)
Visiting a doctor	60 (10.2)

V. DISCUSSION

This study monitors the changes in diet in Slovak medical students under stress (academic stress) exposure during the exam period of the academic year before the Covid pandemic. Most respondents had normal weight, but one-third of the men were overweight. In Polish, Hungarian and American students, a higher incidence of overweight in men was also noted in comparison to women [12]–[14]. On the other hand, the obesity of Iranian students has proportionally reversed: 22.5% of Iranian women were overweight in comparison to 7.3% of Slovak women, and 7.9% of Iranian men were overweight in contrast to 31.4% of Slovak men [15]. The prevalence of obesity among university students was caused by their socio-economical situation, as well as ethnicity, education, income, culture, eating and exercise habits. The higher incidence of overweight in male students in comparison to women may also be caused by different amounts of muscle mass; thus, a better indicator of obesity is measuring the amount of fat and its distribution in the body [16].

The majority of Slovak medical students reported eating a varied diet that included animal products (an omnivorous type of diet), and only 1.4% were vegans. Studies show that vegans have a low body mass index (BMI) and low cholesterol levels in blood plasma [17]. The Mediterranean diet appears to be ideal for preventing cardiovascular diseases and obesity [18], [19]. We can speak about the Mediterranean diet as it is composed of extra virgin olive oil, fresh fruit, vegetables, cereals, nuts, legumes, fish, meat, dairy products, red wine and low amounts of eggs and sweets [20].

In our study, more than half of the participants had breakfast regularly, the same as Chilean students, who ate breakfast 5 – 7 times per week [21]. The

percentage distribution of the diet during the day affects body composition. Chilean students with a low-fat body percentage consumed almost 19% of their daily intake at breakfast, whereas students with a high body fat percentage consumed only 8.9% of their daily intake for breakfast [22].

Eating junk food can increase body weight. In our study, 48.8% of students consume junk food a few times per week. Caso et al., [23] and [24] confirmed that overweight students eat junk food more often and mainly during times of negative emotions (sadness, anger, fear, academic stress) in comparison to students with normal weight [23].

Slovak and American students drink coffee to improve concentration. In addition, American students drink coffee to increase attention (79%), because of its taste (68%), for socialising (39%), to improve physical energy (27%) and mood (18%), and to relieve stress (9%) [25].

Stress is defined as the state of affairs arising when a person relates to situations in certain ways. People are not disturbed by conditions but by how they appraise and react to situations. In general, a person experiences stress when demands exceed a person's coping abilities, resulting in reactions, such as disturbances of cognition, emotion and behaviour, which can adversely affect well-being. The majority of students experience academic stress [26], and the exam period appears to be the main source of stress [27]. Academic stress refers to the stress associated with the academic environment, writing tests, performing difficult cognitive tasks or being evaluated [28]. The current literature offers inconsistent findings regarding gender relative to perceived levels of stress [29]. Ng et al., [30] found that females were more likely to feel as though they experienced higher levels of stress, which was in agreement with Thawabien [31]. In addition,

female students reported more stress-related issues, such as low self-esteem, pressure from exams and depression [31]. However, no gender differences in coping with stress were found by Donaldson [32].

Exposure to stress factors can lead to gastrointestinal problems [33]. Knowles et al., [34] monitored significantly more digestive problems, increased levels of cortisol and decreased amounts of bacterial strains before exam periods. These findings play an important role in the prevention and therapy of digestive problems during stress periods. Increased levels of cortisol are characteristic of chronic stress [35] and there is a relationship between abdominal obesity and higher levels of cortisol [36]. Activation of the sympathetic adrenal medullary system, with the release of catecholamines (epinephrine and norepinephrine) during the acute stress response, leads to a reduction of appetite [35].

Stress can cause an increased or decreased appetite. Chronic stress is characterised by a preference for junk food (with high levels of fat and sugar), and studies show that chronic stress can lead to overweight, mainly in the male population [35]. In our study, half of the respondents consumed less; however, during the examination period, they consumed more junk food. Caso [23] confirmed that academic stress is connected with higher consumption of junk food. Oliver [7] found that approximately the same number of students ate less (38%) or more (42%) food during examination periods. In contrast, the appetite of English students did not change; there were changes in the macronutrient intake ratio, but total calorie intake did not change during exam periods [37]. In our study, half the participants (55.1%) drank energy drinks to improve their concentration, and approximately the same number of students (50%) lost weight or did not change in weight during academic stress.

In general, stress can increase or decrease appetite, and a well-balanced diet and BMI can also be affected by gender [6]. Stress-eaters (people who eat more under negative emotions, such as fear and sadness) more often choose a high fat and/or high carbohydrate diet under stress conditions [38].

Brain signals can affect the motor, sensory and secretory modalities of the gastrointestinal tract; however, gut signals are affected by emotional behaviour. Stress and pain modulate this system using the nervous, endocrine and immune systems. As a result, the gut-brain axis has changed to the microbiota-gut-brain axis. Therapy with probiotics appears to be suitable for abdominal dysfunction caused by stress. Kato-Kataoka et al. [39] monitored the effect of the probiotic bacteria *Lactobacillus casei* strain Shirota on abdominal dysfunction in a double-blind study composed of students before an exam period. They monitored the positive effect of daily intake of probiotics. They found that whereas cortisol levels were

significantly increased in the placebo group, in the group with probiotic intake the amount of bacterial strains in the gut microbiota was significantly increased. The percentage of members of the family *Bacteroidaceae* was significantly reduced.

Exposure to stress factors plays a key role in the development of visceral pains (e.g. functional gastrointestinal diseases; irritable bowel syndrome [40]). In our study, almost 60% of students had digestive problems during the examination period, and women, in particular, suffered from diarrhoea, abdominal cramps, nausea and constipation. Yildirim et al. [41] confirmed the interaction between stress and constipation in Turkish medical students. They also monitored the percentage increase in the number of students with constipation depending on the year of study. Abdominal aroma and meridian massage positively affect constipation and frequency of defecation in female students. Application of abdominal massages leads to a reduction of drug intake and can help to release stress during an exam period [42]. Stress appears to be one of the factors affecting the origin of irritable bowel syndrome. The prevalence of irritable bowel syndrome in Chinese students was 15.7%, and the most common symptoms were changes in stool consistency, frequency of defecation and the presence of abdominal pain released with defecation. The symptoms appeared more often in female students. Psychological and psychosomatic symptoms of affairs and depression were more common in patients with irritable bowel syndrome [43]; therefore, increased demands on students' psyche during exam periods could lead to digestion problems. Polish students with a lack of physical activity repeatedly suffered from digestive problems and were frequently more absent from school because of abdominal pains than students with a sufficient amount of physical activity [44].

a) Limitations

The present study has several limitations. Data were collected and evaluated from Slovak medical students, who filled answers themselves; thus, the participants in our study do not necessarily represent the nutrition of Slovak medical students in general.

VI. CONCLUSIONS

In conclusion, this is the first study dealing with the nutrition issues of Slovak medical students depending on the period of the academic year. Our results suggest that in higher exposure to stress, mainly during exam periods, the participants consumed less food but more junk food and energy drinks, leading to overweight or obesity. We confirmed the assumption that academic stress plays an essential role in the origin of digestive problems, which could be decreased by nutrition education and effective approaches to cope with stress during university life.

Author Contributions

AG and ZJ conceived and designed the study. DF and AG were responsible for data collection. ZJ, DF, ZF, JK and AG analysed the datasets. ZJ, DF, ZF, JK and AG wrote the primary draft of the manuscript. All authors critically reviewed the manuscript and have approved the final article.

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