Acta Scientific NUTRITIONAL HEALTH (ISSN:2582-1423)

Volume 7 Issue 12 December 2023

Research Article

Changes in Lifestyle and Health Outcomes among University Students in Portugal during the COVID-19 Pandemic: FINESCOP Project

Anna Carolina Cortez Ribeiro[1], Vera Ferro-Lebres[2,3], Marta Arroyo-Izaga[4], Liv Elin Torheim[5] and Juliana Almeida-de-Souza[2,3]*

[1]*Instituto Politécnico de Bragança, Bragança, Portugal*

[2]*Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Portugal*

[3]*Laboratório Associado Para a Sustentabilidade e Tecnologia em Regiões de Montanha (SusTEC), Instituto Politécnico de Bragança, Portugal*

[4]*Department of Pharmacy and Food Sciences, Faculty of Pharmacy, BIOMICs Research Group, MICROFLUIDICs and BIOMICs Cluster, University of the Basque Country UPV/EHU, Bioaraba, Spain*

[5]*Department of Nursing and Health Promotion, Faculty of Health Sciences, OsloMet-Oslo Metropolitan University, Oslo, Norway*

***Corresponding Author:** Juliana Almeida-de-Souza, Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Portugal.

Received: October 30, 2023

Published: November 28, 2023

Abstract

Background: Previous studies showed that the COVID-19 pandemic lockdown caused changes in lifestyle habits. However, there is limited information regarding the effects after the lockdown. Aims: This study aimed to assess self-reported lifestyle changes during the COVID-19 pandemic among students at the Instituto Politécnico de Bragança (IPB), Portugal. This research is part of the Food Insecurity among European University Students during the COVID-19 Pandemic (FINESCOP) study.

Methods: This study was conducted between April 4 and May 16, 2022. Students answered an online questionnaire on sociodemographic variables and lifestyle changes, including eating habits.

Results: The sample consisted of 377 students, 55.7% female, with a median of 22 years. Consumption of sugar-sweetened beverages, meat and/or eggs, processed meat and vegetables decreased. Participants also reported increased screen time for work/study, alcohol consumption and smoking, as well as poorer sleep and physical and psychological health problems.

Conclusion: Our findings revealed changes in lifestyle behaviors in students during the COVID-19 pandemic. Thus, professionals who work in community health, as well as the government, should adopt measures to improve healthy lifestyles in this population, paying special attention to the most vulnerable groups.

Keywords: COVID-19; Lifestyle; Feeding Behavior; Health; Students

Abbreviations

BMI: Body Mass Index; FINESCOP: Food Insecurity among European University Students during the COVID-19 Pandemic; IPB: Instituto Politécnico de Bragança; IQR: Interquartile Range; SD: Standard Derivation

Introduction

In 2020, the world was alarmed by the emergence of the novel coronavirus. On January 30, the World Health Organization declared COVID-19 as a public health emergency and pandemic classification [1]. In Portugal, after the first case was reported on March 2, 2020, the government promptly implemented containment measures that came into effect with the announcement of a state of emergency [2]. Under these circumstances, citizens experienced suspension of their rights: mandatory confinement, sanitary fences, and the blockage of commercial establishments and educational institutions [2,3].

The government-mandated physical distancing restrictions to reduce the spread of COVID-19 likely have had a considerable impact on health-related behaviors. So, the measures to control the pandemic and the socioeconomic consequences have drastically affected lifestyles, from altered dietary habits, disrupted sleep patterns, reduced physical activity, increased sedentary behaviors, and tobacco and alcohol consumption [4].

These unhealthy lifestyle behaviors observed in the pandemic phase are related to the potential development of chronic diseases, such as obesity. In addition, poorer self-perceived health was asso-

ciated with unhealthier lifestyles [5]. Stress related to fear and the continuous bombardment of news by the media about the spread of the pandemic could favor the increase in the consumption of "comfort foods" (mainly composed of sugar or fats) or bring about a greater consumption of snacks between meals [6,7]. On the contrary, other studies have observed that being at home (because of the lockdown) provided more time for cooking and reduced the consumption of pre-prepared and takeaway meals, improving eating habits [8,9] and helping increase exercise and relaxation levels. In any case, most studies concentrated on the impact of the coronavirus lockdown on lifestyles. Therefore, more data is needed to find out if these changes have been maintained over time or whether people have returned to their previous habits. In this sense, infectious disease and economic experts have indicated that our lives will not simply return to our pre-COVID "normality" [11].

One group, which appears to be rather vulnerable to unhealthy behaviors, is the university students before [12] and during the pandemic [13-17]. The university stage is considered a critical period to install positive dietary and health behaviors to promote optimal health and prevent immediate health problems. For this reason, the present study aimed to examine how lifestyle and health outcomes have changed among students at the Instituto Politécnico de Bragança (IPB), Portugal, since the COVID-19 pandemic; as well as to assess possible associations between these changes and the variables sex and nationality. Identifying the impact that the pandemic has had on university students will help inform the development of effective health promotion interventions that are relevant in this post-COVID-19 context.

Materials and Methods

Study Design

This study is part of the Food Insecurity among European University Students during the COVID-19 Pandemic (FINESCOP) project, a cross-sectional investigation, which aims to understand the vulnerable and challenging situation students are experiencing during the COVID-19 pandemic. For this purpose, a sample of college or university students was recruited from eleven European universities (from ten countries). One of the participating universities was the IPB, a Portuguese public University of Applied Sciences.

Participants and procedures at the IPB

Subjects were eligible if they were undergraduate or graduate students enrolled in the IPB, 18 years older, and had access to the internet since they had to complete an online questionnaire. The sample size was estimated using the Epidat 3.0 program, considering the total number of students enrolled during the 2020/21 academic year (n = 8500) (data provided by the IPB), a precision level of 5%, a confidence interval of 95%, and a P-value of 0.05. The required sample size was 368 students.

The recruitment and data collection were conducted between 4th April and 16th May 2022. In this period, the epidemiological situation caused by the pandemic showed positive improvements in Portugal, with the release of the use of masks in indoor places and low social restrictions [3]. A timeline of the epidemiological situation and the state of Portugal's response to the COVID-19 pandemic and our survey administration is provided in figure 1.

A total of 377 students completed the survey, with a participation rate of 4.8% using for its Microsoft Forms. Students were recruited through institutional emails, posts on Instagram and Facebook, and leaflets distributed throughout the university. Participants could complete the survey only if they consented to participate in this study on the first page. All study procedures have been approved by the Ethics Committee on Research Involving Human Beings of the University of the Basque Country (Universidad del País Vasc/Euskal Herriko Unibertsitatea UPV/EHU) (M10_2021_185), one of the FINESCOP project coordinators.

Instruments and measures

The questionnaire was developed in English through collaboration with all the partners in the FINESCOP consortium. The selection of the studied variables was based on the experiences of other previous multicenter studies carried out on food insecurity [8,16]. Moreover, the principal investigators of each university participated in the selection and consensus of the measurement variables and tools. Before finalizing the questionnaire, a pilot study was carried out in five of the eleven participating universities in the FINESCOP project. The tools that have not previously been validated in languages other than English were translated into the local languages (in the case of IPB translated into Portuguese) using the double translation methods.

In the present manuscript, we show results from the IPB about sociodemographic factors, educational variables, lifestyle, and health outcomes. Sociodemographic variables include the participant's age, sex (female, male, non-binary, or other), and birthplace (continent of origin). The educational variable analyzed was the level of studies (undergraduate or postgraduate). Finally, health outcomes include weight status, changes in weight during the COVID-19 pandemic, and self-reported physical health before and during the pandemic.

The current weight status was assessed by the body mass index (BMI), calculated from self-reported weight and height data, and interpreted using the criterion of the World Health Organization [18]. In addition, the participants were asked about their self-perception regarding weight change since the beginning of the pandemic (March 2020) to the date they participated in this survey, with the option to indicate if their weight was stable, or if they gained or lost 5 kg or less or more. Self-rated health was assessed on the visual analog scale, from 0 to 100, of the EuroQuol five-dimensional questionnaire (EQ-5D) [19]. This scale was used to analyse physical and psychological health, separately. The respondent should point out a value that can best represent their physical and psychological health (0 means the worst, and 100 means the best). Data on

the perception of health status are expressed as mean value and standard derivations.

The questions about lifestyle (dietary habits, smoking habits, alcohol consumption, physical activity, sedentary habits, and sleep) were referred to before and during the COVID-19 pandemic and had predefined answers (closed answers).

The dietary data were taken from the questionnaires developed and used in other previous investigations carried out during the COVID-19 pandemic [8,17]. These measures were related to dietary intake during the pre-pandemic period and since the start of the pandemic and included questions about the consumption frequency of vegetables or salad, fruits (excluding fruit juice), salty snack foods, sweet treats, sugar-sweetened beverages (excluding drinks with artificial sweeteners), fish or seafood, meat, and eggs, processed meats, legumes, milk, and dietary products, and wholegrain cereal products. Examples of foods, standard serving sizes, and household measurements were included in the food consumption questions. The answers were re-categorized as follows: increase, decrease, and no changes in food consumption. In addition, participants were asked about how often they kept a regular meal schedule and whether they shared their main meals with friends or family before and during the pandemic.

Questions on smoking status were based on those of Di Renzo., *et al.* [8]. These measures were related to smoking habits before and/or since the pandemic (including cigarettes, electronic cigarettes, cigars, pipes, smokeless tobacco, and/or snuffs). Smokers were asked about their smoking intensity (less than 1 per day, 2-5, 6-10, 11-20, or >20 per day). The questions about alcohol consumption were taken from a questionnaire developed and used by the University College Dublin [20]. Participants were asked about how often and many standard alcoholic drinks they drank.

Physical activity was assessed through a question about recreational activities (sports, fitness, and recreational activities). Participants were asked how often: weekly or monthly, they performed physical activity for a minimum of 30 minutes that caused their heart rate to increase before and since the start of the COVID-19 pandemic. The questions about sedentary habits were taken from the questionnaire developed and used by Górnicka., *et al.* [17]. and were referred to time (daily hours) spend studying or working and during leisure time in front of a screen (computer, TV, tablet, and/or telephone). Sleep quality was assessed with the single-item sleep quality scale of Snyder., *et al.* [21]. According to this scale, from 0 to 10, a score of ≤3 is considered bad, 4 to 6 is considered fair, 7 to 9 is considered good and 10 is considered excellent. Just like the variables on food intake, the rest of the data related to lifestyle and those corresponding to health outcomes were re-categorized as follows: increase, decrease, and no changes.

Statistical analysis

Statistical analysis was performed using IBM Statistical Package for the Social Sciences for Windows, version 25.0. All descriptive statistics were reported in mean and standard derivation (SD) for continuous data. The normality of continuous variables was tested using the Kolmogorov-Smirnov test, verifying the variables age and self-rated health do not follow a normal distribution. Whereas non-normally distributed variables are presented as medians with their corresponding interquartile range (IQR), while frequency and percentage for categorical data. Differences between the data corresponding before and since the pandemic were examined using the Wilcoxon test. Additionally, a hierarchical cluster analysis was performed to compare the change patterns, depending on the variables sex, nationality, and educational level. The characteristics of the participants of the clusters were compared with the chi-square method. Statistical significance was set at a P-value less than 0.05.

Results

The participants were aged 18 to 40 years, with a median of 22 years (IQR 3.5), and majorities were women, born in Europe, and undergraduates (Table 1). No participant selected the "non-binary or other" option for the sex variable. The prevalence of overweight/obesity was 28.9%, with an average BMI of 23.6 kg/m2 (SD 4.6) in the total sample. Figure 2 presents the BMI classification and self-reported weight change since the onset of the COVID-19 pandemic. Nearly 40% of students reported that their body weight increased since the COVID-19 pandemic. Supplementary Table S1 shows the changes in lifestyle and health outcomes since the pandemic, and figure 3 summarizes the main results related to these changes. The results of the Wilcoxon test showed statistically significant differences and a higher percentage of participants who reported a decrease than an increase in sugar-sweetened beverages (decrease, 26%; increase, 16%), meat and eggs (decrease, 26%; increase, 14%), processed meat (decrease, 24%; increase, 19%), and legumes consumption (decrease, 29%; increase, 19%). Additionally, significant changes are reported in the frequency of regular meal schedules (decrease, 32%; increase, 14%) and in the frequency of main meals with friends/family (decrease, 40%; increase, 21%).

Variables	n (%)
Sex	
Female	210 (55.7)
Male	167 (44.3)
Continent of origin	
Europe	225 (59.7)
South America	101 (26.8)
Asia	05 (1.3)
Africa	44 (11.7)
Central/ North America	02 (0.5)
Level of studies	
Undergraduate	313 (83.0)
Postgraduate	64 (26.5)

Table 1: General characteristics of the sample.

	Pre-COVID-19 pandemic	During the COVID-19 pandemic	P-value[a]
Food group consumption			
Vegetables or salad, n (%)			
Never/Seldom	4 (1.1%)	9 (2.4%)	0.090
<1/week	14 (3.7%)	21 (5.6%)	
1-3 times/week	116 (30.8%)	119 (31.6%)	
4-6 times/week	99 (26.3%)	90 (23.9%)	
1 time/day	98 (26.0%)	100 (26.5%)	
2 times/day	37 (9.8%)	35 (9.3%)	
≥3 times/day	9 (2.4%)	3 (0.8%)	
Fruit, n (%)			
Never/Seldom	8 (2.1%)	3 (0.8%)	0.598
<1/week	22 (5.8%)	24 (6.4%)	
1-3 times/week	105 (27.9%)	109 (28.9%)	
4-6 times/week	86 (22.8%)	94 (24.9%)	
1 time/day	84 (22.3%)	86 (22.8%)	
2 times/day	49 (13%)	42 (11.1%)	
≥3 times/day	23 (6.1%)	19 (5.0%)	
Salty snack foods, n (%)			
Never/Seldom	15 (4.0%)	34 (9.0%)	0.077
<1/week	134 (35.5%)	131 (34.7%)	
1-3 times/week	154 (40.8%)	141 (37.4%)	
4-6 times/week	46 (12.2%)	55 (14.6%)	
1 time/day	23 (6.1%)	11 (2.9%)	
2 times/day	3 (0.8%)	3 (0.8%)	
≥3 times/day	2 (0.5%)	2 (0.5%)	
Sweet treats, n (%)			
Never/Seldom	14 (3.7%)	19 (5.0%)	0.061
<1/week	135 (35.8%)	137 (36.3%)	
1-2 times/week	121 (32.1%)	131 (34.7%)	
5-6 times/week	66 (17.5%)	55 (14.6%)	
1 time/day	29 (7.7%)	26 (6.9%)	
2 times/day	5 (1.3%)	2 (0.5%)	
≥3 times/day	7 (1.9%)	7 (1.9%)	
Sugar-sweetened beverages, n (%)			
Never/Seldom	57 (15.1%)	61 (16.2%)	0.003
<1/week	122 (32.4%)	141 (37.4%)	
1-3 times/week	100 (26.5%)	106 (28.1%)	
4-6 times/week	53 (14%)	35 (9.3%)	
1 time/day	37 (9.8%)	20 (5.3%)	
2 times/day	6 (1.6%)	12 (3.2%)	
≥3 times/day	2 (0.5%)	2 (0.5%)	
Fish or seafood, n (%)			
Never/Seldom	30 (8.0%)	46 (12.2%)	0.101
<1/week	100 (26.5%)	102 (27.1%)	
1-3 times/week	160 (42.4%)	150 (39.8%)	
4-6 times/week	69 (18.3%)	64 (17%)	
1 time/day	12 (3.2%)	12 (3.2%)	
2 times/day	6 (1.6%)	3 (0.8%)	
≥3 times/day	0 (0%)	0 (0%)	

Meat and/or eggs, n (%)			
Never/Seldom	4 (1.1%)	10 (2.7%)	<0.001
<1/week	10 (2.7%)	7 (1.9%)	
1-3 times/week	48 (12.7%)	52 (13.8%)	
4-6 times/week	71 (18.8%)	79 (21%)	
1 time/day	94 (24.9%)	115 (30.5%)	
2 times/day	136 (36.1%)	107 (28.4%)	
≥3 times/day	14 (3.7%)	7 (1.9%)	
Processed meats, n (%)			
Never/Seldom	29 (7.7%)	43 (11.4%)	0.014
<1/week	138 (36.6%)	140 (37.1%)	
1-3 times/week	144 (38.2%)	133 (35.3%)	
4-6 times/week	36 (9.6%)	45 (11.9%)	
1 time/day	27 (7.2%)	14 (3.7%)	
2 times/day	3 (0.8%)	2 (0.5%)	
≥3 times/day	0 (0.0%)	0	
Legumes, n (%)			
Never/Seldom	10 (2.7%)	13 (3.4%)	0.014
<1/week	49 (13.0%)	66 (17.5%)	
1-3 times/week	139 (36.9%)	129 (34.2%)	
4-6 times/week	87 (23.1%)	93 (24.7%)	
1 time/day	59 (15.6%)	52 (13.8%)	
2 time/day	28 (7.4%)	23 (6.1%)	
≥3 times/day	5 (1.3%)	1 (0.3%)	
Milk and dairy products, n (%)			
Never/Seldom	6 (1.6%)	8 (2.1%)	0.898
<1/week	20 (5.3%)	20 (5.3%)	
1-3 times/week	51 (13.5%)	51 (13.5%)	
4-6 times/week	93 (24.6%)	95 (25.2%)	
1 time/day	92 (24.4%)	83 (22%)	
2 times/day	84 (22.3%)	86 (22.8%)	
≥3 times/day	31 (8.2%)	34 (9%)	
Wholegrain cereal products, n (%)			
Never/Seldom	25 (6.6%)	36 (9.6%)	0.051
<1/week	55 (14.6%)	61 (16.2%)	
1-3 times/week	83 (22%)	83 (22.1%)	
4-6 times/week	102 (27%)	85 (22.6%)	
1 time/day	71 (18.8%)	61 (16.2%)	
2 times/day	25 (6.6%)	31 (8.2%)	
≥3 times/day	16 (4.2%)	19 (5.1%)	
Regular meal schedule, n (%)			
Every day	176 (46.7%)	142 (37.7%)	<0.001
4-6 times/week	129 (34.2%)	132 (35.0%)	
2-3 times/ week	45 (11.9%)	85 (22.5%)	
About 1/ week	16 (4.2%)	8 (2.1%)	
<1/week	4 (1.1%)	6 (1.6%)	
Don't know	7 (1.9%)	4 (1.1%)	
Share main meals with friends/family, n (%)			

Every day	185 (49.1%)	123 (32.6%)	<0.001
4-6 times/ week	67 (17.8%)	93 (24.7%)	
2-3 times/week	67 (17.8%)	99 (26.3%)	
About 1/week	23 (6.1%)	22 (5.8%)	
<1/week	29 (7.7%)	36 (9.5%)	
Don't know	6 (1.6%)	4 (1.1%)	
Toxic habits			
Smoking habits, n (%)			
No	339 (89.9%)	311 (82.5%)	<0.001
Yes	38 (10.1%)	66 (17.5%)	
Smoking intensity, n (%)			
<1/ day	4 (1.1%)	3 (0.8%)	<0.001
1/day	3 (0.8%)	3 (0.8%)	
2-5/day	18 (4.8%)	33 (8.8%)	
6-10/day	11 (2.9%)	21 (5.6%)	
11-20/day	2 (0.5%)	6 (1.6%)	
>20/day	0	0	
Alcohol consumption, frequency, n (%)			
Never	126 (33.4%)	91 (24.1%)	0.009
Monthly or less	119 (31.6%)	139 (36.9%)	
2-4 times/month	14 (3.7%)	25 (6.6%)	
2-3 times/week	113 (30%)	99 (26.3%)	
≥4 times/week	5 (1.3%)	23 (6.1%)	
Alcohol intensity (quantity per occasion), n (%)			
1-2 standard alcoholic drinks	57 (22.7%)	74 (25.9%)	0.005
3-4 standard alcoholic drinks	100 (39.8%)	96 (33.6%)	
5-6 standard alcoholic drinks	69 (27.5%)	72 (25.2%)	
7-8 standard alcoholic drinks	9 (3.6%)	21 (7.3%)	
≥9 standard alcoholic drinks	9 (3.6%)	19 (6.6%)	
Don't know	7 (2.8%)	4 (1.4%)	
Physical activity - recreational activities, n (%)			
Every day	39 (10.3%)	55 (14.6%)	0.459
4-6 times/week	85 (22.5%)	79 (21%)	
2-3 times/week	153 (40.6%)	114 (30.2%)	
About 1/week	10 (2.7%)	13 (3.4%)	
2-3 times/month	10 (2.7%)	19 (5%)	
1/ month	27 (7.2%)	43 (11.4%)	
<1/month	48 (12.7%)	44 (11.7%)	
Don't know	5 (1.3%)	10 (2.7%)	
Hours spend studying/working in front of the screen, n (%)			
<2 hours/ day	90 (23.9%)	46 (12.2%)	<0.001
2-4 hours/ day	172 (45.6%)	89 (23.6%)	
5-7 hours/ day	98 (26%)	145 (38.5%)	
8-10 hours/ day	12 (3.2%)	76 (20.2%)	
>10 hours/ day	2 (0.5%)	15 (4.0%)	
Don't know	3 (0.8%)	6 (1.6%)	
Hours during leisure time spent in front of screens, n (%)			

<2 hours/ day	90 (23.9%)	92 (24.4%)	0.245
2-4 hours/ day	156 (41.4%)	163 (43.2%)	
5-7 hours/ day	70 (18.6%)	72 (19.1%)	
8-10 hours/ day	49 (13%)	41 (10.9%)	
>10 hours/ day	7 (1.9%)	3 (0.8%)	
Don't know	5 (1.3%)	6 (1.6%)	
Sleep quality, n (%)			
Poor	7 (1.9)	22 (5.8)	<0.001
Fair	58 (15.3)	126 (33.5)	
Good	280 (74.3)	192 (50.9)	
Excellent	32 (8.5)	37 (9.8)	
Self-rated health status, mean (SD)			
Physical health	76.6 (14.9)	70.1 (16.9)	<0.001
Psychological health	73.6 (14.7)	67.5 (19.9)	<0.001

Supplementary Table S1: Changes in lifestyle and self-reported health status since the COVID-19 pandemic in the sample. SD: Standard Deviation; Significant P-values Bolded; [a] Wilcoxon Test

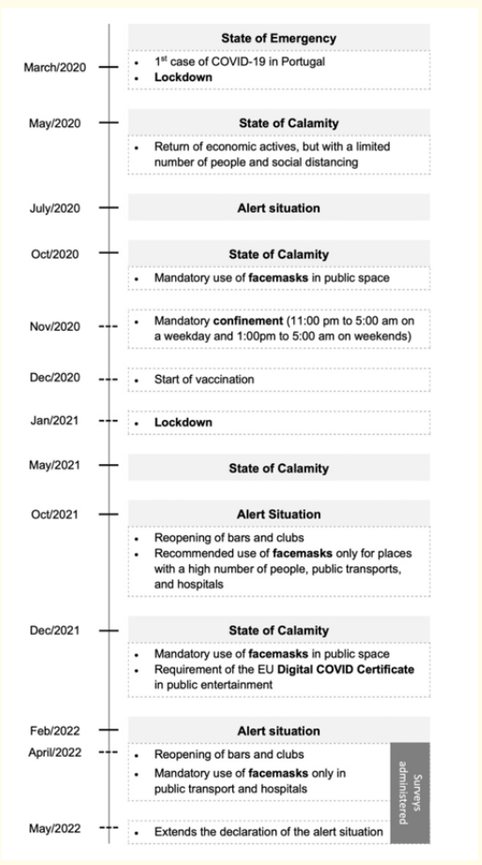

Figure 1: Survey collection timeline, epidemiological situation, and Portugal's mandates in response to the COVID-19 pandemic.

Regarding toxic habits, there were statistically significant differences in the changes experienced in smoking, alcohol consumption, and time spent in front of screens for work/study. Almost 10% of the students increased their frequency, and 45% of smokers increased the intensity of smoking. In this sense, the frequency and amount of alcohol consumed also increased in 28% and 29% of participants, respectively. On the other hand, more than half of students (52%) increased screen time dedicated to work or study.

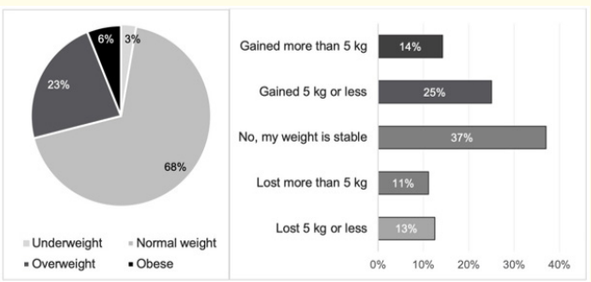

Figure 2: Body mass index classification (a) and weight variation during the COVID-19 pandemic (b) in the sample: students at the Polytechnic Institute of Bragança

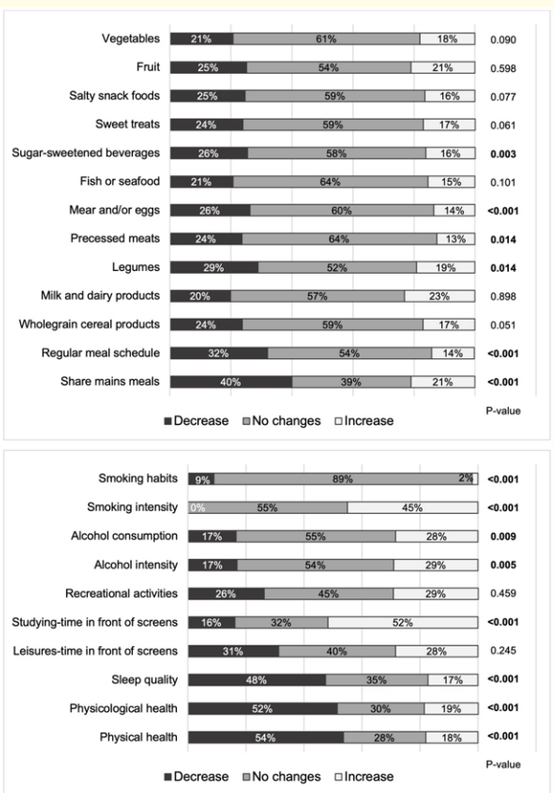

Figure 3: Change in lifestyle since the COVID-19 pandemic in the sample: students at the Polytechnic Institute of Bragança.

On the contrary, no association was found between recreational activities and time spent in front of the screen for leisure between analyzed periods. Concerning health outcomes, students reported a significant decrease in sleep quality (decrease, 48%; increase, 17%), self-reported psychological health (decrease, 52%; increase, 19%), and physical health (decrease, 54%; increase, 18%).

Regarding change patterns in lifestyle and health outcomes, depending on the variable nationality, the chi-square test showed a significant difference in the consumption of meat and eggs (P = 0.001), sugar-sweetened beverages (P = 0.018), processed meats (P = 0.003), legumes (P = 0.001), sweets (P = 0.001), vegetables (P = 0.010), fruits (P = 0.010), and salty snacks (P = 0.027) between nationalities (European vs. non-European students) (Figure 4a). In the same way, statistically significant differences were observed for changes in self-reported physical health (P = 0.002), sleep quality (P = 0.045), screen time for leisure (P = 0.005), and regular meal schedule (P = 0.009). Non-Europeans, compared to Europeans, showed greater variation, mainly a decrease, in consumption of most food groups. Regarding other lifestyle factors, the percentage of non-European students whose self-reported physical health and sleep quality worsened was higher than that of European students.

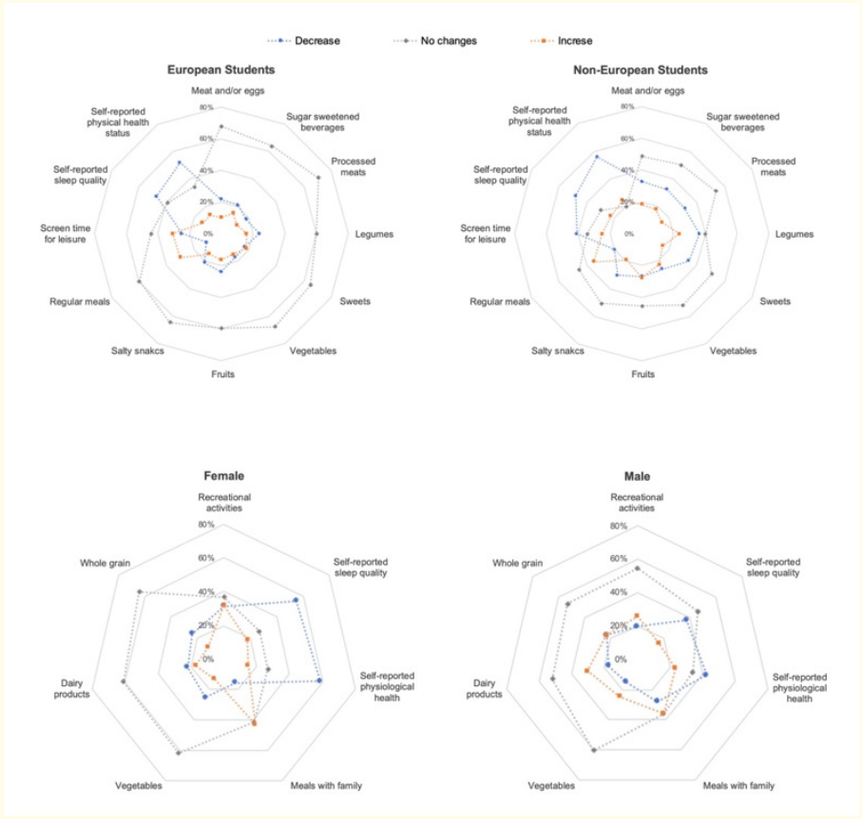

Figure 4: Change in lifestyle since the COVID-19 pandemic in the sample: students at the Polytechnic Institute of Bragança, divided by nationality (a) and sex (b).

Concerning the change patterns in lifestyle and health outcomes, depending on the variable sex, statistically significant changes were observed in physical activity (recreational activities) (P = 0.002), sleep quality (P < 0.001), self-reported physiological health (P = 0.006), sharing the main meals with friends/family (P = 0.013) (Figure 4(b)). Women, compared to men, experienced further deterioration in sleep quality and self-reported psychological health. Moreover, males, in contrast to females, showed a greater increase in the consumption of vegetables (P = 0.003), dairy products (P = 0.009), and whole grains (P = 0.012). No significant differences were found in the change patterns in lifestyle and health outcomes, depending on the variable educational levels (undergraduates vs. postgraduates) (data not showed).

Discussion

This study sought to assess changes in lifestyle and health outcomes during the COVID-19 pandemic, among students from the IPB. The data were recorded between April and May 2022, when the epidemiological situation caused by the COVID-19 pandemic showed positive improvements in Portugal. Regarding changes in food intake frequency, our findings showed a decrease in consumption of three food groups whose intake, at the population level, is recommended to be reduced; and a decrease in legumes that, on the contrary, it is recommended to increase; just as changes for the worse in dietary habits related to schedules and company at mealtimes. Otherwise, participants reported increased in other habits considered unhealthy (such as time spent in time spent in front of

screens, and toxic habits) and a worsening in sleep quality, and self-reported health. Furthermore, change patterns differed according to nationality and sex, changes were more frequent among non-Europeans and women.

Concerning eating habits, in agreement with other authors, our data show a significant decrease in sugar-sweetened beverages, processed meat, and meat/eggs intake which could indicate a greater adequacy to the population recommendations [22,23]. Sugary drinks intake grows total dietary energy intake and is associated with an increased risk of obesity [24]. While the consumption of meat, particularly red and processed meat, is associated with an increased incidence of diseases, such as cancer and cardiovascular diseases, [25] limiting its intake is beneficial. When observing other studies that also analyzed changes in eating habits during the COVID-19 pandemic, several studies point to a slight improvement in food choices [9,26]. One of the potential explanations is that the population followed the Directorate General of Health guidelines and campaigns to follow a healthy diet to prevent COVID-19. In addition, the reduction in social interaction can lead to a decrease in the consumption of sugary drinks since coffee shops and vending machines are often used to purchase juices and soft drinks [26]. Otherwise, it is plausible that students would have reduced their consumption of these foods, mainly meat, due to the food insecurity that increased during the pandemic or also due to concern about the environmental impact of its consumption [9]. Other authors also observed a decrease in meat intake from before to during the pandemic from before to during the pandemic [13,22,23]. On the other hand, our results regarding the changes in the consumption of legumes. Jia., *et al*. [22]. observed a decrease in the percentage of students (from 7.3 to 6.3%) consuming soya products from before to during the lockdown.

Although this study was conducted during the COVID-19 pandemic, it was after the end of severe social restrictions. Even with the return to 'normality', students reported that they reduced the frequency of meals with family and/or friends in addition to reducing their regular mealtimes. Structured routines and frequent family meals have been associated with positive health and well-being outcomes during the pandemic through improved emotional control and stress management [27]. Misalignments in eating routines are associated with an increased risk of obesity and unhealthy eating habits [28]. However, it is important to emphasize that many of the evaluated students experience changes not only due to the pandemic but due to the entering university. Approximately one-third of the assessed students entered university during the pandemic period, and as mentioned in other studies, people tend to consume meals at more unregulated times when they enroll in college or university [29].

Another lifestyle change evidenced in our research was the increase in alcohol consumption and smoking habits. Almost half of the participants increased tobacco use, which agrees with the results of Karadayian., *et al*. [30]. for older students (25-35 years old). In a survey conducted in 2021 by the Portuguese Society of Pneumology, the number of smokers in Portugal also increased significantly during the pandemic [31], despite the knowledge of the increased risk of COVID-19 transmission and severity of disease from smoking [32].

Regarding alcohol consumption, 28% of the students increased the frequency of consumption and 29% the quantity from before to during the pandemic, which agrees with the results of other researchers [13,33]. Notably, ethanol is a psychoactive, reinforcing, and toxic substance, and health damage increases with the amount of alcohol consumed [34]. Despite being negative, the increase was predictable after such a prolonged period of confinement and with the reopening of nightclubs, bars, and pubs, which encourages greater alcohol and tobacco consumption [35]. Furthermore, entrance to the university and the age of the majority favor this increase. Tolerance and acceptance facilitate increases in consumption regularity and intensity [36].

Restrictions related to the COVID-19 pandemic have led many schools, institutions, and companies to adopt online teaching methods. These modifications were essential to help maintain normalcy, but they also dramatically increased the use of screens. Moitra and Madan [37]. and Trott., *et al*. [38]. also reported an excessive increase in screen time during the COVID-19 pandemic. Health damage caused by excessive screen time is well-documented, especially from a mental perspective, increasing anxiety, depression, poor sleep, and physical health [39,40]. In addition, the students surveyed also reported a decrease in self-perception of sleep quality, and health, confirming other studies performed during the lockdown, highlighting the accumulation of psychological distress and the exacerbated stress levels, reducing the quality of life [26,35]. This alteration suggests that the pandemic had lasting and substantial health effects on health even after restrictions ended.

As previous studies have found, the COVID-19 pandemic affected the students´ weight [14,41,42]. Almost 40% of the participants gained weight during the pandemic, and nearly one-third was overweight when they participated in the present study. The prevalence of overweight/obesity (23%/6%) among IPB students was higher than that reported by the National Institute of Statistics of Portugal (18.4% and 5.6%, respectively), for the same age group [43]. Obesity at a younger age is a predisposing factor for adult obesity, [24]. therefore related to the development of several non-communicable chronic diseases (type 2 diabetes, cardiovascular diseases, hypertension, stroke) [44]. Home confinement and isolation may have motivated these bodily changes, given the increase in anxiety and uncertainty, as evidenced in previous studies [8].

When analyzing the clusters, non-European students, who mainly include South Americans and Africans, adopted considerable variations in lifestyles, both increased and decreased. About eating habits, non-Europeans show greater variation, mainly a decrease in the consumption of vegetables, legumes, meat, eggs, pro-

cessed meats, sugary drinks, and sweets, compared to Europeans, who for the most part did not experience major changes during the pandemic. More than half of the non-European students analyzed during the survey also migrated to Portugal during the pandemic. The migration can also be a confounding factor and play an essential role in food choices, as they are exposed to different environmental influences, culture shock, limited familiarity with new country foods, and financial difficulties [45,46]. Moreover, non-Europeans tended to report a worsening in sleep quality and self-reported physical health. Regarding gender, women, compared to men, showed greater decreases in sleep quality and self-reported psychological health. A previous study conducted amongst Polish university students also presented that during the pandemic, females experienced poorer sleep quality in comparison to males [47]. Moreover, regarding gender differences in self-assessed health status, other authors have suggested that the major factors contributing to these differences are a mix of biological factors and societal gender inequalities [48].

Limitations

Our study had some limitations that deserve further discussion. First, an online survey was chosen as the data collection method to reach a large part of the target population. However, the online survey may affect the validity and reliability of the answers, due to the difference in the interpretation of the questions, in addition to the fact that we used a convenient sample, which may not be representative of the IPB student population. Second, food intake was assessed using self-reporting. It relies on personal memory, posing the risk of inaccuracy and unreliability, particularly when remembering the number of services of a particular food group consumed. The grams and household measures corresponding to each evaluated item were presented to help the interviewees answer these questions. Despite these limitations, we believe that our findings are notable and provide timely information to assist in actions to improve healthy lifestyle habits in young students.

Conclusion

The findings of the present research suggest that lifestyle and health outcomes have changed since the COVID-19 pandemic began. During the pandemic, students engaged in unfavorable dietary habits that affected when and with whom they eat, as well as screen time, alcohol, and smoking consumption, and sleep quality. At the same time, self-reported health worsened during this period. Despite this, we observed decreasing in some food groups which seems to show better food choices. Furthermore, patterns of changes in lifestyle and health outcomes differed according to nationality and sex, being the changes more frequent among non-Europeans and women. Thus, professionals who work in the community, as well as the government should adopt measures to improve healthy lifestyles in this population, paying special attention to the most vulnerable groups.

Acknowledgements

The authors are grateful to the Foundation for Science and Technology (FCT, Portugal) for financial support through national funds FCT/MCTES (PIDDAC) to CIMO (UIDB/00690/2020 and UIDP/00690/2020) and SusTEC (LA/P/0007/2020). In addition, we want to acknowledge all the researchers of the Food Insecurity among European University Students during the COVID-19 Pandemic (FINESCOP) project.

Ethical Approval

The study was approved by the Research Ethics Committee Involving Human Subjects of the University of the Basque Country UPV/EHU (Protocol: M10_2021_185).

Conflict of Interest

The authors report no declaration of interest.

Bibliography

1. WHO. COVID 19 Public Health Emergency of International Concern (PHEIC). World Health Organization; Global Research Collaboration for Infectious Disease Preparedness (2020).

2. Ferreira-da-Silva R., *et al*. "A pandemia de COVID-19 em Portugal: Evolução, Vacinação e Farmacovigilância". *Revista Multidisciplinar* 4 (2022): 135-154.

3. Direção-Geral da Saúde. Relatório de Situação COVID-19 (2022).

4. Caroppo E., *et al*. "Will Nothing Be the Same Again? Changes in Lifestyle during COVID-19 Pandemic and Consequences on Mental Health". *International Journal of Environmental Research and Public Health* 18 (2021): 8433.

5. Giner-Murillo M., *et al*. "Lifestyle in Undergraduate Students and Demographically Matched Controls during the COVID-19 Pandemic in Spain". *International Journal of Environmental Research and Public Health* 18 (2021): 8133.

6. Alfawaz H., *et al*. "Dietary Intake and Mental Health among Saudi Adults during COVID-19 Lockdown". *International Journal of Environmental Research and Public Health* 18 (2021): 1653.

7. López-Moreno M., *et al*. "Physical and Psychological Effects Related to Food Habits and Lifestyle Changes Derived from COVID-19 Home Confinement in the Spanish Population". *Nutrients* 12 (2020): 3445.

8. Di Renzo L., *et al*. "Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey". *Journal of Translational Medicine* 18 (2020): 229.

9. Direção-Geral da Saúde. "React-COVID: Inquérito sobre alimentação e atividade física em contexto de contenção social" (2020).

10. Werf ET., *et al*. "Lifestyle changes during the first wave of the COVID-19 pandemic: a cross-sectional survey in the Netherlands". *BMC Public Health* 21 (2021): 1226.

11. Corpuz JCG. "Correspondence: Adapting to the culture of "new normal": An emerging response to COVID-19". *Journal of Public Health (United Kingdom)* 43 (2021): 344-345.

12. Assaf I., *et al*. "Students university healthy lifestyle practice: quantitative analysis". *Health Information Science and Systems* 7 (2019): 7.

13. Bertrand L., *et al*. "The impact of the coronavirus disease 2019 (COVID-19) pandemic on university students' dietary intake, physical activity, and sedentary behaviour". *Applied Physiology, Nutrition, and Metabolism* 46 (2021): 265-272.

14. Chaturvedi K., *et al*. "COVID-19 and its impact on education, social life and mental health of students: A survey". *Children and Youth Services Review* 121 (2021): 105866.

15. Fila-Witecka K., *et al*. "Lifestyle Changes among Polish University Students during the COVID-19 Pandemic". *International Journal of Environmental Research and Public Health* 18 (2021): 9571.

16. Owens MR., *et al*. "Prevalence and Social Determinants of Food Insecurity among College Students during the COVID-19 Pandemic". *Nutrients* 12 (2020): 2515.

17. Górnicka M., *et al*. "Dietary and Lifestyle Changes During COVID-19 and the Subsequent Lockdowns among Polish Adults: A Cross-Sectional Online Survey PLifeCOVID-19 Study". *Nutrients* 12 (2020): 2324.

18. WHO. WHO Expert Committee on Physical Status: The use and interpretation of anthropometry. 1. World Health Organization (2010).

19. Devlin NJ and Brooks R. "EQ-5D and the EuroQol Group: Past, Present and Future". *Applied Health Economics and Health Policy* 15 (2017): 127-137.

20. UCD. The National COVID-19 Food Study. Institute of Food and Health, University College Dublin (2020).

21. Snyder E., *et al*. "A new single-item sleep quality scale: Results of psychometric evaluation in patients with chronic primary insomnia and depression". *Journal of Clinical Sleep Medicine* 14 (2018): 1849-1857.

22. Jia P., *et al*. "Changes in dietary patterns among youths in China during COVID-19 epidemic: The COVID-19 impact on lifestyle change survey (COINLICS)". *Appetite* 158 (2021): 105015.

23. Palmer K., *et al*. "Changes in lifestyle, diet, and body weight during the first COVID 19 'lockdown' in a student sample". *Appetite* 167 (2021): 105638.

24. Malik VS and Hu FB. "The role of sugar-sweetened beverages in the global epidemics of obesity and chronic diseases". *Nature Reviews Endocrinology* 18 (2022): 205-218.

25. Zhong VW., *et al*. "Associations of Processed Meat, Unprocessed Red Meat, Poultry, or Fish Intake with Incident Cardiovascular Disease and All-Cause Mortality". *JAMA Internal Medicine* 180 (2020): 503-512.

26. Lombardo M., *et al*. "Changes in eating habits and physical activity after covid-19 pandemic lockdowns in Italy". *Nutrients* 13 (2021): 1-11.

27. Egli V., *et al*. "Household Mealtimes During the 2020 COVID-19 Lockdown in Aotearoa New Zealand: The Influence of Household Type and Psychological Distress". *Frontiers in Nutrition* (2022): 9.

28. Ramírez-Contreras C., *et al*. "Life before and after COVID-19: The 'New Normal' Benefits the Regularity of Daily Sleep and Eating Routines among College Students". *Nutrients* 14 (2022): 351.

29. Bárbara R and Ferreira-Pêgo C. "Changes in eating habits among displaced and non-displaced university students". *International Journal of Environmental Research and Public Health* 17 (2020): 1-9.

30. Karadayian A., *et al*. "Alcohol Consumption, Hangovers, and Smoking among Buenos Aires University Students during the COVID-19 Pandemic". *Journal of Clinical Medicine* 12 (2023): 1491.

31. SPP. Resultados do Inquérito da SPP revelam que Portugueses fumaram mais durante o segundo confinamento". *Sociedade Portuguesa de Pneumologia* (2021).

32. Gotts JE., *et al*. "What are the respiratory effects of e-cigarettes?" *BMJ* (2019): l5275.

33. Brancaccio M., *et al*. "Effects of the COVID-19 Pandemic on Job Activity, Dietary Behaviours and Physical Activity Habits of University Population of Naples, Federico II-Italy". *International Journal of Environmental Research and Public Health* 18 (2021): 1502.

34. WHO. Global status report on alcohol and health 2018. vol. 65. Geneva: Wordl Health Organization (2018).

35. Landaeta-Díaz L., *et al*. "Anxiety, anhedonia and food consumption during the COVID-19 quarantine in Chile". *Appetite* 164 (2021): 105259.

36. Trigo AC and Santiago LM. "Alcohol drinking in higher education students from coimbra and the impact of academic festivities". *Acta Médica Portuguesa* 34 (2021): 249-256.

37. Moitra P and Madan J. "Impact of screen time during COVID-19 on eating habits, physical activity, sleep, and depression symptoms: A cross-sectional study in Indian adolescents". *PLoS One* (2022): 17.

38. Trott M., *et al*. "Changes and correlates of screen time in adults and children during the COVID-19 pandemic: A systematic review and meta-analysis". *EClinicalMedicine* 48 (2022): 101452.

39. Sultana A., *et al*. "Digital screen time during the COVID-19 pandemic: a public health concern". *F1000 Research* 10 (2021): 81-81.

40. Rocka A., *et al*. "The Impact of Digital Screen Time on Dietary Habits and Physical Activity in Children and Adolescents". *Nutrients* 14 (2022): 2985.

41. Celorio-Sardà R., *et al*. "Effect of COVID-19 Lockdown on Dietary Habits and Lifestyle of Food Science Students and Professionals from Spain". *Nutrients* 13 (2021): 1494.

42. Tan S., *et al*. "Physical Activity, Sedentary Behavior, and Weight Status of University Students during the COVID-19 Lockdown: A Cross-National Comparative Study". *International Journal of Environmental Research and Public Health* 18 (2021): 7125.

43. INE. Inquérito Nacional de Saúde 2019 (2019): 2020.

44. World Health Organization. Who European Regional Obesity Report (2022).

45. Kivuyo NG and Sharma S. "Dietary acculturation among African emigrant students in India: determinants and problems". *Public Health Nutrition* 23 (2020): 2402-2409.

46. Shi Y., *et al*. "Food access, dietary acculturation, and food insecurity among international tertiary education students: A scoping review". *Nutrition* 85 (2021): 111100.

47. Kosendiak AA., *et al*. "Level of Physical Activity, Sleep Quality and Use of Personal Protective Equipment of Students at Wroclaw Medical University during the COVID-19 Pandemic". *International Journal of Environmental Research and Public Health* 20 (2023): 2406.

48. Boerma T., *et al*. "A global assessment of the gender gap in self-reported health with survey data from 59 countries". *BMC Public Health* 16 (2013): 675.