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Mental Health and Eating Habits among Female Students in Japan: A Cross-Sectional Study on Data from COVID-19 Curfew Periods

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Abstract

Background: Global vaccine distribution has significantly decreased COVID-19 pathogenesis and mortality rates. However, the resultant uncertainties and pressures have undoubtedly affected the mental well-being of young people. Maintaining a desirable diet can enhance mental health and encourage healthier lifestyles, potentially improving mental well-being. By elucidating the dietary habits that contribute to better mental health, we can potentially manage mental health issues that emerged during and after the COVID-19 pandemic and the associated lifestyle restrictions.

Methods: We examined the relationship between mental health and dietary habits among students restricted from nonessential travel during the third state of emergency due to the spread of COVID-19 in Tokyo from May to July 2021. This study comprised 816 students enrolled at Otsuma Women's University in the Tokyo suburbs. Using data from online surveys, we measured psychological stress levels using the Kessler 6 (K6) scale and investigated their association with dietary habits.

Results: At cutoff values 10 or 13 on the K6 scale, habits such as "eating breakfast," "considering the balance of nutrients in meals," "eating staple foods, main dishes, and side dishes together," and "consuming a variety of foods" were negatively correlated with the prevalence of psychological stress, whereas habits like "eating snacks," "consuming oily foods," and "eating heavily seasoned foods" were positively correlated.

Conclusion: Desirable dietary habits during the COVID-19 pandemic and the associated outdoor restrictions have reduced psychological stress. However, a longitudinal study is required to investigate this in the youth.

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COVID-19: Coronavirus Disease 2019; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; UNICEF: United Nations Children's Fund; WHO: World Health Organization; SNS: Social Network Services

Introduction

Coronavirus disease (COVID-19) has spread worldwide since a cluster of infections was reported in Wuhan, Hubei Province, China, at the end of 2019. As of August 2023, the cumulative number of infected individuals surpassed 760 million people [1].

The COVID-19 pandemic and the accompanying lifestyle restrictions raise concerns, as they can significantly impact people's mental and physical health. Pandemic-related containment measures such as lockdowns, social distancing, and self-isolation can harm mental well-being [2], particularly the mental well-being of healthy young individuals [3]. According to the initial results of an international survey conducted by UNICEF and Gallup in 21 countries, one in five young people aged 15–24 often report feeling depressed or experiencing a lack of energy [4]. WHO reports that one in seven 10–19-year-olds experience mental disorders, accounting for 13% of the global burden of disease in this age group [5]. Global vaccination has significantly reduced the severity of infection and global mortality by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). However, the anxiety and pressure from an unpredictable future after the COVID-19 pandemic have negatively affected young people's minds. If they are unable to cope with mental health issues, adolescents and young adults will experience impaired physical and mental health, limiting their opportunities to lead fulfilling lives.

Notably, maintaining desirable dietary habits can enhance mental well-being by improving mental health and increasing motivation to lead a healthy lifestyle [6]. Additionally, persistently unhealthy dietary patterns can increase mental distress in women more than in men. Women are considered more susceptible to the effects of unhealthy diets than men [7]. By revealing the dietary habits that contribute to mental health improvement, we can potentially manage mental health issues emerging during and after the COVID-19 pandemic and the associated life restrictions.

In this study, we investigated the relationship between mental health and dietary habits among students during the period of increasing COVID-19 infection rates in the third state of emergency, in which prioritized measures were implemented to prevent the spread of the virus in Tokyo. During this period, students were required to attend online classes to minimize nonessential travel between prefectures.

Materials & Method

Participants

We conducted an online survey of students enrolled at Otsuma Women's (O) University, near Tokyo, during the third state of emergency in Tokyo between May and July 2021 in response to the spread of COVID-19. The survey covered mental health, social network services (SNS) usage, lifestyle, and dietary habits. Of the 961 respondents, 145 were excluded owing to incomplete responses, leaving 816 participants for data analysis.

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Ethical approval

Before commencing the survey, all participants were provided with a document explaining the purpose of the study, the policy on personal information protection, and an assurance that the survey results would be analyzed on a group basis. Participants were informed that completing the survey and providing their names for the questionnaire would be considered consent to participate. Ethical considerations for this study were approved by the Ethics Review Committee of Otsuma Women's University (Approval No. 03-004).

Mental health assessment

We measured mental well-being using the Japanese version of the Kessler 6 scale (K6 scale), which is widely used as an indicator of the level of psychological issues, including psychological stress [8]. This scale consists of six items that inquire about psychological distress symptoms experienced in the past 30 days. Response options ranged from 0 (none at all) to 4 (all times) on a 5-point scale. In this study, Cronbach's alpha coefficient for this scale was 0.76. In Japan, the objective is to reduce the proportion of individuals with a K6 score of 10 or higher; hence, the target value was set at 9.4%. However, there has been no improvement in achieving this target over the past decade [9]. If the K6 score is 13 or higher, severe psychological distress indicates a poor mental health status [10]. Therefore, in this study, we set the cutoff points for the K6 scores to 10 and 13.

Assessments related to eating habits

To investigate the dietary habits during the state of emergency period, we collected responses using the following question items: "Eating breakfast," "Considering the balance of nutrients in meals," "Having staple foods, main dishes, and side dishes together," "Eating a variety of foods as much as possible," "Eating snacks," "Eating oily foods," and "Eating heavily seasoned foods." The response options included "rarely," "1–2 days per week," "3–4 days per week," and "almost every day."

Assessment of covariance

We obtained responses regarding potential confounding factors, such as demographic characteristics in the range of academic years from freshmen to seniors among the subjects. For physical activity, we inquired about the number of days per week and the duration per walking session and calculated the daily walking time. We also asked about physical activity habits practiced at least once a week, with response options of "yes" or "no." Regarding sleep duration, we obtained responses with choices of "less than 5 hours," "6 hours," "7 hours," and "8 hours or more." For SNS usage time, response options included "rarely," "less than 30 minutes," "30 minutes to less than 1 hour," "1 hour to less than 2 hours," "2 hours to less than 3 hours," "3 hours to less than 4 hours," "4 hours to less than 5 hours," "5 hours to less than 6 hours," and "6 hours or more." We reclassified responses of "rarely" and "less than 30 minutes" as "less than 1 hour." Body mass index (BMI) was calculated based on the self-reported height and weight. Participants were categorized as underweight (BMI < 18.5), average weight (18.5 < BMI < 25.0), and overweight (BMI ≥ 25.0) based on their BMI values.

Statistical analysis

Participants were classified into two groups based on their K6 scores: those below ten and those with ten or above. Chi-square or Fisher's exact tests were performed to assess the differences between Participants were classified into two groups based on their K6 scores: those below ten and those with ten or above. Chi-square or Fisher's exact tests were performed to assess the differences between the two groups in academic year, sleep duration, SNS usage time, physical activity habits, and BMI categories.

Results

Of the total participants, 302 (37.0%) had K6 scores of 10 or higher, and 173 (21.2%) had K6 scores of 13 or higher.

Among those with K6 scores of 10 or above (n = 302), a higher proportion of students were underweight (BMI < 18.5) compared with those with scores below 10 (n = 514) (p = 0.002). Additionally, a higher proportion had a sleep duration of less than five hours (p = 0.004), and a higher proportion had an SNS usage time of six hours or more (p = 0.002) compared with those with K6 scores below 10. Similarly, among those with K6 scores of 13 or above (n = 173), a higher proportion of students were underweight (BMI < 18.5) than among those with scores below 13 (n = 643) (p = 0.003). Additionally, a higher proportion had a sleep duration of less than five hours (p = 0.002), but there was no significant difference in SNS usage time compared with those with K6 scores below 13. There were no significant differences in academic year, physical activity habits, or walking time between individuals with K6 scores of 10 or above and those below 10 or between individuals with K6 scores of 13 or above and those below 13 (Table 1).

When the cutoff value for the K6 score was set at 10, dietary habits related to "eating breakfast," "considering the balance of nutrients in meals," "having staple foods, main dishes, and side dishes together," and "eating a variety of foods as much as possible" consistently showed a negative correlation with the prevalence of psychological stress. Even after adjusting for covariates, the OR remained statistically significant. In contrast, dietary habits related to "eating snacks," oily foods," and heavily seasoned foods" were positively correlated with the prevalence of psychological stress. However, after adjusting for covariates, only the "eating snacks" habit remained statistically significant (Table 2).

Similar findings were observed when the cutoff value for the K6 score was 13. Dietary habits related to "eating breakfast," "considering the balance of nutrients in meals," "having staple foods, main dishes, and side dishes together," and "eating as many foods as possible" consistently showed a negative correlation with the prevalence of psychological stress. Even after adjusting for covariates, the OR remained statistically significant. In contrast, dietary habits related to "eating snacks" and "consuming oily foods" were positively correlated with the prevalence of psychological stress. However, the habit of "consuming heavily seasoned food " did not show any significant association. Even after adjusting for covariates, the dietary habits of "eating snacks" and "consuming oily foods" remained statistically significant (Table 3).

Discussion

The results of this study suggest that unfavorable dietary behaviors under the COVID-19 pandemic restrictions may impact young individuals' mental health. Healthy dietary habits, such as eating breakfast, considering nutrient balance in meals, and consuming various foods, are associated with potential psychological stress reduction. Conversely, the consumption of snacks, oily foods, and heavily seasoned foods was positively associated with increased

		< 10	≥ 10	p value*	< 13	≥ 13	p value*
		n = 514	n = 302		n = 643	n = 173	
		n (%)	n (%)		n (%)	n (%)	
Grade							
	1st Grade	174 (33.9)	79 (26.2)	0.057	210 (32.7)	43 (24.9)	0.211
	2nd Grade	146 (28.4)	84 (27.8)		179 (27.8)	51 (29.5)	
	Grade 3	139 (27.0)	94 (31.1)		180 (28.0)	53 (30.6)	
	Grade 4	55 (10.7)	45 (14.9)		74 (11.5)	26 (15.0)	
Type of Residence							
	Living alone	36 (7.0)	25 (8.3)	0.424	44 (6.8)	17 (9.8)	0.295
	Living with family	450 (87.5)	266 (88.1)		566 (88.0)	150 (86.7)	
	Dormitory	28 (5.4)	11 (3.6)		33 (5.1)	6 (3.5)	
BMI							
	BMI < 18.5	87 (17.0)	78 (26.1)	0.002	116 (18.1)	49 (28.8)	0.003
	18.5 < BMI < 25.0	419 (81.7)	213 (71.2)		516 (80.4)	116 (68.2)	
	25.0 < BMI	7 (1.4)	8 (2.7)		10 (1.6)	5 (2.9)	
Sleeping Duration							
	Less than 5 h	35 (6.8)	40 (13.2)	0.004	48 (7.5)	27 (15.6)	0.002
	6 h	208 (40.5)	113 (37.4)		261 (40.6)	60 (34.7)	
	7 h	186 (36.2)	88 (29.1)		226 (35.1)	48 (27.7)	
	More than 8 h	85 (16.5)	61 (20.2)		108 (16.8)	38 (22.0)	
Time spent on SNS							
	Less than 1 h	17 (3.3)	19 (6.3)	0.002	27 (4.2)	9 (5.2)	0.312
	Less than 1 to 2 h	68 (13.2)	30 (9.9)		76 (11.8)	22 (12.7)	
	Less than 2 to 3 h	130 (25.3)	64 (21.2)		159 (24.7)	35 (20.2)	
	Less than 3 to 4 h	117 (22.8)	61 (20.2)		141 (21.9)	37 (21.4)	
	Less than 4 to 5 h	86 (16.7)	37 (12.3)		103 (16.0)	20 (11.6)	
	5 to less than 6 h	37 (7.2)	32 (10.6)		52 (8.1)	17 (9.8)	
	More than 6 h	59 (11.5)	59 (19.5)		85 (13.2)	33 (19.1)	
Exercise Habit							
	Yes	117 (22.8)	68 (22.5)	0.924	144 (22.4)	41 (23.7)	0.723
		(mean±SD)	(mean±SD)		(mean±SD)	(mean±SD)	
Walking time (min/d)		40.3±38.9	42.7±45.8	0.466	41.9±41.4	38.4±41.7	0.367

*; χ^2 test or student's t-test

Table 1: Participant mental health description using the Kessler 6 scale

psychological stress. These dietary habits may adversely affect the mental health of young adults.

The high prevalence of psychological distress among young individuals during the COVID-19 pandemic

In this study, 37.0% of the participants had a K6 score of 10 or above, and 21.2% had a K6 score of 13 or above. During the COVID-19 pandemic, the proportion of individuals with a K6 score of 13 or above in adolescence and young adulthood was as high as 21.7% [11], which is consistent with the proportion observed in the participants of this study. The average K6 score of the participants was 7.8, with a median score of 7.0. However, previous research conducted before the COVID-19 pandemic reported an average K6 score of 5.3 and a median of 5.0 among young individuals under 40 [12]. This finding suggests a strong association between the impact of the COVID-19 pandemic and participants' mental health. As the subjects of this study were students from the Faculty of Home Economics, many practical exercises and experiments were expected in their classes. However, the fact that they had to participate in online experiments and practical activities during the emergency declaration period and experience group work using an unfamiliar web conferencing system may have contributed to their psychological stress.

		< 10	≥ 10	p value*	OR (95%CI)**	OR (95%CI)***
Independent variable		n = 514	n = 302			
Eating breakfast						
	Almost never	38 (7.4)	42 (13.9)	< 0.001	1	1
	1–2 d/wk	49 (9.5)	47 (15.6)		0.868 (0.479–1.572)	0.903 (0.487–1.675)
	3–4 d/wk	81 (15.8)	44 (14.6)		0.491 (0.277–0.871)	0.600 (0.329–1.096)
	Almost every day	346 (67.3)	169 (56.0)		0.442 (0.275–0.711)	0.577 (0.348–0.957)
Eat meals with nutritional balance in mind						
	Almost never	38 (7.4)	54 (17.9)	< 0.001	1	1
	1–2 d/wk	77 (15.0)	48 (15.9)		0.439 (0.253–0.760)	0.475 (0.265–0.853)
	3–4 d/wk	189 (36.8)	101 (33.4)		0.376 (0.233–0.608)	0.441 (0.264–0.737)
	Almost every day	210 (40.9)	99 (32.8)		0.332 (0.206–0.536)	0.390 (0.234–0.650)
Eat a complete set of staple, main, and side dishes						
	Almost never	48 (9.3)	40 (13.2)	0.015	1	1
	1–2 d/wk	109 (21.2)	70 (23.2)		0.771 (0.460–1.291)	0.857 (0.496–1.482)
	3–4 d/wk	147 (28.6)	101 (33.4)		0.824 (0.505–1.346)	1.001 (0.593–1.688)
	Almost every day	210 (40.9)	91 (30.1)		0.520 (0.320–0.846)	0.570 (0.340–0.957)
Eat as much variety of foods as possible						
	Almost never	57 (11.1)	60 (19.9)	< 0.001	1	1
	1–2 d/wk	102 (19.8)	75 (24.8)		0.699 (0.437–1.117)	0.702 (0.429–1.147)
	3–4 d/wk	176 (34.2)	80 (26.5)		0.432 (0.276–0.676)	0.484 (0.302–0.775)
	Almost every day	179 (34.8)	87 (28.8)		0.462 (0.296–0.720)	0.523 (0.327–0.835)
Eat snacks						
	Almost never	262 (51.0)	140 (46.4)	0.001	1	1
	1–2 d/wk	193 (37.5)	113 (37.4)		1.096 (0.804–1.494)	1.126 (0.815–1.557)
	3–4 d/wk	48 (9.3)	25 (8.3)		0.975 (0.576–1.648)	0.941 (0.539–1.642)
	Almost every day	11 (2.1)	24 (7.9)		4.083 (1.943–8.580)	3.231 (1.485–7.030)
Eat oily foods						
	Almost never	98 (19.1)	52 (17.2)	0.007	1	1
	1–2 d/wk	308 (59.9)	155 (51.3)		0.948 (0.644–1.398)	0.962 (0.643–1.440)
	3–4 d/wk	97 (18.9)	81 (26.8)		1.574 (1.006–2.462)	1.553 (0.973–2.479)
	Almost every day	11 (2.1)	14 (4.6)		2.399 (1.017–5.659)	2.337 (0.941–5.803)
Eat highly seasoned foods						
	Almost never	84 (16.3)	43 (14.2)	0.059	1	1
	1–2 d/wk	243 (47.3)	123 (40.7)		0.989 (0.645–1.515)	0.961 (0.618–1.496)
	3–4 d/wk	143 (27.8)	96 (31.8)		1.311 (0.837–2.055)	1.305 (0.817–2.084)
	Almost every day	44 (8.6)	40 (13.2)		1.776 (1.010–3.122)	1.426 (0.786–2.585)

Table 2: Logistic regression analysis for participants with K6 scores ≥ 10
*; $\chi 2$ test
**; univariate analysis
***; adjusted for grade, sleeping hours, time spent on social network services (SNS), and BMI

Importance of dietary habits during the COVID-19 pandemic

The constraints and uncertainties caused by the COVID-19 pandemic have significantly affected the mental health of young individuals' mental health [13]. Furthermore, females experience more severe effects than males [14]. Maintaining healthy dietary habits may enhance the psychological well-being of young individuals. Diet affects physical health and plays an essential role in mental well-being [15]. The results of the present study suggest similar findings, indicating a potential positive impact of dietary habits on mental health. In situations where behaviors are significantly restricted, such as the COVID-19 pandemic's lockdown measures, individuals may experience significant stress. Therefore, supporting mental health through appropriate dietary choices is critical.

Independent variable		< 13	≥ 13	p value*	OR (95%CI)**	OR (95%CI)***
		n = 643	N = 173			
Eating breakfast						
	Almost never	49 (7.6)	31 (17.9)	< 0.001	1	1
	1–2 d/wk	68 (10.6)	28 (16.2)		0.651 (0.347–1.221)	0.648 (0.336–1.247)
	3–4 d/wk	103 (16.0)	22 (12.7)		0.338 (0.177–0.643)	0.380 (0.193–0.749)
	Almost every day	423 (65.8)	92 (53.2)		0.344 (0.208–0.569)	0.412 (0.241–0.706)
Eat meals with nutritional balance in mind						
	Almost never	52 (8.1)	40 (23.1)	< 0.001	1	1
	1–2 d/wk	98 (15.2)	27 (15.6)		0.358 (0.198–0.648)	0.398 (0.212–0.748)
	3–4 d/wk	235 (36.5)	55 (31.8)		0.304 (0.183–0.505)	0.341 (0.198–0.589)
	Almost every day	258 (40.1)	51 (29.5)		0.257 (0.154–0.428)	0.285 (0.164–0.493)
Eat a complete set of staple, main, and side dishes						
	Almost never	63 (9.8)	25 (14.5)	0.041	1	1
	1–2 d/wk	136 (21.2)	43 (24.9)		0.797 (0.448–1.418)	0.884 (0.480–1.626)
	3–4 d/wk	192 (29.9)	56 (32.4)		0.735 (0.424–1.275)	0.871 (0.484–1.567)
	Almost every day	252 (39.2)	49 (28.3)		0.490 (0.281–0.854)	0.522 (0.290–0.943)
Eat as much variety of foods as pos-sible						
	Almost never	74 (11.5)	43 (24.9)	< 0.001	1	1
	1–2 d/wk	135 (21.0)	42 (24.3)		0.535 (0.321–0.893)	0.531 (0.311–0.907)
	3–4 d/wk	217 (33.7)	39 (22.5)		0.309 (0.186–0.514)	0.329 (0.193–0.559)
	Almost every day	217 (33.7)	49 (28.3)		0.389 (0.239–0.633)	0.410 (0.245–0.688)
Eat snacks						
	Almost never	327 (50.9)	75 (43.4)	0.009	1	1
	1–2 d/wk	240 (37.3)	66 (38.2)		1.199 (0.828–1.736)	1.294 (0.881–1.900)
	3–4 d/wk	56 (8.7)	17 (9.8)		1.324 (0.728–2.407)	1.297 (0.688–2.444)
	Almost every day	20 (3.1)	15 (8.7)		3.270 (1.600–6.684)	2.343 (1.092–5.025)
Eat oily foods						
	Almost never	120 (18.7)	30 (17.3)	0.019	1	1
	1–2 d/wk	374 (58.2)	89 (51.4)		0.952 (0.600–1.511)	0.962 (0.598–1.547)
	3–4 d/wk	135 (21.0)	43 (24.9)		1.274 (0.752–2.158)	1.220 (0.706–2.109)
	Almost every day	14 (2.2)	11 (6.4)		3.143 (1.297–7.617)	2.983 (1.158–7.683)
Eat highly seasoned foods						
	Almost never	100 (15.6)	27 (15.6)	0.065	1	1
	1–2 d/wk	297 (46.2)	69 (39.9)		0.860 (0.522–1.418)	0.814 (0.487–1.362)
	3–4 d/wk	189 (29.4)	50 (28.9)		0.980 (0.578–1.660)	0.965 (0.559–1.666)
	Almost every day	57 (8.9)	27 (15.6)		1.754 (0.939–3.277)	1.407 (0.725–2.732)

*; $\chi 2$ test
**; univariate analysis
***; adjusted for grade, sleeping hours, time spent on social network services (SNS), and BMI

Table 3: Logistic regression analysis for participants with K6 scores ≥ 13

The influence of BMI

Among young Japanese women, a high proportion of underweight individuals with a BMI < 18.5 [16]. Measures are necessary to address this issue, not only for the prevention of osteoporosis during future childbirth and menopause but also for overall health and well-being. Lack of self-esteem is associated with body image, which explains the association between underweight and depressive symptoms [17]. In this study, the proportion of underweight individuals was higher among those who experienced psychological stress. Therefore, besides improving dietary habits, it is necessary to promote self-esteem to address distorted body images and enhance overall well-being.

The influence of academic year

The participants in this study were in the 1st to 4th academic years of university, with an average age of 20.0 ± 1.1. Given the slight individual differences in age based on the standard deviation, it can

be inferred that differences in psychological stress among academic years may be strongly related. Although the difference was not statistically significant, more participants experienced psychological stress during their 4th academic year. This might be attributed to the contrast between enjoyable memories of the first two years of university life, where students attended lectures on campus and engaged in various extracurricular activities and part-time work, and the constraints imposed by the COVID-19 pandemic in later stages. Additionally, being in their final year of university and facing uncertainties in job hunting and future professional life could contribute to higher stress levels among 4th-year students, as anticipated.

The influence of family composition

Individuals living alone may experience feelings of loneliness that can affect their mental health. However, most of these studies have focused on the older population [18], there is limited research on young adults. Among the participants of this study, 7.5% lived alone. However, no significant difference was found in the prevalence of living alone between those who reported severe psychological stress and those who did not. Social media (SNS) by young people is increasing worldwide. During the COVID-19 pandemic, SNS usage rates have increased with restrictions on going out. Connecting through SNS may help alleviate loneliness among those living alone. Recent reports also emphasize the importance of supportive interpersonal relationships and close-knit community connections in reducing loneliness's negative impact on young individuals' happiness [19].

The influence of sleep duration

Research on sleep duration and mental health has reported that individuals experiencing mental anxiety have shorter sleep durations and poor sleep quality [20]. The average sleep duration in Japanese people is shorter than that in people from other countries [21]. In the present study, the average sleep duration was 6 h. Furthermore, individuals with high psychological stress tended to sleep for 5 h or less. Among those with high psychological stress, a significant number reported using social media (SNS) for six hours or more. A positive correlation was observed between sleep duration and SNS use. Therefore, SNS use may play a role in the relationship between sleep duration and psychological stress.

The influence of exercise

Research on exercise and mental health has reported that regular physical activity effectively alleviates psychological anxiety [22]. Among the participants in this study, more than 20% had high psychological stress and did not report engaging in physical activity at least once a week. Among them, 42% were involved in home-based muscle training, yoga, or calisthenics. No significant differences were observed between the individuals with and without high psychological stress. Owing to the COVID-19 pandemic, restrictions were imposed on outdoor activities during the survey period. Consequently, many individuals exercise alone at home on platforms such as YouTube. It is speculated that this situation may have hindered opportunities for stress reduction through communication while exercising because engaging in physical activity through social interactions was limited. Regarding walking, the average daily walking time for the participants in this study was 40.3 ± 38.9 minutes. However, no significant differences were observed between the individuals with and without high levels of psychological stress. During the COVID-19 pandemic, even in cases of active walking or walking for daily purposes such as shopping, it is likely that these activities were conducted while wearing masks and without engaging in conversations. Similar to the exercise habits, this situation may have hindered stress reduction through walking.

Limitations and Strengths of the Study

This study had several limitations. First, the choice of participants was subject to selection bias. The participants were recruited from a women's university in the Tokyo metropolitan area, raising concerns about their representativeness. Second, the timing of the survey is a limitation. The survey was conducted during the third state of emergency declaration in Tokyo due to the COVID-19 pandemic. However, information on mental health before the pandemic and during the first and second states of emergency is lacking. Therefore, there is a substantial possibility that mental health during these periods influenced mental health and dietary habits during the survey period. Third, other factors that influence mental health were not considered. Household income [23], academic performance [24], friendships (https://doi.org/10.3390/ijerph20032160), and the presence and quality of romantic relationships [25] have been reported to impact the mental health of young individuals. However, these factors were not considered in this study.

Despite these limitations, this study is the first to report the significant impact of COVID-19 pandemic-related restrictions on the mental health of Japanese youth and the positive influence of favorable dietary habits on maintaining their mental well-being.

Conclusions

This cross-sectional study revealed that favorable dietary habits during the COVID-19 pandemic, characterized by practices such as "eating breakfast," "considering balanced nutrition in meals," "consuming staple foods, main dishes, and side dishes," and "incorporating a variety of foods," were associated with alleviating psychological stress and maintaining healthy mental well-being among young individuals. However, longitudinal investigations with participants are necessary to further examine the impact of dietary habits on the mental health of young people experiencing the COVID-19 pandemic.

Competing Interests

The authors declare that they have no competing interests.

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References

1. World Health Organization. WHO Coronavirus (COVID-19) Dashboard 2023.
2. Fiorillo A, Gorwood P (2020) The consequences of the COVID-19 pandemic on mental health and implications for clinical practice. Eur Psychiatry 63: e32.

3. Okuyama J, Seto S, Fukuda Y, Funakoshi S, Amae S, et al. (2021) Mental Health and Physical Activity among Children and Adolescents during the COVID-19 Pandemic. Tohoku J Exp Med 253: 203-215.

4. Unicef, The State of the World's Children 2021-2023.

5. World Health Organization, Mental health of adolescents ,2021.

6. Richard A, Rohrmann S, Pestoni G, Strippoli MF, Lasserre A, et al. (2022) Associations between anxiety disorders and diet quality in a Swiss cohort study. Compr Psychiatry 118: 152344.

7. Begdache L, Patrissy CM (2021) Customization of Diet May Promote Exercise and Improve Mental Wellbeing in Mature Adults: The Role of Exercise as a Mediator. J Pers Med 11: 435.

8. Furukawa TA, Kawakami N, Saitoh M, Ono Y, Nakane Y, et al. (2008) The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. Int J Methods Psychiatr Res 17: 152-158.

9. Ministry of Health, Labour and Welfare. Health Japan 21 (Second) Final Evaluation Report. 2023.

10. Kessler RC, Barker PR, Colpe LJ, Epstein JF, Gfroerer JC, et al. (2003) Screening for serious mental illness in the general population. Arch Gen Psychiatry 60: 184-189.

11. Yamamoto T, Uchiumi C, Suzuki N, Yoshimoto J, Murillo-Rodriguez E (2020) The Psychological Impact of 'Mild Lockdown' in Japan during the COVID-19 Pandemic: A Nationwide Survey under a Declared State of Emergency. Int J Environ Res Public Health 17: 9382.

12. Sakurai R, Nemoto Y, Mastunaga H, Fujiwara Y (2021) Who is mentally healthy? Mental health profiles of Japanese social networking service users with a focus on LINE, Facebook, Twitter, and Instagram. PloS one 16: e0246090.

13. Bell IH, Nicholas J, Broomhall A, Bailey E, Bendall S, et al. (2023) The impact of COVID-19 on youth mental health: A mixed methods survey. Psychiatry Res 321: 115082.

14. Morgan R, Pimenta DN, Rashid S (2022) Gender equality and COVID-19: act now before it is too late. Lancet 399: P2327-2329.

15. Firth J, Gangwisch JE, Borisini A, Wootton RE, Mayer EA (2020) Food and mood: how do diet and nutrition affect mental wellbeing? BMJ 369: m2382.

16. Ochiai H, Shirasawa T, Nanri H, Nishimura R, Nomoto S, et al. (2017) Lifestyle factors associated with underweight among Japanese adolescents: a cross-sectional study. Arc Public Health 75: 45.

17. Barnes M, Abhyankar P, Dimova E, Best C (2020) Associations between body dissatisfaction and self-reported anxiety and depression in otherwise healthy men: A systematic review and meta-analysis. PloS one 15: e0229268.

18. Aylaz R, Aktürk Ü, Erci B, Öztürk H, Aslan H (2012) Relationship between depression and loneliness in elderly and examination of influential factors. Arch Gerontol Geriatr 55(3):548-54.

19. Goodfellow C, Hardoon D, Inchley J, Leyland AH, Qualter P, et al. (2022) Loneliness and personal well-being in young people: Moderating effects of individual, interpersonal, and community factors. J Adolesc 94: 554-568.

20. Seow LSE, Tan XW, Chong SA, Vaingankar JA, Abdin E, et al. (2020) Independent and combined associations of sleep duration and sleep quality with common physical and mental disorders: Results from a multi-ethnic population-based study. PloS one 15: e0235816.

21. Ito K, Kadotani H, Okajima I, Ubara A, Ichikawa M, et al. (2021) Large Questionnaire Survey on Sleep Duration and Insomnia Using the TV Hybridcast System by Japan Broadcasting Corporation (NHK). Int J Environ Res Public Health 18: 2691.

22. Herbert C, Meixner F, Wiebking C, Gilg V (2020) Regular Physical Activity, Short-Term Exercise, Mental Health, and Well-Being Among University Students: The Results of an Online and a Laboratory Study. Front Psychol 11: 509.

23. Parra-Mujica F, Johnson E, Reed H, Cookson R, Johnson M (2023) Understanding the relationship between income and mental health among 16- to 24-year-olds: Analysis of 10 waves (2009-2020) of Understanding Society to enable modelling of income interventions. PloS one 18: e0279845.

24. Agnafors S, Barmark M, Sydsjö G (2021) Mental health and academic performance: a study on selection and causation effects from childhood to early adulthood. Soc Psychiatry Psychiatr Epidemiol 56: 857-866.

25. Price M, Hides L, Cockshaw W, Staneva AA, Stoyanov SR (2016) Young Love: Romantic Concerns and Associated Mental Health Issues among Adolescent Help-Seekers. Behav Sci (Basel) 6: 9.