

NUTRITIONAL BEHAVIOURS AND LIFESTYLE BEFORE AND DURING COVID-19 PANDEMIC: BASED ON DATA FROM POLISH AND TURKISH SURVEYS

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ABSTRACT

Background. Students are a group particularly high risk of adverse effects from such restrictions introduced within counter transmission the SARS-CoV-2 pandemic. Fear felt of contracting the disease and social isolation can lead to consuming excessive amounts of energy with food, resulting in weight gain and eating disorders.

Objective. The aim of the study was analysed selected lifestyle aspects of Polish and Turkish students before and during the COVID-19 pandemic and to determine the existence of differences between the lifestyles of these individuals during the two periods.

Material and methods. The study was conducted at the turn of 2020-2021 among 435 students, including 331 Polish and 104 Turkish students. The research instrument was an original questionnaire created in a Google Forms, consisting of metric and a proper part regarding lifestyle before and during the pandemic. Prior to the actual study, in order to verify whether the research tool is understandable, a pilot study was conducted, which included 40 individuals. The Wilcoxon test was used to examine the differences between the lifestyle of students before and during the pandemic. A value of $p < 0.05$ was considered statistically significant.

Results. Both before and during the pandemic, most Polish students ate 4–5 meals daily (52.9% and 47.7%, respectively), while most Turkish students ate 3 meals (47.1% and 38.5%, respectively). There were statistically significant differences in: duration of sleep ($p=0.001$), way of spending one's leisure time ($p=0.001$) and type of physical activity ($p=0.001$) among the Polish and Turkish students before and during the pandemic.

Conclusions. The results of this study showed changes in the lifestyle of both Polish and Turkish students during the pandemic compared to the pre-pandemic period. This indicates the need to develop interventions to prevent harmful behaviour and their health consequences in the future.

Key words: COVID-19 pandemic, nutritional behaviours, Polish students, Turkish students, lifestyle

INTRODUCTION

The SARS-CoV-2 pandemic is still one of the biggest challenge around the world. The first cases occurred in December 2019 in Wuhan; however, the pandemic spread quickly outside of the Asian continent. In order to prevent further spread of the virus, the authorities of the countries with the first cases of the disease started to implement heightened safety measures and movement restrictions [19, 28]. These, coupled with the need for isolation and social

distancing, are important for reducing the number of infections; however, they do affect the mental health and lifestyle of people, including their dietary behaviour and physical activity [2]. Students are at a particularly high risk of adverse effects from such restrictions. Research shows that students display a high level of stress and depression associated with isolation [27, 33]. In addition, the fear of contracting the disease and social isolation can lead to consuming excessive amounts of energy with food, resulting in weight gain and eating disorders [3, 26].

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Publisher: National Institute of Public Health NIH - National Research Institute

According to currently available research the Covid-19 pandemic has contributed to changes in the nutrition and lifestyle of many persons. The worrying trend of increasing food consumption, including snacks, spending time passively in front of the TV screen and reducing the share of physical activity in everyday life has led to an increase in the incidence of overweight, obesity, hypertension and other diet-related diseases. This problem is particularly important due to the inflammatory conditions accompanying these diseases, which directly affect the reduction of immunity and are a direct risk factor for the severe course of SARS-CoV-2 infection [25, 31]. Due to the well-known effect of a proper diet in reducing the indicator of chronic inflammation, the importance of diet in defense against viruses is indicated [11]. Products such as fish, eggs and lean meat contain protein with a high biological value. When consumed in adequate quantities, they play a key role in the correct production of antibodies. Fish, particularly mackerel, salmon and tuna, are also a rich source of omega-3 acids, which are specialized inflammation-dampening mediators [14, 17]. Fruit and vegetables are also important dietary components supporting health and immunity, which supports the body through its antioxidant effects on the pulmonary epithelial cells [4, 29]. With their probiotic bacterial content, fermented dairy products have a proven positive effect on the functioning of the body, including the gastrointestinal tract and immune system [7]. Nevertheless, it is worth noting that the effect of consuming pro-/ prebiotic products on preventing SARS-CoV-2 infection has not yet been demonstrated [8]. Proper hydration is also important, since it affects temperature regulation and transport of essential nutrients, among other functions. Mineral water is one of recommended beverages and the consumption of sweet carbonated drinks should be limited. Highly processed foods, including fast food and instant meals, negatively affect the body's ability to respond to diseases associated with a weakened immune system, including viral diseases [18].

The aim of the study was to analyze selected aspects of the lifestyle of Polish and Turkish students before and during the COVID-19 pandemic, and to determine the differences between the lifestyles of these people in both periods.

MATERIAL AND METHODS

The survey was conducted in December 2020 among 435 students, including 331 Polish and 104 Turkish students. An original questionnaire was used, which was administered as a Google form distributed in social media. Only adult students were allowed to participate in the study. Non-students under the age of 18 were not allowed to participate in the study.

The study consisted of two parts. The first concerned demographic data such as nationality, gender, age, weight, height, field of study, type of study, place of residence and employment before and during the pandemic. The second part of the questionnaire contained questions about the lifestyle of students before and during the pandemic, including primarily eating habits. In order to test whether the research tool is free from bias, a pilot study was carried out with 40 participants. The approval of the bioethics committee was not required.

The Statistica 13.3 program was used for data analysis. The results are presented by nationality and the period covered by the questions (before or during the pandemic). The *Wilcoxon* test was used to explore differences between students' lifestyles before and during the pandemic. The *Chi²* test was used to assess differences in the frequency of experiencing various sensations and changes in body weight among Polish and Turkish students. A value $p < 0.05$ was considered statistically significant. Proper eating habits were compared on the basis of current recommendations.

RESULTS

Both before and during the pandemic, the majority of Polish students ate 4-5 meals a day (52.9% and 47.7%, respectively), while the majority of Turkish students ate 3 meals (47.1% and 38.5%, respectively). Both before and during the pandemic, the majority of Polish (53.2% and 65.9%) and Turkish (51% and 72.1%) students declared that they always eat breakfast. It is positive that among Polish students (16% vs 6.6%) and Turkish students (8.6% vs 4.8%) the percentage of people who did not eat breakfast decreased. The majority of Polish students indicated that they prepared meals on their own before and during the pandemic (69.5% and 71.3%, respectively). Most Turkish students ate meals in their dorms before the pandemic (40.4%), but now eat meals prepared by family/friends (72.1%). Statistically significant differences were found in the number of meals and the frequency of eating breakfast among Polish and Turkish students before and during the pandemic ($p < 0.05$). Differences in the place/form of breakfast among Turkish students before and during the pandemic were also observed ($p < 10^{-6}$, Table 1).

Both before and during the pandemic, most Polish students ate vegetables several times a day (40.2% and 38.1%, respectively). In Poland, it is believed that the norm of fruit and vegetable consumption should be at least 400 g, of which $\frac{3}{4}$ should be vegetables and $\frac{1}{4}$ fruit. The frequency among Turkish students was different: before and during the pandemic, they usually ate vegetables several times a week (59.6% and 55.8%). It is different with the frequency of eating fruit. Before and during the pandemic, most Polish

Table 1. Consumption of meals before and during pandemic by Polish and Turkish students

| Possible answers | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|---|-----------------------|------|-----------------|------|--------|------------------------|------|-----------------|------|-------------------|
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N | % | N | % | | N | % | N | % | |
| Amount of consumed meals | | | | | | | | | | |
| <3 | 17 | 5.1 | 38 | 11.5 | 0.038 | 19 | 18.3 | 37 | 35.6 | 0.008 |
| 3 | 132 | 39.9 | 124 | 37.5 | | 49 | 47.1 | 40 | 38.5 | |
| 4-5 | 175 | 52.9 | 158 | 47.7 | | 31 | 29.8 | 24 | 23.1 | |
| >5 | 7 | 2.1 | 11 | 3.3 | | 5 | 4.8 | 3 | 2.9 | |
| Breakfast consumption | | | | | | | | | | |
| Yes, always | 176 | 53.2 | 218 | 65.9 | <0.001 | 53 | 51 | 75 | 72.1 | 0.003 |
| Yes, sometimes | 102 | 30.8 | 91 | 27.5 | | 42 | 40.4 | 24 | 23.1 | |
| Never | 53 | 16 | 22 | 6.6 | | 9 | 8.6 | 5 | 4.8 | |
| Place or form of preparing the consumed meals | | | | | | | | | | |
| Prepared by yourself | 230 | 69.5 | 236 | 71.3 | 0.071* | 15 | 14.4 | 27 | 26.0 | <10 ⁻⁶ |
| Prepared by family/friends | 68 | 20.5 | 77 | 23.3 | | 26 | 25 | 75 | 72.1 | |
| Purchased ready-to eat | 19 | 5.8 | 12 | 3.6 | | 3 | 2.9 | 2 | 1.9 | |
| Consumed in fast-food bars | 4 | 1.2 | 3 | 0.9 | | 15 | 14.4 | 0 | 0 | |
| Consumed in academic | 4 | 1.2 | 0 | 0 | | 42 | 40.4 | 0 | 0 | |
| Consumed in restaurants | 6 | 1.8 | 3 | 0.9 | | 3 | 2.9 | 0 | 0 | |

*- non-statistical

students ate fruit several times a week (29.9% and 31.7%), while Turkish students usually ate fruit several times a day (48.1% and 57.7%).

As for wholegrain cereal products, most of both groups consumed them several times a day before and during the pandemic (43.5% and 41.4% for Polish students and 50% and 54.8% for Turkish students). This is very positive, because according to Polish recommendations, cereal products should be consumed from 5-6 portions a day.

Before and during the pandemic, the majority of Polish students ate legumes several times a month (36.6% and 34.7%, respectively) and nuts and seeds (31.7% and 32.0%). Turkish students consumed more legumes, respectively - most often they indicated the frequency several times a week before and during the pandemic in the case of legumes (72.1% and 76.9%) and nuts and seeds (31.7% and 40.4%), Table 2.

Statistically significant differences were found regarding the frequency of vegetable consumption among the Polish and Turkish students before and during the pandemic ($p < 0.05$). There were also statistically significant differences in terms of fruit ($p = 0.006$) and legume consumption frequency ($p = 0.025$) among the Turkish students between the periods in question (Table 2).

Both before and during the pandemic, the majority of Polish students consumed milk and milk-based drinks several times a week (36.9% and 35.6%, respectively), while among Turkish students the frequency was

dominant several times a week before the pandemic (45.2%) and several times a day during the pandemic (48.1%). Turkish students had better eating behavior. According to Polish recommendations, you should consume at least 2 full glasses of milk, or the same amount of kefir or yoghurt, and 1-2 slices of cheese every day. Statistically significant differences were found in the frequency of consumption of milk and milk-based beverages among Polish students before and during the pandemic ($p = 0.026$, Table 3). Both before and during the pandemic, most of the Polish participants consumed white cheese a few times a week (44.7%), and the Turkish participants did so a few times a day (43.3%). Statistically significant differences were found in the frequency of white cheese consumption among the Polish students before and during the pandemic ($p = 0.038$, Table 3).

Both before and during the pandemic, rennet cheeses were consumed predominantly a few times a week by the Polish (44.1%, 43.5%) and Turkish students (26.9%, 29.8%). Both Polish (41.7% before the pandemic, 40.5% during the pandemic) and Turkish students (44.2%, 48.1%) mostly ate fish a few times a month. Statistically significant differences were found in the frequency of fish consumption among the Turkish students before and during the pandemic ($p = 0.007$, Table 3).

Both before and during the pandemic, sweets and salty snacks were eaten by Polish and Turkish students, mostly several times a week. In the case

Table 2. Consumption frequency of selected products of a plant origin

| Possible answers | | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|-----------------------------|-----------------------|-----------------------|------|-----------------|------|--------|------------------------|------|-----------------|------|--------|
| | | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | | N | % | N | % | | N | % | N | % | |
| Vegetables | Several times a day | 133 | 40.2 | 126 | 38.1 | 0.008 | 22 | 21.2 | 35 | 33.7 | 0.004 |
| | Once a day | 105 | 31.7 | 94 | 28.4 | | 8 | 7.7 | 4 | 3.8 | |
| | Several times a week | 70 | 21.1 | 83 | 25.1 | | 62 | 59.6 | 58 | 55.8 | |
| | Several times a month | 12 | 3.6 | 17 | 5.1 | | 5 | 4.8 | 5 | 4.8 | |
| | Occasionally | 9 | 2.7 | 7 | 2.1 | | 7 | 6.7 | 2 | 1.9 | |
| | Never | 2 | 0.7 | 4 | 1.2 | | 0 | 0 | 0 | 0 | |
| Fruits | Several times a day | 80 | 24.2 | 69 | 20.8 | 0.092* | 50 | 48.1 | 60 | 57.7 | 0.006 |
| | Once a day | 98 | 29.6 | 101 | 30.5 | | 4 | 3.8 | 6 | 5.8 | |
| | Several times a week | 99 | 29.9 | 105 | 31.7 | | 37 | 35.6 | 34 | 32.7 | |
| | Several times a month | 38 | 11.5 | 39 | 11.8 | | 3 | 2.9 | 2 | 1.9 | |
| | Occasionally | 15 | 4.5 | 16 | 4.8 | | 10 | 71.4 | 2 | 1.9 | |
| | Never | 1 | 0.3 | 1 | 0.3 | | 0 | 0 | 0 | 0 | |
| Legumes | Several times a day | 7 | 2.1 | 7 | 2.1 | 0.169* | 4 | 3.8 | 6 | 5.8 | 0.025 |
| | Once a day | 20 | 6 | 18 | 5.4 | | 1 | 1 | 2 | 1.9 | |
| | Several times a week | 88 | 26.6 | 82 | 24.8 | | 75 | 72.1 | 80 | 76.9 | |
| | Several times a month | 118 | 35.6 | 115 | 34.7 | | 17 | 16.3 | 14 | 13.5 | |
| | Occasionally | 72 | 21.8 | 83 | 25.1 | | 6 | 5.8 | 1 | 1.0 | |
| | Never | 26 | 7.9 | 26 | 7.9 | | 0 | 0 | 1 | 1.0 | |
| Whole grain cereal products | Several times a day | 144 | 43.5 | 137 | 41.4 | 0.219* | 52 | 50 | 57 | 54.8 | 0.627* |
| | Once a day | 93 | 28.1 | 86 | 26.0 | | 7 | 6.7 | 4 | 3.8 | |
| | Several times a week | 67 | 20.2 | 81 | 24.5 | | 33 | 31.7 | 29 | 27.9 | |
| | Several times a month | 13 | 4 | 16 | 4.8 | | 9 | 8.7 | 13 | 12.5 | |
| | Occasionally | 10 | 3 | 9 | 2.7 | | 3 | 2.9 | 1 | 1.0 | |
| | Never | 4 | 1.2 | 2 | 0.6 | | 0 | 0 | 0 | 0 | |
| Nuts/seeds | Several times a day | 10 | 3 | 6 | 1.8 | 0.065* | 12 | 11.5 | 9 | 8.7 | 0.492* |
| | Once a day | 46 | 13.9 | 41 | 12.4 | | 1 | 1 | 1 | 1.0 | |
| | Several times a week | 90 | 27.2 | 88 | 26.0 | | 33 | 31.7 | 42 | 40.4 | |
| | Several times a month | 105 | 31.7 | 106 | 32.0 | | 32 | 30.8 | 38 | 36.5 | |
| | Occasionally | 60 | 18.1 | 67 | 20.2 | | 21 | 20.2 | 6 | 5.8 | |
| | Never | 20 | 6.1 | 23 | 6.9 | | 5 | 4.8 | 8 | 7.7 | |

* - non-statistical

of sweets, this answer was chosen by 38.7% of Poles before and 40.2% during the pandemic, and 10.8% of Turks before and 47.1% during the pandemic. In the case of salty snacks, 33.2% and 32.3% for Polish students and 49% and 41.3% for Turkish students, respectively. Summing up, the consumption of sweets in both groups increased during the pandemic, while the consumption of salty snacks decreased after the pandemic. Statistically significant differences were found in the frequency of eating sweets ($p=0.011$) and salty snacks ($p<0.001$) among Turkish students before and during the pandemic (Table 4).

Occasional consumption of fast food before and during the pandemic was indicated by 37.8% and 37.2% of Polish students, respectively. Among Turkish students before the pandemic, 36.5% ate such products several times a week, and now 32.7% eat them occasionally - this is very positive. Statistically significant differences in the consumption of fast food by Turkish students between the analyzed periods were found, $p<10^{-6}$ (Table 4).

The largest percentage of respondents did not consume energy drinks before and during the pandemic (52.0% and 58.0% for Polish students and 70.2% and 81.7% for Turkish students, respectively). Turkish

Table 3. Consumption frequency of food products of animal origin

| Possible answers | | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|-----------------------|-----------------------|-----------------------|------|-----------------|------|--------|------------------------|------|-----------------|------|--------|
| | | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | | N | % | N | % | | N | % | N | % | |
| Milk & dairy products | Several times a day | 52 | 15.7 | 51 | 15.4 | 0.026 | 44 | 42.3 | 50 | 48.1 | 0.179* |
| | Once a day | 90 | 27.2 | 79 | 23.9 | | 6 | 5.8 | 8 | 7.7 | |
| | Several times a week | 122 | 36.9 | 118 | 35.6 | | 47 | 45.2 | 42 | 40.4 | |
| | Several times a month | 38 | 11.5 | 52 | 15.7 | | 2 | 1.9 | 1 | 1.0 | |
| | Occasionally | 15 | 4.5 | 16 | 4.8 | | 5 | 4.8 | 2 | 1.9 | |
| | Never | 14 | 4.2 | 15 | 4.5 | | 0 | 0 | 1 | 1.0 | |
| White cheeses | Several times a day | 17 | 5.1 | 11 | 3.3 | 0.038 | 45 | 43.3 | 55 | 52.9 | 0.175* |
| | Once a day | 37 | 11.2 | 37 | 11.2 | | 4 | 3.8 | 6 | 5.8 | |
| | Several times a week | 148 | 44.7 | 144 | 43.5 | | 44 | 42.3 | 31 | 29.8 | |
| | Several times a month | 84 | 25.4 | 90 | 27.2 | | 4 | 3.8 | 3 | 2.9 | |
| | Occasionally | 30 | 9.1 | 32 | 9.7 | | 2 | 2 | 2 | 1.9 | |
| | Never | 15 | 4.5 | 17 | 5.1 | | 5 | 4.8 | 7 | 6.7 | |
| Rennet cheeses | Several times a day | 24 | 7.3 | 22 | 6.6 | 0.258* | 12 | 11.5 | 14 | 13.5 | 0.292* |
| | Once a day | 58 | 17.5 | 53 | 16.0 | | 1 | 1 | 6 | 5.8 | |
| | Several times a week | 146 | 44.1 | 144 | 43.5 | | 28 | 26.9 | 31 | 29.8 | |
| | Several times a month | 58 | 17.5 | 68 | 20.5 | | 25 | 24 | 17 | 16.3 | |
| | Occasionally | 28 | 8.5 | 27 | 8.2 | | 22 | 21.2 | 10 | 9.6 | |
| | Never | 17 | 5.1 | 17 | 5.1 | | 16 | 15.4 | 26 | 25.0 | |
| Fishes | Several times a day | 1 | 0.3 | 1 | 0.3 | 0.921* | 0 | 0 | 0 | 0 | 0.007 |
| | Once a day | 4 | 1.2 | 4 | 1.2 | | 1 | 1 | 1 | 1.0 | |
| | Several times a week | 64 | 19.3 | 67 | 20.2 | | 18 | 17.3 | 28 | 26.9 | |
| | Several times a month | 138 | 41.7 | 134 | 40.5 | | 46 | 44.2 | 50 | 48.1 | |
| | Occasionally | 83 | 25.1 | 81 | 24.5 | | 25 | 24 | 10 | 9.6 | |
| | Never | 41 | 12.4 | 44 | 13.3 | | 14 | 13.5 | 15 | 14.4 | |

*: non-statistical

students showed better eating habits. Differences in the frequency of energy drink consumption among Polish and Turkish students before and during the pandemic were found ($p < 0.05$, Table 4).

Physical activity, leisure time and rest

Sleep time among Turkish students has changed during the pandemic. Before the pandemic, most of them slept less than 7 hours (55.8%), while during pandemic 61.5% of them indicate that they sleep 7-9 hours. Both before and during the pandemic, Polish students slept 7-9 hours each (57.4% and 63.7%, respectively). This may have been caused by difficulties in moving around, apathy, and mental fatigue.

Before the pandemic, meeting friends was the most common way to spend one's leisure time among both Polish and Turkish students. This answer was selected by 67.7% of the Polish and 87.5% of the Turkish students. Currently, due to pandemic restrictions, the

number of individuals using a TV or computer has risen (51.1% of the Poles, 84.6% of the Turks). Before the pandemic, 34.4% of the Polish students spent up to 30 minutes on physical activity, while currently the highest percentage of the subjects do not have any physical activity at all (38.7%). Before the pandemic, the majority of the Turkish students exercised for 30–60 minutes (43.3%), while at present most of them spend up to 30 minutes on physical activity (50%). The most commonly selected type of physical activity performed before and during the pandemic was weight training, the respective figures being 22.7% and 10.9% for the Polish group and 25.3% and 13.5% for the Turkish one (Table 5).

Statistically significant differences were found regarding the duration of sleep per 24 hours, way of spending one's leisure time and type of physical activity among the Polish and Turkish students before and during the pandemic ($p < 0.05$). Differences were also observed in terms of the time spent on physical

Table 4. Consumption frequency of other food products before and during pandemic by Polish and Turkish students

| Possible answers | | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|--------------------|-----------------------|-----------------------|------|-----------------|------|--------|------------------------|------|-----------------|------|-------------------|
| | | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | | N | % | N | % | | N | % | N | % | |
| Sweets | Several times a day | 30 | 9 | 38 | 11.5 | 0.182* | 27 | 26 | 16 | 15.4 | 0.011 |
| | Once a day | 79 | 23.9 | 58 | 17.5 | | 1 | 1 | 3 | 2.9 | |
| | Several times a week | 128 | 38.7 | 133 | 40.2 | | 47 | 10.8 | 49 | 47.1 | |
| | Several times a month | 51 | 15.4 | 50 | 15.1 | | 15 | 14.4 | 18 | 17.3 | |
| | Occasionally | 36 | 10.9 | 39 | 11.8 | | 11 | 2.5 | 13 | 12.5 | |
| | Never | 7 | 2.1 | 13 | 3.9 | | 3 | 2.9 | 5 | 4.8 | |
| Salty snacks | Several times a day | 11 | 3.2 | 10 | 3.0 | 0.327* | 17 | 16.3 | 7 | 6.7 | <0.001 |
| | Once a day | 22 | 6.6 | 23 | 6.9 | | 1 | 1 | 3 | 2.9 | |
| | Several times a week | 110 | 33.2 | 107 | 32.3 | | 51 | 49 | 43 | 41.3 | |
| | Several times a month | 103 | 31.2 | 97 | 29.3 | | 22 | 21.2 | 28 | 26.9 | |
| | Occasionally | 71 | 21.4 | 75 | 22.7 | | 9 | 8.7 | 15 | 14.4 | |
| | Never | 14 | 4.4 | 19 | 5.7 | | 4 | 3.8 | 8 | 7.7 | |
| Fast-food products | Several times a day | 1 | 0.3 | 3 | 0.9 | 0.096* | 4 | 3.8 | 0 | 0 | <10 ⁻⁶ |
| | Once a day | 8 | 2.4 | 13 | 3.9 | | 0 | 0 | 0 | 0 | |
| | Several times a week | 68 | 20.5 | 55 | 16.6 | | 38 | 36.5 | 21 | 20.2 | |
| | Several times a month | 115 | 34.7 | 105 | 31.7 | | 34 | 32.7 | 27 | 26.0 | |
| | Occasionally | 125 | 37.8 | 123 | 37.2 | | 23 | 22.1 | 34 | 32.7 | |
| | Never | 14 | 4.3 | 32 | 9.7 | | 5 | 4.8 | 22 | 21.2 | |
| Energy-drinks | Several times a day | 4 | 1.2 | 5 | 1.5 | <0.001 | 0 | 0 | 0 | 0 | 0.005 |
| | Once a day | 19 | 5.7 | 14 | 4.2 | | 1 | 1 | 1 | 1.0 | |
| | Several times a week | 35 | 10.6 | 21 | 6.3 | | 8 | 7.7 | 5 | 4.8 | |
| | Several times a month | 33 | 10 | 32 | 9.7 | | 10 | 9.6 | 9 | 8.7 | |
| | Occasionally | 68 | 20.5 | 67 | 20.2 | | 12 | 11.5 | 4 | 3.8 | |
| | Never | 172 | 52 | 192 | 58.0 | | 73 | 70.2 | 85 | 81.7 | |

* - non-statistical

activity before and during the pandemic by the Polish students ($p < 0.001$, Table 5).

Most Polish students indicated that they drank alcohol occasionally both before and during the pandemic (38.7% and 45.3%, respectively). The frequency of drinking alcohol did not change among the Turkish students during the pandemic. The majority of them indicated that they did not drink alcohol both before and during the pandemic (81.8% for both periods). Turkish students showed better eating habits.

Both before and during the pandemic, Polish students usually drank medium-strength alcohol (40.1% and 44.5%, respectively). Before the pandemic, most Turkish individuals consumed low-strength alcohol (55.6%). However, currently, they drink medium strength beverages more often (44.5%).

Before the pandemic, the majority of the subjects consumed 1–2 units of alcohol (51.7% of the Poles and 50% of the Turks). During the pandemic, the usual

amount of consumed alcohol did not change among the Polish students. Among the Turkish students, however, the percentages for 1–2 units and 3–4 units were the same in the respective periods (47.4%) (Table 6). Statistically significant differences were found regarding the frequency of alcohol consumption among the Polish and Turkish students during the periods in question ($p < 0.03$). Differences were observed in the type of alcohol consumed by the Turkish students before and during the pandemic ($p = 0.028$). Among the Polish students, differences were found in the number of alcohol units consumed before and during the pandemic ($p < 0.001$, Table 6).

The majority of the Polish students (70.7% and 81%) and Turkish students (75% and 84.6%) declared that they did not smoke before and during the pandemic. Among both Polish (70.7% vs 81%) and Turkish students (75% vs 84.6%), the percentage of individuals who did not smoke increased during the pandemic.

Table 5. Physical activity, free time and rest

| Possible answers | Polish students N=331 | | | | p-values | Turkish students N=104 | | | | p-values |
|---|-----------------------|------|-----------------|------|-------------------|------------------------|------|-----------------|------|-------------------|
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N | % | N | % | | N | % | N | % | |
| Length of sleep during a day | | | | | | | | | | |
| <7 hours | 136 | 41.1 | 72 | 21.8 | <10 ⁻⁶ | 58 | 55.8 | 20 | 19.2 | <0.001 |
| 7-9 hours | 190 | 57.4 | 211 | 63.7 | | 41 | 39.4 | 64 | 61.5 | |
| >9 hours | 5 | 1.5 | 48 | 14.5 | | 5 | 4.8 | 20 | 19.2 | |
| Spending free time | | | | | | | | | | |
| Meetings with family/friends | 224 | 67.7 | 116 | 35.0 | <10 ⁻⁶ | 91 | 87.5 | 11 | 10.6 | <10 ⁻⁶ |
| Using of TV, computer | 78 | 23.6 | 169 | 51.1 | | 8 | 7.7 | 88 | 84.6 | |
| Reading books or audiobooks | 12 | 3.6 | 25 | 7.6 | | 2 | 1.9 | 42 | 40.4 | |
| Listening to music, podcasts | 7 | 2.1 | 16 | 4.8 | | 2 | 1.9 | 34 | 32.7 | |
| Cinema, theater, museum etc. | 3 | 0.9 | 0 | 0 | | 1 | 1 | 0 | 0 | |
| Physical activity | 4 | 1.2 | 11 | 3.3 | | 0 | 0 | 6 | 5.8 | |
| Other, e.g. cooking | 3 | 0.9 | 6 | 1.8 | | 0 | 0 | 7 | 6.7 | |
| Physical activity during a day | | | | | | | | | | |
| Up to 30 minutes | 114 | 34.4 | 110 | 33.2 | <0.001 | 28 | 27 | 52 | 50 | 0.896* |
| 30-60 minutes | 104 | 31.4 | 65 | 19.6 | | 45 | 43.3 | 15 | 14.4 | |
| >60 minutes | 42 | 12.7 | 28 | 8.5 | | 14 | 13.5 | 5 | 4.8 | |
| No physical activity | 71 | 21.5 | 128 | 38.7 | | 17 | 16.2 | 32 | 30.8 | |
| Possible answers | Polish students | | | | p-values | Turkish students | | | | p-values |
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N=260 | % | N=206 | % | | N=87 | % | N=72 | % | |
| Type of physical activity most performed | | | | | | | | | | |
| Cycling | 47 | 18.1 | 24 | 7.3 | <0.001 | 14 | 16.1 | 2 | 1.9 | 0.008 |
| Running | 35 | 13.5 | 31 | 9.4 | | 14 | 16.1 | 12 | 11.5 | |
| Swimming | 15 | 5.8 | 4 | 1.2 | | 2 | 2.3 | 0 | 0 | |
| Team games | 20 | 7.7 | 6 | 1.8 | | 6 | 6.9 | 2 | 1.9 | |
| Strength sports | 59 | 22.7 | 36 | 10.9 | | 22 | 25.3 | 14 | 13.5 | |
| Other, e.g. dance | 84 | 32.3 | 102 | 30.8 | | 29 | 33.3 | 42 | 40.4 | |

*: non-statistical

There were 51.5% of students from Poland and 57.7% from Turkey who declared that they smoked fewer than 5 cigarettes before the pandemic. Currently, fewer than 5 a day is also the most common number of cigarettes smoked by the Poles (50.8%) and Turks (62.5%).

The Polish students (29.6% and 33.3%) and Turkish students (6.3% in both periods). The pandemic had a positive impact on reducing smoking in both groups who used e-cigarettes mostly indicated that they used 1–5 ml of e-liquid before and during the pandemic. Statistically significant differences were found regarding the frequency of cigarette and e-cigarette use among the Polish and Turkish students before and during the pandemic ($p < 0.05$). Differences were also observed in terms of the number of cigarettes

smoked by the Turkish students before and during the pandemic ($p = 0.43$, Table 7).

Both before and during the pandemic, the majority of the Polish students (95.2%) and Turkish students (98.1%) declared that they did not take illicit drugs. Statistically significant differences were found in illicit drug use among the Polish students before and during the pandemic ($p = 0.03$, Table 8). The culture of the nation may influence it.

During online classes, the majority of the Polish and Turkish students experienced negative emotions (63.7% and 63.5%, respectively). One of the most commonly experienced states during online classes by both Polish and Turkish students was difficulty concentrating (42% and 47.1%, respectively). There were 72.8% of students from Poland and 85.6% of students from Turkey that

Table 6. Alcohol consumption before and during pandemic by Polish and Turkish students

| Possible answers | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|--|-----------------------|------|-----------------|------|--------|------------------------|------|---------------------|------|--------|
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N | % | N | % | | N | % | N | % | |
| Frequency of alcohol consumption | | | | | | | | | | |
| Several times a day | 0 | 0 | 1 | 0.3 | <0.001 | 0 | 0 | 0 | 0 | 0.002 |
| Once a day | 1 | 0.3 | 3 | 0.9 | | 2 | 1.9 | 1 | 1 | |
| Several times a week | 49 | 15 | 39 | 11.8 | | 5 | 4.8 | 6 | 5.8 | |
| Several times a month | 119 | 36 | 88 | 26.6 | | 7 | 6.7 | 7 | 6.7 | |
| Occasionally | 128 | 38.7 | 150 | 45.3 | | 5 | 4.8 | 5 | 4.8 | |
| Never | 34 | 10 | 50 | 15.1 | | 85 | 81.8 | 85 | 81.8 | |
| Possible answers | Polish students | | | | p | Turkish students | | | | p |
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N=297 | % | N=281 | % | | N=36 | % | N=19 | % | |
| Type of alcohol consumed | | | | | | | | | | |
| High percentage | 79 | 26.6 | 62 | 22.1 | 0.583* | 5 | 13.9 | 1 | 5.3 | 0.028 |
| Medium percentage | 119 | 40.1 | 125 | 44.5 | | 11 | 30.5 | 13 | 68.4 | |
| Low percentage | 99 | 33.3 | 94 | 33.5 | | 20 | 55.6 | 5 | 26.3 | |
| Possible answers | Polish students | | | | p | Turkish students | | | | p |
| | Before pandemic | | During pandemic | | | Before pandemic | | During the pandemic | | |
| | N=281 | % | N=281 | % | | N=36 | % | N=19 | % | |
| Amount of servings of alcohol consumed | | | | | | | | | | |
| 1-2 | 145 | 51.7 | 145 | 51.7 | <0.001 | 18 | 50 | 9 | 47.4 | 0.463* |
| 3-4 | 80 | 28.5 | 80 | 28.5 | | 16 | 44.4 | 9 | 47.4 | |
| 5-6 | 28 | 9.9 | 28 | 9.9 | | 2 | 5.6 | 1 | 5.3 | |
| >6 | 28 | 9.9 | 28 | 9.9 | | 0 | 0 | 0 | 0 | |

* - non-statistical

felt depressed and/or upset due to having a limited contact with peers. An association was found between nationality and emotions during online classes in the study population of Polish and Turkish students ($p < 10^{-5}$). A relationship was also revealed between nationality and feeling negative emotions caused by a limited contact with peers among students from Poland and Turkey ($p = 0.006$, Table 9).

DISCUSSION

Healthy eating, physical activity, appropriate amount of sleep and avoidance of recreational substance use are the most important factors supporting health and well-being [21]. Lifestyle changes caused by the COVID-19 pandemic including, for example, remote learning and reduced social contacts or a lack thereof may have an impact on both the physical and mental health of young people [13].

The present study shows that 53.2% of the Polish students ate breakfast every day before the pandemic and 65.9% did so during the pandemic. The respective figures for the Turkish students were 51.0% and 72.1%. In both groups, the percentage of individuals who ate breakfast every day increased. In a study by Ismail et al. regarding the dietary habits and lifestyle of United Arab Emirates residents, an increase in the frequency of eating breakfast was also observed. In that study, the percentage of individuals who ate breakfast before the pandemic was 66.0%, with the rate increasing during the pandemic to 74.2% (10). Breakfast accounts for about 25% of your daily caloric intake, so skipping it can lead to nutrient restriction. Alfawaz et al. [1], who investigated the impact of the COVID-19 pandemic-related isolation on the lifestyle and health behaviour of 1,965 residents of the United Arab Emirates, obtained different results to the ones in the current study. The authors demonstrated that during the pandemic the percentage of individuals who always ate fresh fruit

Table 7. Smoking of cigarettes, using e-cigarettes and liquids before and during pandemic

| Possible answers | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|--------------------------------------|-----------------------|------|-----------------|------|--------|------------------------|------|-----------------|------|-------|
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N | % | N | % | | N | % | N | % | |
| Smoking of cigarettes/e-cigarettes | | | | | | | | | | |
| Yes, regularly | 41 | 12.3 | 35 | 10.6 | <0.001 | 13 | 12.5 | 9 | 8.7 | 0.007 |
| Yes, occasionally | 56 | 17 | 28 | 8.5 | | 13 | 12.5 | 7 | 6.7 | |
| No | 234 | 70.7 | 268 | 81 | | 78 | 75 | 88 | 84.6 | |
| Possible answers | Polish students | | | | p | Turkish students | | | | p |
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N=97 | % | N=63 | % | | N=26 | % | N=16 | % | |
| Amount of cigarettes smoked | | | | | | | | | | |
| <5 | 50 | 51.5 | 32 | 50.8 | 0.838* | 15 | 57.7 | 10 | 62.5 | 0.043 |
| 6-10 | 7 | 7.2 | 3 | 4.8 | | 5 | 19.2 | 1 | 6.3 | |
| >10 | 5 | 5.2 | 4 | 6.3 | | 6 | 23.1 | 5 | 31.3 | |
| Not smoking a cigarettes | 35 | 36.1 | 24 | 38.1 | | 0 | 0 | 0 | 0 | |
| Possible answers | Polish students | | | | p | Turkish students | | | | p |
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N=98 | % | N=63 | % | | N=16 | % | N=16 | % | |
| Amount of milliliters of liquid used | | | | | | | | | | |
| 1-5 | 29 | 29.6 | 21 | 33.3 | 0.449* | 1 | 6.3 | 1 | 6.3 | - |
| 6-10 | 7 | 7.2 | 8 | 12.7 | | 0 | 0 | 0 | 0 | |
| >10 | 1 | 1 | 3 | 4.8 | | 0 | 0 | 0 | 0 | |
| Not smoking e-cigarettes | 61 | 62.2 | 31 | 49.2 | | 15 | 93.7 | 15 | 93.8 | |

* - non-statistical

Table 8. Drug use before and during pandemic

| Possible answers | Polish students N=331 | | | | p | Turkish students N=104 | | | | p |
|-------------------|-----------------------|------|-----------------|------|-------|------------------------|------|-----------------|------|--------|
| | Before pandemic | | During pandemic | | | Before pandemic | | During pandemic | | |
| | N | % | N | % | | N | % | N | % | |
| Yes, regularly | 4 | 1.2 | 4 | 1.2 | 0.003 | 0 | 0 | 0 | 0 | 1.000* |
| Yes, occasionally | 12 | 3.6 | 12 | 3.6 | | 2 | 1.9 | 2 | 1.9 | |
| No | 315 | 95.2 | 315 | 95.2 | | 102 | 98.1 | 102 | 98.1 | |

* - non-statistical

and vegetables slightly decreased from 26.5% to 25.1%, whereas the proportion of subjects who did not eat any fruit and vegetables at all increased from 2.4% to 3.7%. In contrast, in a study by *Rodríguez-Pérez et al.* [23], who investigated changes in the dietary behaviour of Spaniards during the COVID-19 pandemic, an increase was observed of approximately 12% in terms of fruit and vegetable consumption as a healthy eating habit. *Peng et al.* [20], who investigated the impact of the COVID-19 pandemic-related isolation on the lifestyle of young Chinese people, demonstrated

a slight decrease in fruit and vegetable consumption among both undergraduate and graduate students. In Poland, it is believed that the norm of fruit and vegetable consumption should be at least 400 g, of which $\frac{3}{4}$ should be vegetables and $\frac{1}{4}$ fruit.

Peng et al. [20] also noticed a decrease in dairy product consumption: in their study, before the pandemic, 44.5% of undergraduate students ate such products 1–3 times a week, while during the pandemic, that figure dropped to 41.0%. There were similar findings for graduate students: the percentage of those

Table 9. Emotions and states felt by students resulting from limited contact with peers before and during pandemic

| Possible answers | During the pandemic | | | | p |
|--|--------------------------|------|---------------------------|------|-------------------|
| | Polish students N=331 | | Turkish students N=104 | | |
| | N | % | N | % | |
| Emotions accompanying on-line classes | | | | | |
| Positive | 109 | 32.9 | 10 | 9.6 | 0.278* |
| Negative | 211 | 63.7 | 66 | 63.5 | |
| Not applicable due to absence of pandemic restrictions | 11 | 3.3 | 28 | 26.9 | |
| States felt during on-line classes | | | | | |
| Chronic fatigue | 102 | 30.8 | 32 | 30.8 | <10 ⁻⁵ |
| Somnolence | 80 | 24.2 | 28 | 26.9 | |
| Problems with concentration | 139 | 42.0 | 49 | 47.1 | |
| Annoyance | 49 | 14.8 | 7 | 6.7 | |
| Constant feeling of hunger | 8 | 2.4 | 5 | 4.8 | |
| Headache | 33 | 10 | 7 | 6.7 | |
| Feeling depressed and/or upset due to limited contact with peers | | | | | |
| Yes | 241 | 72.8 | 89 | 85.6 | 0.006 |
| No | 83 | 25.1 | 11 | 10.6 | |
| Not applicable due to the absence of pandemic restrictions | 7 | 2.1 | 4 | 3.8 | |

* - non-statistical

consuming dairy products 1–3 times a week decreased from 39.7% to 37.6%. Different results were obtained by *Udovicki et al.* [30], who evaluated the rate of milk consumption among 500 Serbian and Greek students. The authors demonstrated that 52.1% of the Serbian and 29.5% of the Greek students consumed milk at least once a week.

In the study, frequent consumption of sweets and salty snacks was observed, which may affect tooth decay, the development of cardiovascular diseases, overweight, etc. *Dragun et al.* [12] obtained different results. In their study, 26.4% of Croatian students and 33.9% of international students ate more sweets and snacks during the COVID-19 pandemic compared to the time before the pandemic.

Sleeping more than eight hours may be harmful to your health. The more we sleep, the more we are at risk of death and cardiovascular disease. The longer sleep was affected by the limitation in moving around, mental exhaustion, and the pandemic. *Ismail et al.*, who investigated the dietary habits and lifestyle of adults over 18 years of age, including students, in the United Arab Emirates during the COVID-19 pandemic, obtained different results to those of the current study. Compared to the period before the pandemic, the proportion of individuals who slept for longer than 9 hours increased (from 3% to 11.7%). The figures for 7–9 hours for the two periods were 49.3% and 45.4% [10].

WHO recommends that all adults get at least 150–300 minutes of moderate-intensity aerobic physical

activity per week (or equivalent amount of vigorous activity). *Galle et al.* [15], who investigated the physical activity and sedentary activities of Italian students during the COVID-19 pandemic-related isolation, observed a decrease in the duration of physical activity among the subjects. The mean duration of weekly physical activity decreased from 820 minutes to 340 minutes. Similar results were obtained by *Castañeda-Babarro et al.* [9], who studied changes in the physical activity of adults, including 267 students living in Spain before and during lockdown. The authors noted that the subjects decreased their time for moderate physical activity by 16.1%.

In a study by *Rodríguez-Pérez et al.* [23], who studied changes in the nutritional behaviour of 7,514 Spaniards during the isolation, 39.1% of the participants declared that there was no change in their frequency of alcohol consumption. Different results were obtained by *Horigian et al.* [16] who investigated an association between depression, anxiety, alcohol consumption and illicit drug use in 1,008 young adult Americans during the COVID-19 pandemic. In that study, 80% of the subjects indicated that they consumed alcohol, 19% of whom admitted to becoming intoxicated at least once a week, and 44% declared that they drank at least once a month. The authors also observed that the higher the level of loneliness, the higher the level of alcohol consumption was among the subjects [16].

Before the pandemic, 70.7% of the Polish students did not smoke cigarettes. During the pandemic, this rate increased to 80%. Among the Turkish students,

75% declared that they did not smoke before the pandemic, and 84.6% indicated that they did not smoke during the pandemic. *Bommele et al.*, who studied the relationship between stress, COVID-19 pandemic and tobacco smoking, obtained heterogeneous results: among the 957 Dutch people taking part in the study, 14.1% indicated that they smoked less and 18.9% stated that they smoked more during the pandemic [6]. The results of the study by *Dragun et al.* were also different. They recorded a slight decrease in the percentage of smokers among Croatian students from 17.5% to 16.2% during the pandemic. However, international students were found to smoke more during the pandemic, with an increase from 17.4% to 25.4% [12].

The students who took part in the present study indicated that they supplemented their diet with vitamins before and during the COVID-19 pandemic (62.8% and 62.3% of the students from Poland, and 62.7% and 62.0% of those from Turkey, respectively). *Yilmaz et al.*, who studied the impact of the COVID-19 pandemic on the dietary habits and behaviour of students from Turkey, obtained different results. In their study, 81.9% of students before the pandemic and 90.3% of students during the pandemic did not take any dietary supplements [32].

In this study, over 40% of students in both groups indicated that they had difficulty concentrating during online classes. Sitting in front of the computer for too long has certainly contributed to this. *Bieganowska-Skóra and Pankowska* [5] observed the same problem among Polish primary and secondary school students. According to this study, 47.2% of the participants reported this problem. *Ptaszek et al.* [22] examining the impact of remote learning on the functioning of students, teachers and parents, obtained different results. In this study, 27% of students reported having difficulty paying attention to what the teacher said.

Both the present study and the papers mentioned above indicate the presence of changes in lifestyle caused by the COVID-19 pandemic and the associated restrictions. Research described in this paper makes it possible to collect data and develop interventions to prevent harmful behaviour and its health consequences in the future.

CONCLUSIONS

1. The results of this study showed lifestyle changes among both Polish and Turkish students during the COVID-19 pandemic compared to the pre-pandemic period. However, Turkish students showed better eating habits than Polish students.
2. Significant differences were observed in both groups of students regarding the consumption of certain food products compared to the period

before the pandemic. In Turkish students observed a reduction of consumption savoury snacks and fast food, but an increase consumption of fruit, legumes, fish and sweets. In Polish students, the consumption of milk, milk drinks and white cheese decreased. The consumption of milk, dairy drinks and white cheese has decreased. In Polish and Turkish students, the frequency of alcohol and energy drink consumption increased, while fruit decreased.

3. The results indicate the need to develop interventions to prevent harmful behaviour and their health consequences in the future.

Conflicts of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Received: 21.03.2023

Accepted: 19.05.2023

Published online first: 18.07.2023