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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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## Abstract

Background: University studying is demanding on the mental as well as the physical side of the organism. However, studying medicine is even more challenging-the study is six years long, and it is tough to remember more information. The study changed the social life of students, and the students didn't have enough time to relax. The examinations of students are full of stress. Stress harms health, especially in the gastrointestinal tract (autonomic nerve system). Aims: The first study evaluated the relationship between medical university studying (university stress-academic stress) and eating habits and their effect on student's health. We analysed the eating changing during the academic year. 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 1 st to 6 th year completed selfreport measures of BMI, academic stress, eating habits and the occurrence or development of digestive problems during the study.

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*Index terms*— academic stress; eating habit; gastrointestinal disorders; students.

## 1 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].

## 2 II.

## 3 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 Methods: We made the questionnaire and distributed it to medical

43 students at the Faculty of Medicine in Bratislava, Slovakia. A total of 587 students from the 1<sup>st</sup> to 6<sup>th</sup> year  
44 completed self-report measures of BMI, academic stress, eating habits and the occurrence or development of  
45 digestive problems during the study.

46 Results: Our results showed that most respondents were of normal range weight and their eating habits were  
47 omnivorous (90%); more than half of the participants had breakfast regularly, and almost half of the students  
48 ate junk food a few times per week. Our participants consumed less food but more junk food and energy drinks  
49 during the exam period, which can cause obesity and digestive problems. Conclusion: Our findings confirm  
50 that subjective academic feelings of stress play an important role in eating habit changes and in the origin of  
51 digestive disorders in our medical students. a subjective emotion, and every student can feel the stress of another  
52 possibility.

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

### 58 4 III.

## 59 5 Materials and Methods

### 60 6 a) Participants

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

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

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

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

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

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

### 79 7 b) Questionnaire

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

82 The second part of the questionnaire included questions focused on the type of diet; evaluation of eating  
83 habits, how often they eat breakfast, where they are used to having lunch, how often they eat snacks (sweet,  
84 salty), and how much water they drink daily, how often they drink sweetened drinks and beverages for increasing  
85 energy/attention and what nutritional supplements they take.

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

### 90 8 c) Body Mass Index (BMI)

91 Body Mass Index (BMI -weight/height<sup>2</sup>) was calculated by measuring the weight in kilograms and dividing it  
92 by height in squared metres [11].

### 93 9 d) Statistical analysis

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

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## 10 IV.

## 11 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/m<sup>2</sup>, and women's mean BMI was 20.99±2.6 kg/m<sup>2</sup>. 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, Lactovegetarian by 2.7% and a special diet for health reasons (gluten-free, low histamine, lactose-free, dairy-free) by 3.6% of students.

## 12 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. 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). 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). 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. 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).

## 13 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). 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). 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). V.

## 14 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 socioeconomical 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].

153 In our study, more than half of the participants had breakfast regularly, the same as Chilean students, who ate  
154 breakfast 5-7 times per week [21]. The percentage distribution of the diet during the day affects body composition.  
155 Chilean students with a low-fat body percentage consumed almost 19% of their daily intake at breakfast, whereas  
156 students with a high body fat percentage consumed only 8.9% of their daily intake for breakfast [22].

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

161 Slovak and American students drink coffee to improve concentration. In addition, American students drink  
162 coffee to increase attention (79%), because of its taste (68%), for socialising (39%), to improve physical energy  
163 (27%) and mood (18%), and to relieve stress (9%) [25].

164 Stress is defined as the state of affairs arising when a person relates to situations in certain ways. People are  
165 not disturbed by conditions but by how they appraise and react to situations. In general, a person experiences  
166 stress when demands exceed a person's coping abilities, resulting in reactions, such as disturbances of cognition,  
167 emotion and behaviour, which can adversely affect well-being. The majority of students experience academic  
168 stress [26], and the exam period appears to be the main source of stress [27]. Academic stress refers to the stress  
169 associated with the academic environment, writing tests, performing difficult cognitive tasks or being evaluated  
170 [28]. The current literature offers inconsistent findings regarding gender relative to perceived levels of stress [29].  
171 Ng et al., [30] found that females were more likely to feel as though they experienced higher levels of stress, which  
172 was in agreement with Thawabien [31]. In addition, female students reported more stress-related issues, such as  
173 low self-esteem, pressure from exams and depression [31]. However, no gender differences in coping with stress  
174 were found by Donaldson [32].

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

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

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

194 Brain signals can affect the motor, sensory and secretory modalities of the gastrointestinal tract; however, gut  
195 signals are affected by emotional behaviour. Stress and pain modulate this system using the nervous, endocrine  
196 and immune systems. As a result, the gut-brain axis has changed to the microbiota-gut-brain axis. Therapy  
197 with probiotics appears to be suitable for abdominal dysfunction caused by stress. Kato-Kataoka et al. [39]  
198 monitored the effect of the probiotic bacteria *Lactobacillus* casei strain Shirota on abdominal dysfunction in  
199 a double-blind study composed of students before an exam period. They monitored the positive effect of daily  
200 intake of probiotics. They found that whereas cortisol levels were significantly increased in the placebo group, in  
201 the group with probiotic intake the amount of bacterial strains in the gut microbiota was significantly increased.  
202 The percentage of members of the family Bacteroidaceae was significantly reduced.

203 Exposure to stress factors plays a key role in the development of visceral pains (e.g. functional gastrointestinal  
204 diseases; irritable bowel syndrome [40]). In our study, almost 60% of students had digestive problems during  
205 the examination period, and women, in particular, suffered from diarrhoea, abdominal cramps, nausea and  
206 constipation. Yildirim et al. [41] confirmed the interaction between stress and constipation in Turkish medical  
207 students. They also monitored the percentage increase in the number of students with constipation depending  
208 on the year of study. Abdominal aroma and meridian massage positively affect constipation and frequency of  
209 defecation in female students. Application of abdominal massages leads to a reduction of drug intake and can  
210 help to release stress during an exam period [42]. Stress appears to be one of the factors affecting the origin of  
211 irritable bowel syndrome. The prevalence of irritable bowel syndrome in Chinese students was 15.7%, and the  
212 most common symptoms were changes in stool consistency, frequency of defecation and the presence of abdominal  
213 pain released with defecation. The symptoms appeared more often in female students. Psychological and  
214 psychosomatic symptoms of affairs and depression were more common in patients with irritable bowel syndrome  
215 [43]; therefore, increased demands on students' psyche during exam periods could lead to digestion problems.

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216 Polish students with a lack of physical activity repeatedly suffered from digestive problems and were frequently  
217 more absent from school because of abdominal pains than students with a sufficient amount of physical activity  
218 [44].

## 219 **15 a) Limitations**

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

## 223 **16 VI.**

## 224 **17 Conclusions**

225 In conclusion, this is the first study dealing with the nutrition issues of Slovak medical students depending on the  
226 period of the academic year. Our results suggest that in higher exposure to stress, mainly during exam periods,  
227 the participants consumed less food but more junk food and energy drinks, leading to overweight or obesity. We  
228 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.

1

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

Figure 1: Table 1 :

2

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)	

Figure 2: Table 2 :

229

3

Frequency of eating fast/fried food N (%)

Never Seldom	7 (1.3)	126 (21.5)
2 -3 times a week	287 (48.8)	167 (28.4)
Every day	16 (2.7)	138 (23.5)
Daily water intake (litres/day)	149 (25.4)	284 (48.4)
N (%) Less than 0.5 L		
0.5 -1.0 L		
1.0 - 2.0 L		
More than 2 L		

Frequency of drinking sugar-sweetened beverages N (%) Never 156 (26.5) Seldom 291 (49.5) 2 -3 times a week

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%) (Table4).G© 2023 Global Journ als

Figure 3: Table 3 :

4

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)

Figure 4: Table 4 :

5

N (%)

Figure 5: Table 5 :

6

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)

Figure 6: Table 6 :

7

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)

Figure 7: Table 7 :

8

	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	-	-

Figure 8: Table 8 :

9

N (%)

Figure 9: Table 9 :





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## .2 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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## 17 CONCLUSIONS

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