

Article

Changes in Daily Life, Physical Activity, GAD, Depression, and Personal Hygiene of Adolescents in South Korea Due to the COVID-19

Eun-Yeob Kim ^{1,†}, Chilhwan Oh ^{1,2,†} , Hwa-Jung Sung ^{3,*} and Jaeyoung Kim ^{1,4,*} ¹ Research Institute for Skin Image, Korea University College of Medicine, Seoul 08308, Korea² Department of Dermatology, Wonkwang University Hospital, Wonkwang University School of Medicine, Iksan 54538, Korea³ Department of Hematooncology, College of Medicine, Korea University, Seoul 02841, Korea⁴ Core Research & Development Center, Korea University Ansan Hospital, Ansan 15355, Korea

* Correspondence: doctorsung@korea.ac.kr (H.-J.S.); jaykim830@gmail.com (J.K.); Tel.: +82-31-412-6549 (H.-J.S.); +82-31-412-6711 (J.K.)

† These authors contributed equally to this work.

Abstract: This study used raw data obtained from the Adolescents' Health Behavior Survey by government-affiliated agency open data. A total of 109,796 students were sampled. A comparative analysis was performed based on the year 2020 and when the COVID-19 pandemic occurred, in which we analyzed changes in adolescents' depression and panic anxiety perception and dietary habits, physical factors, physical activity, and handwashing habits. There was no weight control in the second year compared to the first year of the COVID-19 pandemic, and obesity also increased. The continuation of the non-contact situation caused by COVID-19 led to a worsening of subjective health awareness, and the experience of generalized anxiety disorder, depression, sadness and hopelessness, and suicidal thoughts and attempts increased. The frequency of washing hands with soap before meals and after using the toilet at school or at home was reduced. As a result of this analysis, we believe that there needs to be a system of support in place to address the academic gaps and deficiencies in learning caused by COVID-19, and that psychological and emotional support needs to be strengthened at this time, as well as the issues to be supported after the end of the non-contact situation.

Keywords: COVID-19; daily life; adolescent; personal hygiene

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1. Introduction

In December 2019, the SARS-CoV-2 coronavirus disease 2019 (COVID-19) outbreak began in Wuhan, China, spreading worldwide. According to a report by state agencies in 2020, confirmed cases of COVID-19 were 37 million, deaths exceeded 1 million, and as of 28th January 2021, the spread of COVID-19 has continued to increase [1–3]. The World Health Organization (WHO) declared an 'International Public Health Emergency (PHIC)' for the novel COVID-19 virus on 31 January 2020, and a pandemic on 11 March 2020 [2,3]. Unlike existing infectious diseases, COVID-19 has caused great social, economic, and cultural changes as the pandemic has been prolonged worldwide [4,5]. Since the first confirmed case in South Korea on 23 January 2020, COVID-19 has become prevalent and has affected the daily life of people of all age groups. COVID-19 has had significant physical, emotional, and psychological impact [6] on the daily lives of adolescents whose identity had not yet been established [6,7]. Seong (2020) found that there was a difference in risk perception by age when asked, 'If you are infected with COVID-19, how serious would it be to your health?' [8]. As such, various risk perceptions and behaviors have emerged due to the unprecedented changes brought on by COVID-19 [8]. Honarvar et al. [9] used the Health Belief Model (HBM, Rosenstock, 1974) [10] to study knowledge, behavior, and

risk perception about COVID-19, and the knowledge and behavioral recognition intentions were low [11,12]; the lower the knowledge or education level on COVID-19, the lower the perceived severity of the risk [9,13–15]. As a result, COVID-19 knowledge impacts risk-prevention behavior [11,16]. Children and adolescents lack the ability to protect themselves compared to adults [17], making it difficult to actively respond to disasters such as COVID-19 [18]. Wang et al. found that COVID-19 had a negative impact on the mental health of children and adolescents [19]. Jung [6] also reported that the ratio of study time and excessive study time for children increased compared to that before COVID-19, and that children that showed excessive media use and less than the recommended exercise time showed higher anxiety about the future [20]. In addition, it is expected that there will be unencountered changes in the daily life and mental health of adolescents due to the COVID-19 pandemic.

Therefore, to overcome the limitations caused by COVID-19, this study statistically analyzes the changes in daily life and mental health of adolescents based on data from the Korea Centers for Disease Control and Prevention (KDCA) and preventive adolescent health behavior survey data. Our goal is to improve the collective understanding of adolescents' psychological and behavioral responses. By analyzing the psychological, emotional, and physical changes of adolescents based on the situation in 2020 and 2021, it is necessary to identify the impact of new infectious diseases, such as COVID-19, on adolescents, and to seek appropriate support policies. In addition, this study can be used as basic data on the educational environment and policy decisions for future youth having to deal with new infectious diseases.

2. Materials and Methods

2.1. Study Setting, Designs and Sampling

This study used raw data from the 16th (2020) and 17th (2021) "Youth Health Behavior Survey" conducted by the Ministry of Education, the Ministry of Health and Welfare, and the Korea Disease Control and Prevention Agency (KDCA) (Approval No. 117058) [21–23]. The "Youth Health Behavior Survey" is a national representative data survey conducted on about 60,000 students every year by stratifying 800 schools (400 middle and high schools each) based on the table frame of the Ministry of Education's basic statistics survey. A total of 109,796 people sampled 54,948 students in 2020 (28,961 middle school students, 25,984 high school students) and 54,848 students in 2021 (30,015 middle school students, 24,833 high school students). In this study, a comparative analysis was performed based on the 16th (August 2020) and 17th (August 2021) surveys in the midst of the COVID-19 pandemic. We analyzed changes in adolescents' depression and panic anxiety perception and dietary habits, physical factors, physical activity, and handwashing habits through survey questions. The 16th (2020) and 17th (2021) survey data were collected from August to November 2020 and 2021 due to COVID-19.

2.2. Data Variables

In our study, the variables analysed were as follows: (1) general characteristics, namely kidney (m), weight (kg), obesity (BMI), age, gender, weight control effort and smartphone usage time; (2) subjective health/body type perception, stress perception, experience of sadness/despair over the past year, and suicidal thoughts and experience; (3) in the past 7 days, eating habits, including breakfast (bread, rice or wheat flour, oatmeal, cereal, etc.), fruit intake, sweet drink intake, ion drink intake (Gatorade, Pocari Sweat, etc.), juice drink intake (Coco Farm, Juicy Cool, etc.), coffee drink intake (coffee mix, Let's Bee, etc.), fast food intake (pizza, hamburger, chicken, etc.), nutritional education, daily water intake (including bottled water, carbonated water, barley tea, etc.), physical activity (high-intensity physical activity that increases heart rate and leads to shortness of breath or sweating), strength exercise, and muscle-strengthening exercise; (4) handwashing habits, including washing hands before eating at school and at home, after school and after going to the bathroom,

and when returning home after going out; and (5) comparative analysis of perceptions pre-COVID-19 with physical activity, breakfast, drinking, smoking, and depression.

Obesity was defined as a body mass index (BMI) of 25, where $BMI = \text{weight (kg)}/\text{height (m)}^2$. An obesity level of 25 was based on the WHO Asia-Pacific region and the Korean Obesity Association. To determine the level of adolescent generalized anxiety disorder (GAD), the response results of the GAD 7 scale developed by Spitzer et al., used in the Youth Health Behavior Survey, were used. This consists of seven questions in the form of a four-point Likert scale (0 = not at all to 3 = very much) related to anxiety or anxiety experienced in the last two weeks. The higher the combined score, the higher the pan-anxiety level. It can be judged that 0–4 points show normal behavior, 5–9 points show mild anxiety, 10–14 points show moderate anxiety, and 15 points or more indicate severe anxiety. The GAD 7 scale results, which are frequently used as a primary screening discrimination tool for GAD in medical institutions, were judged to be suitable for estimating the overall level of GAD in domestic adolescents.

2.3. Data Analysis

For statistical analysis, a database was secondarily processed with the creation of an analysis database, and the chi-square test or Mann–Whitney analysis was performed according to technical statistics, frequency analysis, and characteristics of variables. The analysis software used IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA), and the statistical significance level was set at $p < 0.05$.

3. Results

3.1. Changes in General Characteristics in the First and Second Years of the COVID-19 Outbreak

Table 1 shows the results of changes in general characteristics in the first and second years of the COVID-19 outbreak. Obesity in the first year of the outbreak was 18.1%, but obesity increased in the second year to 19.3% ($p < 0.001$). The percentage of those not trying to lose weight in the past month increased from 45.1% to 46.4%, and efforts to lose weight decreased from 35.1% to 33.9% ($p < 0.001$). Smartphone use increased weekly during the COVID-19 outbreak, from 96.4% to 96.9% ($p < 0.001$), and there was no change in weekend smartphone use ($p = 0.983$) (Table 1).

Table 1. Changes in general characteristics in the first and second years of the COVID-19 outbreak.

| Characteristics | COVID-19 | | | | χ^2/z | <i>p</i> -Value | |
|--|----------------------|--------|--------|--------|------------|-----------------|-------|
| | 2020 | | 2021 | | | | |
| | M | SD | M | SD | | | |
| Height (m) ⁴ | 166.09 | 8.41 | 166.16 | 8.36 | −1.308 | 0.191 | |
| Weight (kg) ⁴ | 59.79 | 13.20 | 60.11 | 13.73 | −1.774 | 0.076 | |
| Body Mass Index ⁴ | 21.53 | 3.66 | 21.62 | 3.83 | −1.611 | 0.107 | |
| Age ⁴ | 15.10 | 1.75 | 15.09 | 1.74 | −0.712 | 0.476 | |
| Obesity ³ | Normal | 41,164 | 81.9 | 40,624 | 80.7 | 25.548 | 0.000 |
| | Obesity | 9093 | 18.1 | 9738 | 19.3 | | |
| Sex ³ | Man | 28,353 | 51.6 | 28,401 | 51.8 | 0.362 | 0.547 |
| | Woman | 26,595 | 48.4 | 26,447 | 48.2 | | |
| | No effort | 24,774 | 45.1 | 25,436 | 46.4 | | |
| Weight loss efforts in the past month ³ | Tried to lose weight | 19,272 | 35.1 | 18,590 | 33.9 | 31.397 | 0.000 |
| | Tried to gain weight | 4220 | 7.7 | 3962 | 7.2 | | |
| | Maintained weight | 6682 | 12.2 | 6860 | 12.5 | | |

Table 1. Cont.

| Characteristics | COVID-19 | | | | X^2/z | p -Value | |
|---|-------------|--------|------|--------|---------|------------|-------|
| | 2020 | | 2021 | | | | |
| | M | SD | M | SD | | | |
| Smartphone use during the week ³ | Did not use | 1970 | 3.6 | 1725 | 3.1 | 16.352 | 0.000 |
| | Used | 52,978 | 96.4 | 53,123 | 96.9 | | |
| Weekend smartphone use ³ | Did not use | 1800 | 3.3 | 1798 | 3.3 | 0.000 | 0.983 |
| | Used | 53,148 | 96.7 | 53,050 | 96.7 | | |

Average (M), Standard deviation (SD),³ chi-square test (X^2) (n = sample),⁴ Mann–Whitney test (z), p -value < 0.05.

3.2. Emotional and Cognitive Changes in the First and Second Years of the COVID-19 Outbreak

The results of emotional and cognitive changes in the first and second years of the COVID-19 outbreak are as follows. Subjective health perception deteriorated from 3.89 ± 0.90 in the first year of the outbreak to 3.77 ± 0.91 in the second year ($p < 0.001$). Usual stress was 3.27 ± 0.96 in the second year compared to 3.17 ± 0.94 in the first year of the outbreak ($p < 0.001$). GAD experiences increased to 11.13 ± 4.50 in the second year from 10.91 ± 4.37 in the first year of the outbreak ($p < 0.001$). In the past year, experiences of sadness and despair increased from 25.2% during the first year of the outbreak to 26.8% in the second year ($p < 0.001$), suicidal thoughts increased from 10.9% to 12.7% ($p < 0.001$), suicide plans increased from 3.6% to 4.0%, and suicide attempts increased from 2.0% to 2.3% ($p < 0.001$) (Table 2).

Table 2. Emotional and cognitive changes in the first and second years of the COVID-19 outbreak.

| Variable | COVID-19 | | | | Z^3 | p -Value | |
|--|----------------|-----------------|-------|--------|---------|------------|-------|
| | 2020 | | 2021 | | | | |
| | M ¹ | SD ² | M | SD | | | |
| Health perception | 3.89 | 0.90 | 3.77 | 0.91 | −23.036 | 0.000 | |
| Subjective body shape perception | 3.18 | 0.97 | 3.17 | 0.98 | −2.910 | 0.004 | |
| Stress perception | 3.17 | 0.94 | 3.27 | 0.96 | −18.228 | 0.000 | |
| Degree of fatigue recovery from sleep ⁴ | 2.94 | 1.14 | 2.72 | 1.10 | −32.860 | 0.000 | |
| Feeling agitated, anxious, or irritable ⁵ | 1.56 | 0.77 | 1.61 | 0.79 | −10.778 | 0.000 | |
| Inability to stop worrying ⁵ | 1.60 | 0.82 | 1.64 | 0.85 | −7.299 | 0.000 | |
| Worrying too much about various things ⁵ | 1.97 | 0.95 | 2.00 | 0.97 | −4.966 | 0.000 | |
| General unease ⁵ | 1.46 | 0.76 | 1.49 | 0.79 | −7.553 | 0.000 | |
| Restlessness ⁵ | 1.27 | 0.62 | 1.30 | 0.65 | −4.871 | 0.000 | |
| Easily irritable ⁵ | 1.70 | 0.87 | 1.73 | 0.88 | −5.492 | 0.000 | |
| Feeling afraid that something terrible is about to happen ⁵ | 1.36 | 0.71 | 1.37 | 0.73 | −3.171 | 0.002 | |
| GAD ⁵ | 10.91 | 4.37 | 11.13 | 4.50 | −8.789 | 0.000 | |
| Sadness and despair ⁶ | No | 41,108 | 74.8 | 40,156 | 73.2 | 36.503 | 0.000 |
| | Yes | 13,840 | 25.2 | 14,692 | 26.8 | | |
| Suicidal thoughts ⁶ | No | 48,969 | 89.1 | 47,892 | 87.3 | 85.678 | 0.000 |
| | Yes | 5979 | 10.9 | 6956 | 12.7 | | |
| Suicide plan ⁶ | No | 52,995 | 96.4 | 52,642 | 96.0 | 16.479 | 0.000 |
| | Yes | 1953 | 3.6 | 2206 | 4.0 | | |

Table 2. Cont.

| Variable | | COVID-19 | | | | Z ³ | p-Value |
|------------------------------|-----|----------------|-----------------|--------|------|----------------|---------|
| | | 2020 | | 2021 | | | |
| | | M ¹ | SD ² | M | SD | | |
| Suicide attempt ⁶ | No | 53,827 | 98.0 | 53,603 | 97.7 | 6.875 | 0.009 |
| | Yes | 1121 | 2.0 | 1245 | 2.3 | | |

¹ M; average, ² SD; standard deviation, ³ z; Mann–Whitney test, ⁴; in the 1st week, ⁵; in the past 2 weeks, ⁶; in the last year, *p*-value < 0.05.

3.3. Changes in Diet and Daily Life in the First and Second Years of the COVID-19 Outbreak

Changes in diet and daily life over the past week in the first and second years of the COVID-19 outbreak were as follows. The frequency of breakfast consumption increased in the second year when compared to that in the first year of the outbreak, while the number of meals eaten five times a week in the second year did not change, and the response to all other answers decreased (*p* < 0.001). The frequency of fruit intake decreased in the “not eating” category in the first year to the “more than three times a day” category in the second year, while there was no change in eating twice a day, and the response of other answers increased (*p* < 0.001). The carbonated drink answer “no drink,” increased, while “drink 1 or 2 times a day” answers were unchanged, and the other answers decreased (*p* < 0.001). The sweet drink intake answers “no drink and 1–2 times a week” decreased (*p* < 0.001). Fast food intake decreased in the “not to eat” category in the second year compared to that in the first year, while the frequency of intake increased 1–2/3–4/5–6 times a week (*p* < 0.001). All the respondents who drank more than 1 cup of water every day increased their intake in the second year compared to that in the first year (*p* = 0.005). Compared to heart rate in the first year, in the second year, heart rate increased for more than 60 min a day, mild physical activity increased from 1 to 6 d a week (*p* < 0.001), the response to high-intensity physical activity (20 min or more) increased from 1 d to 5 d per week (*p* < 0.001), and the other answers decreased by 2 weeks (Table 3).

Table 3. Changes in diet and daily life in the first and second years of the COVID-19 outbreak.

| Variable | | COVID-19 | | | | X ² ³ | p-Value |
|--|----------|----------------|----------------|--------|------|-----------------------------|---------|
| | | 2020 | | 2021 | | | |
| | | N ¹ | % ² | N | % | | |
| Breakfast (bread, sun food or wheat flour, oatmeal, cereal, etc.) ⁴ | 0th time | 11,441 | 20.8 | 11,904 | 21.7 | 39.341 | 0.000 |
| | 1st time | 4234 | 7.7 | 4031 | 7.3 | | |
| | 2nd time | 5010 | 9.1 | 4875 | 8.9 | | |
| | 3rd time | 4698 | 8.5 | 4527 | 8.3 | | |
| | 4th time | 3901 | 7.1 | 3825 | 7.0 | | |
| | 5th time | 6069 | 11.0 | 6494 | 11.8 | | |
| | 6th time | 3857 | 7.0 | 3853 | 7.0 | | |
| | 7th time | 15,738 | 28.6 | 15,339 | 28.0 | | |

Table 3. Cont.

| Variable | COVID-19 | | | | X ² ³ | p-Value | |
|---|------------------------|----------------|------|--------|-----------------------------|---------|-------|
| | 2020 | | 2021 | | | | |
| | N ¹ | % ² | N | % | | | |
| Fruit (fruit juice excluded) ⁴ | 0th time | 7130 | 13.0 | 6544 | 11.9 | 56.939 | 0.000 |
| | 1~2nd time/1 week | 17,643 | 32.1 | 17,639 | 32.2 | | |
| | 3~4th time/1 week | 14,613 | 26.6 | 15,293 | 27.9 | | |
| | 5~6th time/1 week | 5561 | 10.1 | 5586 | 10.2 | | |
| | 1st time/everyday | 5762 | 10.5 | 5800 | 10.6 | | |
| | 2nd time/everyday | 2583 | 4.7 | 2553 | 4.7 | | |
| | 3rd time over/everyday | 1656 | 3.0 | 1433 | 2.6 | | |
| Carbonated drinks ⁴ | 0th time | 12,251 | 22.3 | 13,169 | 24.0 | 61.798 | 0.000 |
| | 1~2nd time/1 week | 23,139 | 42.1 | 22,596 | 41.2 | | |
| | 3~4th time/1 week | 12,133 | 22.1 | 11,973 | 21.8 | | |
| | 5~6th time/1 week | 3677 | 6.7 | 3440 | 6.3 | | |
| | 1st time/everyday | 1958 | 3.6 | 1986 | 3.6 | | |
| | 2nd time/everyday | 861 | 1.6 | 900 | 1.6 | | |
| | 3rd time over/everyday | 929 | 1.7 | 784 | 1.4 | | |
| Sweet drinks (ion drinks, juice drinks, and coffee drinks excluded) ⁴ | 0th time | 9205 | 16.8 | 8476 | 15.5 | 68.234 | 0.000 |
| | 1~2nd time/1 week | 20,476 | 37.3 | 19,949 | 36.4 | | |
| | 3~4th time/1 week | 14,048 | 25.6 | 14,782 | 27.0 | | |
| | 5~6th time/1 week | 5498 | 10.0 | 5671 | 10.3 | | |
| | 1st time/everyday | 3430 | 6.2 | 3622 | 6.6 | | |
| | 2nd time/everyday | 1285 | 2.3 | 1386 | 2.5 | | |
| | 3rd time over/everyday | 1006 | 1.8 | 962 | 1.8 | | |
| Fast food (pizza, hamburger, chicken, etc.) ⁴ | 0th time | 10,037 | 18.3 | 9319 | 17.0 | 43.112 | 0.000 |
| | 1~2nd time/1 week | 31,255 | 56.9 | 31,284 | 57.0 | | |
| | 3~4th time/1 week | 10,861 | 19.8 | 11,294 | 20.6 | | |
| | 5~6th time/1 week | 1803 | 3.3 | 1975 | 3.6 | | |
| | 1st time/everyday | 656 | 1.2 | 639 | 1.2 | | |
| | 2nd time/everyday | 155 | 0.3 | 158 | 0.3 | | |
| | 3rd time over/everyday | 181 | 0.3 | 179 | 0.3 | | |
| Nutritional and eating habit education ⁵ | No | 28,653 | 52.1 | 31,518 | 57.5 | 313.477 | 0.000 |
| | Yes | 26,295 | 47.9 | 23,330 | 42.5 | | |
| Daily water (including bottled water, carbonated water, barley tea, etc.) | 1 cup below per day | 1966 | 3.6 | 1963 | 3.6 | 15.034 | 0.005 |
| | 2 cups per day | 9583 | 17.4 | 9764 | 17.8 | | |
| | 3 cups per day | 11,910 | 21.7 | 12,222 | 22.3 | | |
| | 4 cups per day | 9790 | 17.8 | 9831 | 17.9 | | |
| | 5 cups or more per day | 21,699 | 39.5 | 21,068 | 38.4 | | |

Table 3. Cont.

| Variable | COVID-19 | | | | X ² ³ | p-Value | |
|--|----------------------|----------------|------|--------|-----------------------------|---------|-------|
| | 2020 | | 2021 | | | | |
| | N ¹ | % ² | N | % | | | |
| Physical activity causing shortness of breath for a total of 60 min over per day ⁴ | 0th time | 21,111 | 38.4 | 18,250 | 33.3 | 409.631 | 0.000 |
| | 1st time/1 week | 8432 | 15.3 | 8481 | 15.5 | | |
| | 2nd time/1 week | 7698 | 14.0 | 8790 | 16.0 | | |
| | 3rd time/1 week | 6328 | 11.5 | 7170 | 13.1 | | |
| | 4th time/1 week | 3248 | 5.9 | 3806 | 6.9 | | |
| | 5th time/1 week | 3517 | 6.4 | 3783 | 6.9 | | |
| | 6th time/1 week | 1185 | 2.2 | 1377 | 2.5 | | |
| High-intensity physical activity for 20 min causing shortness of breath or sweating ⁴ | 0th time | 20,937 | 38.1 | 17,781 | 32.4 | 452.968 | 0.000 |
| | 1st time/1 week | 10,185 | 18.5 | 10,510 | 19.2 | | |
| | 2nd time/1 week | 8159 | 14.8 | 9484 | 17.3 | | |
| | 3rd time/1 week | 5657 | 10.3 | 6511 | 11.9 | | |
| | 4th time/1 week | 2783 | 5.1 | 3208 | 5.8 | | |
| | 5th time over/1 week | 7227 | 13.2 | 7354 | 13.4 | | |
| Exercise to increase muscle strength such as push-ups, sit-ups, lifting weights, dumbbells, iron bars, and parallel bars (muscle strengthening exercises) ⁴ | 0th time | 27,585 | 50.2 | 28,370 | 51.7 | 69.543 | 0.000 |
| | 1st time/1 week | 8283 | 15.1 | 8112 | 14.8 | | |
| | 2nd time/1 week | 5539 | 10.1 | 5771 | 10.5 | | |
| | 3rd time/1 week | 4414 | 8.0 | 4337 | 7.9 | | |
| | 4th time/1 week | 2349 | 4.3 | 2282 | 4.2 | | |
| 5th time over/1 week | 6778 | 12.3 | 5976 | 10.9 | | | |

¹ N; sample, ² %; percentage, ³ X²; chi-square test, ⁴ in the past week, ⁵; nutritional education in the past year, p-value < 0.05.

3.4. Changes in Personal Hygiene Habits Due to the COVID-19 Outbreak

Changes in personal hygiene habits due to the COVID-19 outbreak was observed. “Hand washing with soap before eating at school, in the past week” decreased from 88.3% to 84.6% ($p < 0.001$). Handwashing using soap after using the toilet at school decreased from 97.0% to 96.5% ($p < 0.001$) in the past week. Handwashing using soap before eating at home decreased from 93.3% to 91.5% in the past week ($p < 0.001$). Handwashing with soap after using the toilet at home decreased from 97.3% to 96.8% in the past week ($p < 0.001$). Handwashing using soap after returning home decreased in the past week from 97.6% to 97.1% ($p < 0.001$) (Table 4).

Table 4. Changes in personal hygiene habits due to the COVID-19 outbreak.

| Variable | COVID-19 | | | | χ^2 | p-Value | |
|--|------------|--------|------|--------|----------|---------|-------|
| | 2020 | | 2021 | | | | |
| | N | % | N | % | | | |
| Washing hands using soap before eating at school * | Always | 17,759 | 32.3 | 14,342 | 26.1 | 766.537 | 0.000 |
| | Often | 16,071 | 29.2 | 15,436 | 28.1 | | |
| | Sometimes | 14,700 | 26.8 | 16,660 | 30.4 | | |
| | Not at all | 6418 | 11.7 | 8410 | 15.3 | | |
| Hand washing using soap after using the toilet at school * | Always | 37,007 | 67.3 | 36,467 | 66.5 | 46.631 | 0.000 |
| | Often | 11,839 | 21.5 | 11,617 | 21.2 | | |
| | Sometimes | 4482 | 8.2 | 4831 | 8.8 | | |
| | Not at all | 1620 | 2.9 | 1933 | 3.5 | | |
| Hand washing using soap before eating at home * | Always | 21,931 | 39.9 | 20,789 | 37.9 | 156.279 | 0.000 |
| | Often | 16,903 | 30.8 | 16,370 | 29.8 | | |
| | Sometimes | 12,400 | 22.6 | 13,061 | 23.8 | | |
| | Not at all | 3714 | 6.8 | 4628 | 8.4 | | |
| Hand washing using soap after using the toilet at home * | Always | 37,551 | 68.3 | 37,118 | 67.7 | 43.082 | 0.000 |
| | Often | 11,024 | 20.1 | 10,752 | 19.6 | | |
| | Sometimes | 4891 | 8.9 | 5192 | 9.5 | | |
| | Not at all | 1482 | 2.7 | 1786 | 3.3 | | |
| Returning home and hand washing using soap * | Always | 39,115 | 71.2 | 38,993 | 71.1 | 44.276 | 0.000 |
| | Often | 9694 | 17.6 | 9260 | 16.9 | | |
| | Sometimes | 4842 | 8.8 | 4994 | 9.1 | | |
| | Not at all | 1297 | 2.4 | 1601 | 2.9 | | |

Sample (N), percentage (%), chi-square test (χ^2), in the past week (*), p-value < 0.05.

3.5. Changes in Daily Life Due to the COVID-19 Outbreak

The results in changes in daily life due to the COVID-19 outbreak can be seen in Table 5. Physical activity decreased compared to that before the COVID-19 outbreak (47.4%), not eating breakfast (72.6%), drinking (81.8%) and smoking (83.6%) remained unchanged, whereas depression (36.0%) increased.

Table 5. Changes in daily life due to the COVID-19 outbreak.

| Variable | Sample N | Percentage % |
|----------------------|----------------|--------------|
| Physical activity | Large increase | 6.3 |
| | Increase | 14.0 |
| | No change | 32.4 |
| | Decrease | 32.3 |
| | Large decrease | 15.1 |
| Not eating breakfast | Large increase | 4.3 |
| | Increase | 10.1 |
| | No change | 72.6 |
| | Decrease | 7.5 |
| | Large decrease | 5.5 |

Table 5. Cont.

| | Variable | Sample N | Percentage % |
|------------|----------------|----------|--------------|
| Drinking | Large increase | 306 | 0.6 |
| | Increase | 1212 | 2.2 |
| | No change | 44,659 | 81.8 |
| | Decrease | 808 | 1.5 |
| | Large decrease | 7617 | 14.0 |
| Smoking | Large increase | 254 | 0.5 |
| | Increase | 273 | 0.5 |
| | No change | 45,078 | 83.6 |
| | Decrease | 466 | 0.9 |
| | Large decrease | 7864 | 14.6 |
| Depression | Large increase | 3758 | 6.9 |
| | Increase | 15,972 | 29.1 |
| | No change | 29,562 | 53.9 |
| | Decrease | 1937 | 3.5 |
| | Large decrease | 3606 | 6.6 |

4. Discussion

The results of comparing the first year (2020) and the second year (2021) of the COVID-19 outbreak among adolescents are as follows. Between the first and second years of the outbreak, obesity increased by 1.2%, the number of adolescents making no weight control efforts increased by 1.3%, and efforts to lose weight decreased by 1.2%. Weekday smartphone usage time also increased by 0.5%. Subjective health conditions deteriorated in the second year compared to that in the first year of the outbreak. Stress and general anxiety disorder (GAD) were 0.10 and 0.22% higher in the second year when compared to that in the first year, respectively. "Experience of sadness and despair of the past year" increased by 1.6% from the first year, "suicide thoughts" by 1.8%, "suicide plans" by 0.4%, and "suicide attempt" by 0.3%.

Handwashing before eating at school decreased by 3.7%, handwashing after using the bathroom at school by 0.5%, handwashing before eating at home by 1.8%, handwashing after using the bathroom at home by 0.5%, and handwashing after returning home by 0.5%. Compared to before the outbreak, physical activity decreased by 79.8%. A total of 72.6% participants said they did not eat breakfast. Depression increased by 36.0%. Jung et al. [6] found that adolescents' stress levels decreased slightly to 0.11 on average in 2020, and that the proportion of experiences of sadness/despair and suicidal thoughts experienced by adolescents decreased compared to that in 2019 [20]. However, in this study, adolescents in 2021 showed a 0.10 stress level, and experiences of sadness/desperation and suicidal thoughts increased. In addition, it was found that adolescents from poor families had a higher experience of sadness/despair than those from non-poor families, and that they had higher sadness/despair in 2021, the second year of the outbreak, than in 2020, the first year of the outbreak [20,24].

Kang et al. reported that obesity increased before the pandemic, and this result also showed that obesity was higher in 2021 than in 2020 [25]. Kang et al. reported that the frequency of eating breakfast, fast food intake, fruit intake, and carbonated drinks increased in the obese group before the COVID-19 outbreak [25], while the frequency of eating fruit, sweet drinks, and fast foods increased in 2021 when compared to that in 2020. It cannot be concluded that an increased frequency of intake has a negative effect on the body, such as obesity, and it is necessary to consider the amount and calories consumed. In the medical guidance, it was said that protecting ourselves from infection means washing our hands [26],

and that personal hygiene is the best way to protect ourselves from infectious diseases. However, in this study, when comparing the first year to the second year, the personal hygiene of handwashing was not well-actioned. Of course, if a new infectious disease such as Middle-Eastern Respiratory Syndrome (MERS) appears, it may be useless [26], but handwashing in daily life is a very good way to defend oneself from germs and viruses. Kim et al. also stated that handwashing promotion activities had a significant effect on reducing the incidence of hospital infections [27], but that we should now practice handwashing in our daily life in order to defend against bacteria and viruses. Handwashing is the easiest form of personal hygiene to carry out in everyday life, but as an important preventive habit [27], daily handwashing habits should be made a part of daily life to prevent new infectious diseases such as COVID-19. This study also showed a tendency to decline in handwashing over time, supplementing education and promotion programs to ensure that a culture of proper hand hygiene practice is established.

Due to COVID-19, face-to-face classes such as schools, online remote classes, and outside activities have increased the time spent at home, and adolescents need to engage in regular physical activities, proper eating habits, and personal hygiene habits, but COVID-19 has had a negative impact on many of these areas [24,26]. Cho et al. found that the increase in online learning time after COVID-19 has led to an increase in smartphone use time and, as a result, the problem of smartphone overdependence [28], and in addition, for some groups of adolescents (such as multicultural family youth, and other family youth), the COVID-19 situation may reduce their experiences of sadness/despair, suicidal thoughts, and violence, while for others (such as adolescents from impoverished families and youth living in military areas), the COVID-19 situation may lead to higher experiences of sadness/despair or violence. Because the COVID-19 pandemic has increased the frequency of online classes and staying at home, it tends to cause obesity, adaptation disorders, depression, increased cognitive impulsivity, lack of behavioral control, and increased smartphone dependence [25], showing the same results as previous studies. As such, a new epidemic like COVID-19 has its own disease-causing impact, but because the links are intertwined in so many areas, new alternatives are needed to address the factors that pose a risk to adolescents while addressing the prevention of infectious diseases. The COVID-19 pandemic was an unprecedentedly difficult time for everyone around the world, but also caused difficulties for adolescents studying in school, academia, etc., and caused their daily life to be restricted, marked by confusion and difficulties. Society and the nation should aim to reduce the anxiety and discomfort caused by diseases such as COVID-19 to enable proper study.

5. Conclusions

The outbreak of COVID-19 increased the time that adolescents spent at home, and the frequency of breakfast, soda, sweet drinks, and water intake increased within their dietary habits. In addition, the frequency of muscle strengthening exercises and middle- and high-intensity physical activities increased. On the other hand, handwashing habits showed a trend of decreasing overall at school and home. Overall, compared to before the COVID-19 outbreak, the amount of physical activity decreased, and depression showed an increasing trend.

As a result of this analysis, we believe there needs to be a system of support to address the academic gaps and deficiencies in learning caused by COVID-19. Psychological and emotional support needs to be strengthened at this time, as well as in the issues to be supported after the end of a non-contact situation. In addition to creating psychological and emotional support policies to help disadvantaged youth during the COVID-19 pandemic, we need to consider what form of psychological and emotional support policy will be introduced for disadvantaged youth after the COVID-19 non-contact situation.

Since this is a cross-sectional study, there is a limitation in clearly grasping temporal pre-post relationships. However, we think that the online youth health behavior survey

is meaningful because it is a representative survey of approximately 60,000 teenagers nationwide every year.

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