

Temporal Shifts in the Characteristics of Eating Disorder-Related Consultations: A Comparison across the Pre-Pandemic, Earlier-Pandemic-, and Post-Emergency Periods-A Retrospective Study of 4,260 Consultations

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Abstract

Background

This study examined the impact of the COVID-19 pandemic on eating disorder (ED)-related consultations in Japan, based on consultation data from three designated ED support base hospitals across the country.

Methods

We conducted a retrospective time-series analysis of 4,260 consultation records obtained at ED support base hospitals in Miyagi, Chiba, and Fukuoka Prefectures between April 2018 and March 2023. Demographic characteristics, body mass index (BMI), and consultation content were compared between the pre-pandemic period and the period following the onset of the pandemic, and between COVID-19-related and unrelated consultation records. Temporal trends were assessed using Seasonal and Trend decomposition using Loess, followed by interrupted time-series analysis with a segmented generalized linear model that included an interaction between time since pandemic onset and age group. All data were derived from consultation records rather than diagnoses established using structured diagnostic criteria.

Results

During the pandemic, the average age at consultation significantly decreased (from 27.5 to 24.9 years), while BMI did not differ significantly. The total number of ED-related consultations increased during periods when multiple states of emergency were intermittently declared, with a particularly marked increase in consultations involving adolescents. Interrupted time-series analysis showed a significant interaction between time since pandemic onset and the 10–19-year age group ($\beta = 0.0061, p < 0.01$), indicating a more sustained increase and a slower subsequent decline in consultations among adolescents than in the total consultation trend. Consultation records classified as COVID-19 related had a lower mean age than those classified as unrelated (22.0 vs. 25.0 years) and more frequently included complaints related to dietary restriction and thinness.

Discussion

Although the overall number of ED-related consultations and the mean age at consultation were gradually returning to pre-pandemic levels by the end of the study period, the increase in consultations involving adolescents was more sustained and declined more slowly than the overall trend. Stress and emotional changes associated with behavioral restrictions may have had prolonged effects on eating behaviors among adolescents. These findings highlight the importance of promoting disease awareness

and establishing preventive and early-intervention measures during non-crisis periods to mitigate the impact of future emergencies.

Plain English summary

The COVID-19 pandemic disrupted daily life and may have affected people with eating disorders, especially young people. We examined 4,260 consultation records from three eating disorder support hospitals across Japan between April 2018 and March 2023. The number of consultations increased temporarily during states of emergency, and the average age recorded at consultation decreased. Consultations involving adolescents aged 10–19 years remained elevated for longer and declined more slowly than consultations overall. Following the pandemic onset, reports of thinness and food restriction became more common, while reports of binge eating and vomiting became less common. Consultations in which eating problems were reported as triggered or worsened by the pandemic more frequently included reports of food restriction. These findings suggest that disruptions to daily life may have lasting effects on adolescents with eating disorders. Improving awareness, early recognition, and access to support before future emergencies may help reduce these effects.

Background

If they persist over time, eating disorders (EDs) are known to become more severe, not only physically but also psychologically [1]. Among psychiatric disorders, EDs carry an exceptionally high mortality rate, attributable to both suicide and physical complications, such as cardiovascular collapse [2], underscoring the critical importance of early detection and intervention. In particular, anorexia nervosa (AN) and bulimia nervosa (BN) are characterized by a core psychopathology in which self-evaluation is overly influenced by body weight and shape [3]. The onset and course of EDs are closely linked to psychosocial factors, and it is well established that environmental changes can exacerbate symptoms [4]. Individuals with EDs often have low tolerance for unexpected events and a strong tendency to avoid uncertainty. When their sense of self-control is diminished due to external stressors, their concerns regarding weight, body shape, and eating are likely to intensify [5].

In 2019, the novel coronavirus (SARS-CoV-2) was first detected in China, and on March 11, 2020, the World Health Organization (WHO) declared corona virus disease (COVID-19) a pandemic. The virus rapidly spread worldwide, prompting strict public health measures, including lockdowns that forced people to remain at home. In Japan, the first case of COVID-19 was identified in January 2020, and the subsequent rapid rise in cases led to widespread public anxiety. On April 7, 2020, the Japanese government issued the first state of emergency in seven prefectures, leading to school closures and remote work orders. Between April 2020 and September 2021, Japan experienced four states of emergency declarations or equivalent restrictions periods.

These dramatic societal shifts resulted in significant stress within the population, and various studies have reported their impact on the onset and progression of numerous health conditions [6, 7], including

EDs [8]. Pandemic- and lockdown-related stressors were particularly pronounced among students with a history of EDs, who exhibited worsened disordered eating behaviors, such as restriction and binge eating [9, 10]. Among individuals with EDs, multiple stress factors, including social isolation, limited access to medical services, food insecurity, and restrictions on outdoor exercise, have been shown to increase psychological distress [11–15]. In Japan, approximately 30% of individuals who had their first ED consultation in 2020 were reported to have developed the illness in the same year, with a significantly different cumulative incidence pattern compared to 2019 [16]. The majority of these patients were diagnosed with the restricting subtype of AN (AN-R). In our previous report, we found that during Japan's first state of emergency, nearly 80% of newly diagnosed patients with EDs were classified as having AN-R, with a notably young median at diagnosis of 14 years, in contrast to 22 years among those diagnosed outside this period [17].

In recent decades, Japan, like many Western countries, has faced a growing problem with the increasing prevalence of EDs [18]. Despite the increasing number of patients with EDs, in Japan's healthcare system, the limited number of medical institutions capable of treating such patients made it difficult for them to access appropriate care, which was a major challenge. In response, the Japanese government launched the Eating Disorder Support Center initiative in 2015, establishing designated support base hospitals for EDs across the country. These base hospitals offer consultation services for patients and families, provide expert guidance to other medical institutions, and promote public awareness to improve regional healthcare systems. Although the goal is to establish one center in every prefecture, as of November 2025, only ten prefectures have such facilities. Our Department of Psychosomatic Medicine at Kyushu University Hospital has been actively involved in ED support activities as Fukuoka Prefectural Support Base Hospital for EDs since 2015, even before the pandemic, and it has accumulated substantial data on patients with EDs in our prefecture.

Based on these observations, we hypothesized that the age distribution and symptom presentation of patients with ED have shifted following the COVID-19 pandemic, in contrast to the pre-pandemic period. Furthermore, with the recent reclassification of COVID-19 under Japan's Infectious Disease Control Law and the return to pre-pandemic daily life, it is plausible that the clinical profiles of patients with EDs have also changed. To date, no large-scale time-series study has examined the impact of the COVID-19 crisis on EDs across the pre-pandemic, earlier-pandemic, and post-emergency periods. Understanding these effects is critically important for future improvements in healthcare policy and service delivery. To test this hypothesis, we retrospectively analyzed data from 4,260 ED-related consultation records collected at ED support centers affiliated with support base hospitals in three prefectures in Japan between 2018 and 2023. We examined temporal changes in the demographics and clinical characteristics recorded during ED-related consultations across the course of the COVID-19 pandemic.

Methods

Data source and consultation records

The dataset comprised 4,260 consultation records obtained through telephone, e-mail, or face-to-face consultations conducted between April 1, 2018, and March 31, 2023, at the consultation rooms of designated ED support base hospitals operated by psychosomatic medicine departments in Miyagi (Department of Psychosomatic Medicine, Tohoku University Hospital), Chiba (Department of Psychosomatic Medicine, Kohnodai Hospital, Japan Institute for Health Security), and Fukuoka Prefectures (Department of Psychosomatic Medicine, Kyushu University Hospital). The unit of analysis was the individual consultation rather than the individual patient. Therefore, multiple consultations involving the same individual may have been included and were treated as separate consultation records.

All data were derived directly from consultation records, and ED diagnoses were not established using structured diagnostic criteria such as those in the Diagnostic and Statistical Manual of Mental Disorders or the International Classification of Diseases. All data from each participating institution were anonymized and centrally aggregated at the Department of Psychosomatic Medicine, Kyushu University Hospital. These three institutions were selected as study sites because, unlike other designated ED support hospitals operated by psychiatry departments, they are run by psychosomatic medicine departments and have maintained complete datasets since 2018. The study was approved by the ethics committees of each participating institution as well as the Kyushu University Research Ethics Committee (M23075).

Study items

Consultation data were anonymized and used for research analysis. The variables analyzed included age, gender, body mass index (BMI), ED symptoms, general symptoms (such as physical symptoms and depression or anxiety), and consultation content.

Definitions

The period from April 1, 2018, to December 31, 2019, was defined as the pre-pandemic period, and the period from January 1, 2020, to March 31, 2023, was defined as the period following the pandemic onset. This classification was based on the identification of the first COVID-19 case in Japan in January 2020.

For descriptive purposes, the period following the pandemic onset was further divided into the earlier pandemic period, which encompassed the repeated states of emergency (January 1, 2020, to September 30, 2021), and the post-emergency period (October 1, 2021, to March 31, 2023). September 30, 2021, marked the complete lifting of the repeated states of emergency in Japan. Here, “post-emergency period” refers specifically to the period following the lifting of these emergency measures; it does not imply the end of the COVID-19 pandemic or the legal reclassification of COVID-19 in Japan. For the

primary pre- versus post-onset comparisons, the earlier pandemic and post-emergency periods were combined and analyzed as the period following the pandemic onset.

Based on the consultation content, consultation records in which ED symptoms were considered to have been triggered or exacerbated by the spread of COVID-19 were classified as the “Related group,” whereas records without such associations were classified as the “Not related group.” Trained consultation staff at each ED support center initially performed this classification, and a physician specializing in eating disorders subsequently reviewed it. In cases of disagreement, the final classification was determined through discussion to reach consensus. Because consultations occurring before the recognition of COVID-19 in Japan could not, by definition, be associated with the pandemic, this classification was applied only to consultation records obtained during the period following the pandemic onset (January 2020–March 2023); pre-pandemic consultations were therefore excluded from this classification.

Statistical analysis

Continuous variables were compared between two groups using Student’s *t*-test, and differences across months or quarters were examined using one-way analysis of variance (ANOVA). Categorical variables were analyzed using the chi-square test or Fisher’s exact test, as appropriate. Odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated for comparisons of categorical variables.

For comparisons of the mean age in the first quarter of 2021 with each of the remaining 19 quarters, a Bonferroni correction was applied, yielding a corrected significance threshold of $p < 0.0026$ ($0.05/19$). The first quarter of 2021 was selected for this comparison because visual inspection of the quarterly trend identified it as the period with the lowest observed mean age. This comparison was therefore exploratory and descriptive, intended to characterize the magnitude of the observed decline rather than to test a pre-specified hypothesis. A three-point moving average was calculated to visualize temporal trends in mean age at consultation.

Temporal patterns in monthly consultation counts were evaluated using Seasonal-Trend decomposition using Loess (STL) to separate the seasonal, trend, and residual components. We further conducted an interrupted time-series (ITS) analysis using a segmented generalized linear model with a Poisson distribution and a log-link function to assess changes in consultation trends following the COVID-19 pandemic outset. The unit of time was one month, and the outcome variable was the monthly number of consultations. January 2020 was specified as the intervention point. Age was categorized as 0–9, 10–19, 20–29, 30–39, 40–49, ≥ 50 years, or unknown. Monthly consultation counts for the age groups were modeled jointly. The model included time, an indicator for the period following the pandemic onset, time since pandemic onset, age group, and an interaction between time since pandemic onset and age group. Model-based contrasts accounting for the covariance between the total and age-specific consultation counts compared the change in the post-onset slope for each age group with the corresponding change in the total consultation trend. A positive contrast coefficient indicated that the post-onset slope for the

corresponding age group was less negative than the total slope, representing a slower decline relative to the total consultation trend.

For comparisons of the six consultation characteristics shown in Figs. 3 and 4, *p* values were adjusted separately for each figure using the Holm method to account for multiple testing. The comparison of mean age in Fig. 4a was performed using Welch’s *t*-test and was not included in the family of six symptom comparisons in Fig. 4b–g. Both unadjusted and Holm-adjusted *p* values were calculated, and statistical significance for the symptom comparisons was determined using the Holm-adjusted *p* values.

All other tests were two-sided, and *p* values < 0.05 were considered statistically significant. Except for the comparison of the first quarter of 2021 with the other 19 quarters, for which the Bonferroni-corrected threshold was applied, adjusted or unadjusted *p* values < 0.05, as applicable, were considered statistically significant. Statistical analyses were performed using JMP Student Edition 19 (SAS Institute Inc., Cary, NC, USA), Microsoft Excel for Mac version 16 (Microsoft Corporation, Redmond, WA, USA), and R version 4.6.0 (R Foundation for Statistical Computing, Vienna, Austria).

Analyses were based on available cases; observations with missing values were excluded from the relevant analyses, and no missing values were imputed.

Use of generative artificial intelligence

During the preparation of this manuscript, the authors used OpenAI Codex (OpenAI, San Francisco, CA, USA; accessed August 2026) to assist with English-language editing, manuscript organization, figure legend preparation, and clarification of statistical reporting. All the authors independently reviewed and verified AI-assisted outputs, including numerical expressions and statistical descriptions, against the original data and outputs from JMP, Microsoft Excel, and R. They made all scientific interpretations and final decisions and take full responsibility for the manuscript content.

Results

Characteristics

Table 1 presents the characteristics recorded during consultation. Data were collected from a total of 4,260 ED-related consultations across Fukuoka (*n* = 1,009), Chiba (*n* = 2,295), and Miyagi (*n* = 956) Prefectures. Approximately 88% of consultation records in each prefecture concerned female individuals. In the aggregated data, the mean age at consultation during the period following the pandemic onset was significantly lower than during the pre-pandemic period (24.9 ± 12.1 years vs. 27.5 ± 12.6 years, *p* < 0.05), and this trend was consistent across all prefectures. No significant differences were observed in BMI.

Table 1 Characteristics of the participants during pre-pandemic and pandemic periods

	Total		Fukuoka		Chiba		Miyagi	
	pre	mid, post-	pre	mid, post-	pre	mid, post-	pre	mid, post-
n	1429	2831	342	667	776	1519	311	645
total n	4260		1009		2295		956	
Female %	87.3	87.9	84.8	83.9	88.4	89.5	87.5	88.7
age	27.5 ± 12.6	24.9 ± 12.1 [⊠]	28.5 ± 13.1	26.0 ± 12.9 [⊠]	27.1 ± 12.3	24.7 ± 12.1 ^{⊠⊠}	27.3 ± 12.8	24.4 ± 11.1 [⊠]
BMI (kg/m ²)	17.4 ± 4.9	17.2 ± 4.9	17.4 ± 4.8	17.7 ± 4.9	16.9 ± 4.9	16.7 ± 4.8	18.4 ± 4.9	17.9 ± 4.8

⊠p < 0.05 vs. pre, ⊠⊠p < 0.0001 vs. pre, BMI: body mass index, pre: pre-pandemic

Changes in Age at Consultation Following the COVID-19 Pandemic

Figure 1a shows the quarterly trend in the average age at consultation from April 1, 2018. Figure 1b presents the three-point moving average, indicating the overall trend in age. As shown in the figures, the average age in the first quarter of 2021 was significantly lower than in other periods (22.4 years, $p < 0.0001$ vs. segments ⊠⊠⊠⊠⊠⊠ in the figure). These differences remained statistically significant after Bonferroni correction. This period corresponds to the midpoint of the four national states of emergency declared in Japan, as indicated by the arrows in the figure. Notably, as shown in Fig. 1b, trend analysis revealed a transient decline in age during the most severe phase of the COVID-19 pandemic, which lasted until the full lifting of restrictions on September 30, 2021, followed by a gradual return to baseline by the first quarter of 2023.

Changes in Consultation Volume Following the COVID-19 Pandemic

Figure 2a shows monthly consultation counts stratified by age group. The total number of ED-related consultations increased during the period of repeated states of emergency, with a particularly marked increase in consultations involving individuals aged 10–19 years. Figure 2b presents the trends estimated using STL decomposition. ITS analysis showed that the post-onset slope for the 10–19-year age group differed significantly from that of the total consultation trend ($\beta = 0.0061$, $p < 0.01$). The positive coefficient indicated that consultations among adolescents declined more slowly and remained elevated for longer than the total consultation count. No significant differences from the total trend were observed in the other age groups.

Changes in Consultation Content before and after the COVID-19 Pandemic

Figure 3 illustrates changes in consultation content recorded between the pre-pandemic period and the period following the pandemic onset. Complaints of thinness (OR = 1.36, 95% CI: 1.20–1.55; Holm-adjusted $p < 0.05$) and dietary restriction (OR = 1.85, 95% CI: 1.62–2.12; Holm-adjusted $p < 0.05$) significantly increased in the period following the pandemic onset (Figs. 3a and 3b), while binge eating (OR = 0.81, 95% CI: 0.72–0.93; Holm-adjusted $p < 0.05$) and vomiting (OR = 0.78, 95% CI: 0.68–0.89; Holm-adjusted $p < 0.05$) significantly decreased (Figs. 3c and 3d). Additionally, emotional instability (OR = 2.46, 95% CI: 2.13–2.86; Holm-adjusted $p < 0.05$) and hyperactivity (OR = 2.38, 95% CI: 1.80–3.14; Holm-adjusted $p < 0.05$) were significantly increased in the period following the pandemic onset (Figs. 3e and 3f).

Characteristics Recorded in COVID-19-Related Consultations

Figure 4 compares the characteristics recorded in COVID-19-related consultation records (Related group, $n = 164$) with those recorded in unrelated consultation records (Not related group, $n = 2,667$). The mean age at consultation was significantly lower in the “Related group” than in the “Not related” group (22.0 vs. 25.0 years, $p < 0.005$). There were no significant differences in BMI (data not shown). In terms of symptoms, thinness (OR = 1.79, 95% CI: 1.27–2.53; Holm-adjusted $p < 0.05$) and dietary restriction (OR = 2.10, 95% CI: 1.51–2.91; Holm-adjusted $p < 0.05$) were significantly more prevalent in the ‘Related group’ (Figs. 4b and 4c), whereas binge eating (OR = 0.53, 95% CI: 0.38–0.76; Holm-adjusted $p < 0.05$) and vomiting (OR = 0.63, 95% CI: 0.44–0.92; Holm-adjusted $p < 0.05$) were significantly less prevalent (Figs. 4d and 4e). Emotional instability (OR = 1.27, 95% CI: 0.92–1.74; Holm-adjusted $p = 0.1413$) did not differ significantly between the groups, whereas hyperactivity (OR = 2.38, 95% CI: 1.59–3.57; Holm-adjusted $p < 0.05$) was significantly more frequent in the Related group (Fig. 4f and 4g).

Discussion

To the best of our knowledge, this is the first relatively large-scale study to examine temporal changes in ED consultations from the pre-pandemic period through the post-emergency periods. Although the overall increase in ED-related consultations following the COVID-19 pandemic onset was transient, the increase in consultations involving adolescents aged 10–19 years was more sustained, with a slower decline than the overall consultation trend. These findings suggest that the pandemic had a particularly prolonged impact on adolescent ED presentations. Following the pandemic onset, the mean age at consultation decreased, and complaints of thinness and dietary restriction became more frequent, whereas binge eating and vomiting were reported less often. These trends were particularly pronounced among consultation records classified as COVID-19 related.

Although BMI remained unchanged, the significant reduction in mean age at consultation following the pandemic onset indicates an increase in consultations involving younger patients rather than necessarily representing a shift toward earlier-stage illness. Approximately 70% of AN cases of less than five years' duration are of the restricting type, whereas approximately 70% of cases persisting beyond five years are of the binge/purge type [1]. Thus, the observed rise in dietary restriction may reflect, at least in part, an increased proportion of consultation records involving individuals with relatively recent-onset restrictive symptoms. However, because illness duration and diagnoses were not systematically established in the present study, this interpretation should be considered exploratory. These results are consistent with previous reports from Japan [16, 17].

Kawai et al. [19] similarly reported a transient increase in ED cases during the pandemic. Our findings extend these observations by demonstrating that, although the overall increase in consultations diminished over time, the consultation trend among adolescents aged 10–19 years declined more slowly and remained elevated for longer. This age-specific persistence is particularly noteworthy and suggests that adolescents were disproportionately and more enduringly affected, especially during periods of repeated states of emergency, and is consistent with a recent population-based study showing that ED-related acute care use remained above expected levels among adolescents in 2023, whereas rates among young adults had returned to or fallen below expected levels by 2022 [20]. Similarly, German health insurance data indicated that hospital admissions for typical and atypical anorexia nervosa among children and adolescents remained higher than pre-pandemic levels up to two years after the final lockdown [21]. A recent systematic review and meta-analysis also demonstrated that eating disorder-related healthcare use increased substantially during the pandemic, with larger increases among adolescents and girls [22]. Together, these findings suggest that adolescents were disproportionately affected and that the impact on ED-related healthcare use may have persisted longer in this age group. These observations align with earlier international studies showing that disordered eating behaviors, including dietary restriction and binge eating, worsened among students during COVID-19 lockdowns [9, 10].

During Japan's first state of emergency, when the strictest measures were implemented, residents were asked to stay home and avoid nonessential outings, and many activities outside the home were restricted. A descriptive review of the consultation narratives showed that some individuals reported having "nothing to do," becoming increasingly focused on themselves, and engaging in dieting behaviors influenced by social media and television. However, because these narratives were not evaluated using a systematic qualitative or quantitative method, these observations should be interpreted with caution. Future studies using systematic approaches, such as text mining or structured quantitative analysis, are needed to identify and quantify recurring themes in consultation narratives. Furthermore, dietary restriction and binge/purge behaviors may have served as maladaptive strategies for regulating emotional instability, including depression and anxiety. Adolescents, particularly adolescent girls, who are known to be particularly concerned about weight and body image [23], may have been especially vulnerable to these effects. This vulnerability could explain the increase in ED onset or exacerbation during intermittent states of emergency [24], the associated decline in mean age at consultation, and the

sustained consultation trend among adolescents aged 10–19 years. These findings underscore the potential influence of environmental change on eating behaviors. Similar to our results, studies from other countries have reported that lockdown-like measures generally have adverse effects on eating behaviors [8]. Furthermore, our previous study suggested that increased maternal attention to children during the stay-at-home period enabled mothers to notice changes in their children at an earlier stage, which may have contributed to the younger age at consultation and facilitated earlier help-seeking behavior [17].

Among patients with EDs, both ED-specific symptoms and general psychopathology worsened during the lockdown and persisted thereafter; following the lifting of lockdown measures, symptoms such as ineffectiveness and impulsivity remained elevated, whereas some ED-specific symptoms, including excessive physical activity and binge eating / purging behaviors, showed partial improvement [25]. This suggests that the intense stress associated with prolonged stay-at-home measures was alleviated when restrictions were eased and daily life approached pre-pandemic norms, which may have contributed to the gradual decline in overall consultation numbers. However, the slower decline among adolescents observed in the present study indicates that the effects of the pandemic were not entirely transient and may have persisted longer in this age group.

A notable strength of this study is the ability to track trends in a relatively large number of consultation records. Additionally, the ITS analysis enabled us to distinguish the overall post-onset consultation trend from age-group-specific changes and to identify the more sustained trend among adolescents aged 10–19 years. However, several limitations should be acknowledged. First, because the data were derived from consultation records rather than clinical diagnoses, the presence of an ED could not be definitively confirmed. Second, this study included data from only three prefectures, and all participating institutions were ED support base hospitals operated by psychosomatic medicine departments. Therefore, the observed trends may not be representative of Japan as a whole or of other clinical settings, such as general psychiatric services or primary care, and this potential selection bias should be considered when interpreting the findings. Third, the dataset included only consultation records from individuals who contacted designated ED support base hospitals. These centers have specific referral pathways and service roles and therefore may not capture all individuals with eating disorders in the community, particularly those with mild symptoms or undiagnosed conditions who may have sought care elsewhere or not sought care at all. Fourth, Japan's state of emergency lacked the legal enforcement of lockdowns implemented elsewhere, relying largely on voluntary compliance, which limits direct comparisons with studies from other countries. Fifth, as the study relied on information reported during consultations, symptoms could not be uniformly assessed using standardized psychological tests. Sixth, because numerous symptoms and characteristics recorded during consultations were compared between groups, the possibility of type I error should be considered. Although the Holm method was used to adjust for multiple testing in the symptom comparisons, residual concerns regarding multiplicity remain for the exploratory analyses. Similarly, the comparison of the first quarter of 2021 with the remaining 19 quarters was based on a quarter selected post hoc as the period with the lowest observed mean age. Although Bonferroni correction was applied, this procedure does not fully account for the selection

process itself, and the corrected p value may still underestimate the true type I error rate relative to a pre-specified hypothesis test. This analysis should therefore be interpreted as descriptive, supporting the visually observed trend, rather than as confirmatory evidence. Seventh, the unit of analysis was the consultation record rather than the individual patient, and multiple consultations from the same individual may have been included. Therefore, the observations may not have been fully independent, potentially resulting in underestimated standard errors and overly small p values in group comparisons, including the chi-square and Fisher's exact tests. Because the anonymized data did not allow repeated consultations from the same individual to be reliably linked, within-person clustering could not be accounted for. Finally, the observational design does not allow causal relationships between pandemic-related restrictions and changes in ED consultations to be established.

Conclusions

In conclusion, during periods of strict public health measures, including repeated states of emergency involving stay-at-home requests, the number of ED-related consultations transiently increased and the mean age at consultation decreased. Although the overall number of consultations subsequently approached pre-pandemic levels, the increase in consultations involving adolescents aged 10–19 years was more sustained and declined more slowly than the overall consultation trend. These findings indicate that the pandemic's effects were not uniformly transient and that adolescents may have experienced a particularly prolonged impact. Adolescents, particularly girls, may be especially vulnerable to large-scale environmental stressors, which may contribute to the onset or worsening of disordered eating behaviors. These findings highlight the importance of raising public awareness about EDs, strengthening early-detection and consultation systems, and promoting adaptive coping strategies during non-crisis periods to mitigate the impact of future large-scale stressors.

Abbreviations

ED
eating disorders
COVID-19
corona virus disease 2019
AN
anorexia nervosa
BN
bulimia nervosa
AN-BP
binge eating / purging type of anorexia nervosa
AN-R
restricting-type of anorexia nervosa
BMI
body mass index

Declarations

Competing interests

ST, TK, NM, KT, TS, CAS, MG, TH, and NS declare no conflict of interest.

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Author Contribution

ST designed the study and collected and analyzed the data. TK collected data. TK and NM analyzed the data. KT, TS, CAS, MG, TH, and NS contributed to the interpretation of the findings and preparation of the manuscript. All authors read and approved the final manuscript.

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Figures

Figure 1

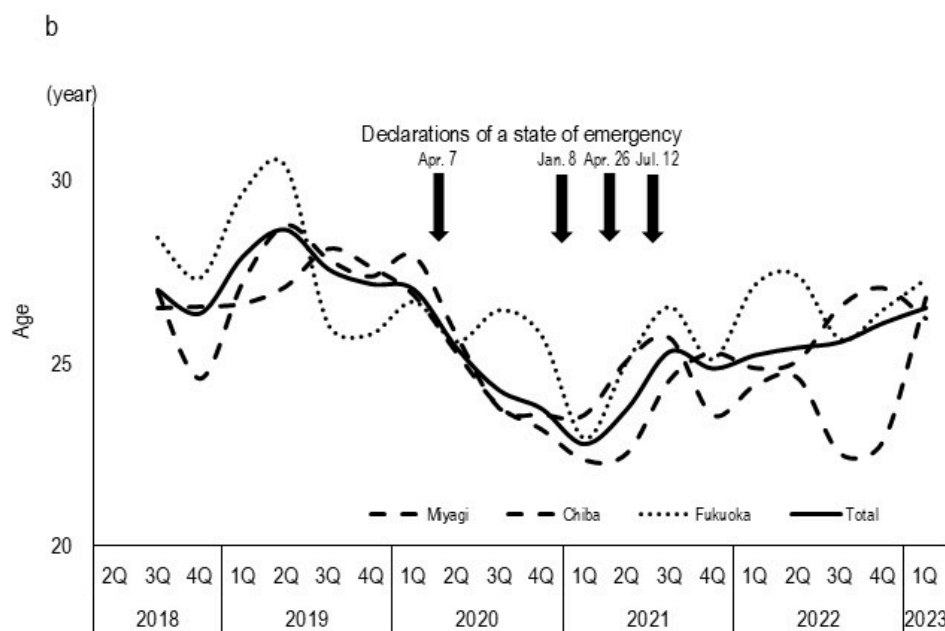
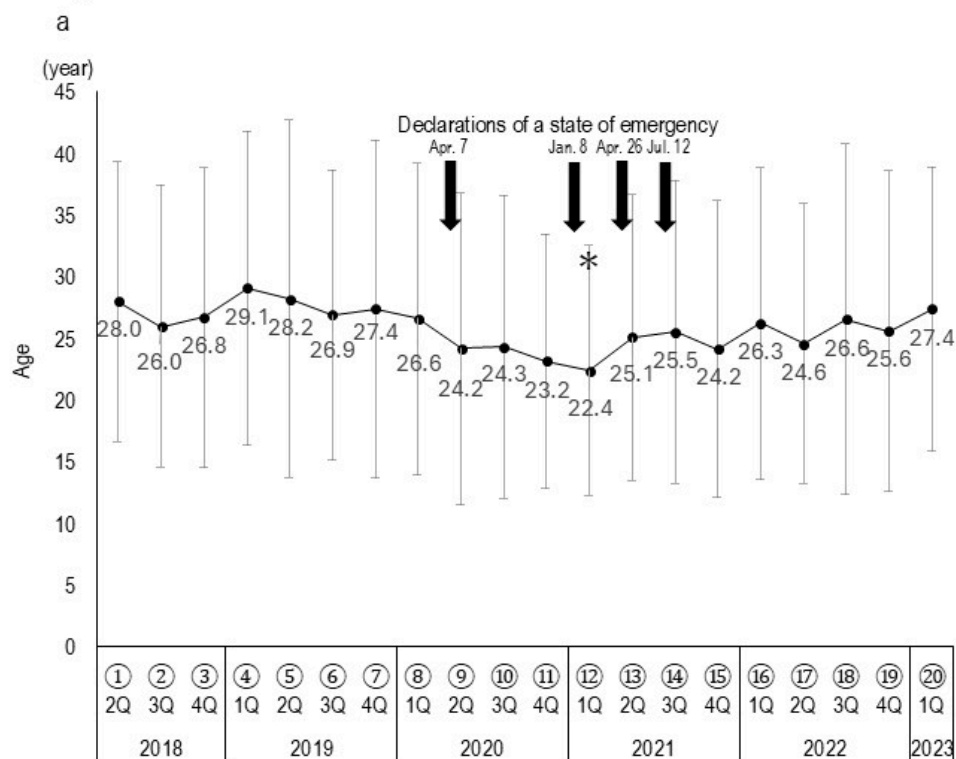


Figure 1

(a) Quarterly trend in the mean age at consultation. Arrows indicate the timing of state of emergency declarations. * $p < 0.0001$ vs. 2018-2019.

(b) Three-point moving average of age of the quarterly mean age at consultation.

Figure 2

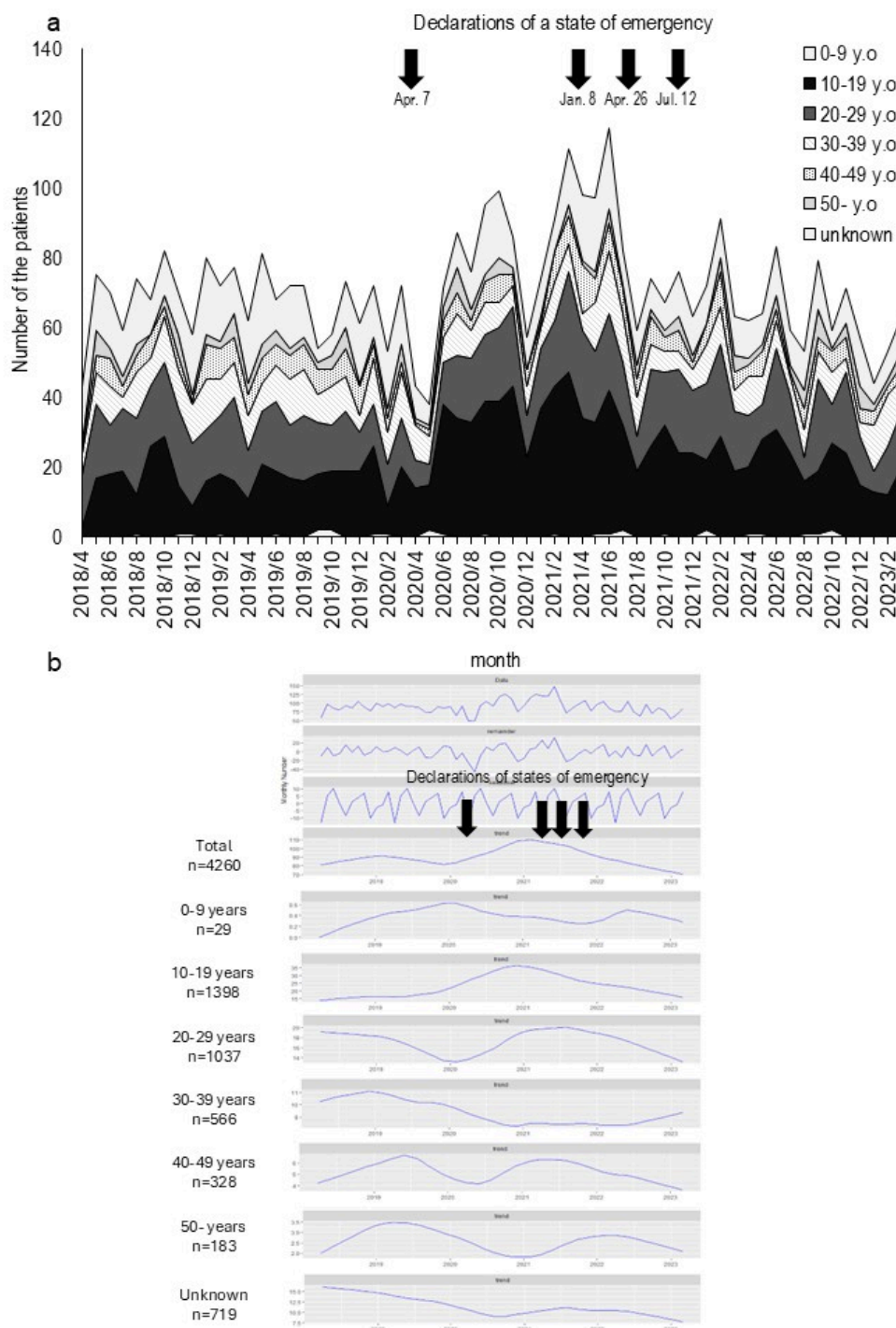


Figure 2

(a) Monthly trend in the number of consultation records. Arrows indicate the timing of state of emergency declarations.

(b) All components of monthly consultation counts derived using Seasonal and Trend decomposition using Loess (STL) are shown for all consultations, whereas trend components are shown for each age

group. Arrows indicate the timing of declarations of states of emergency in Japan.

Figure 3

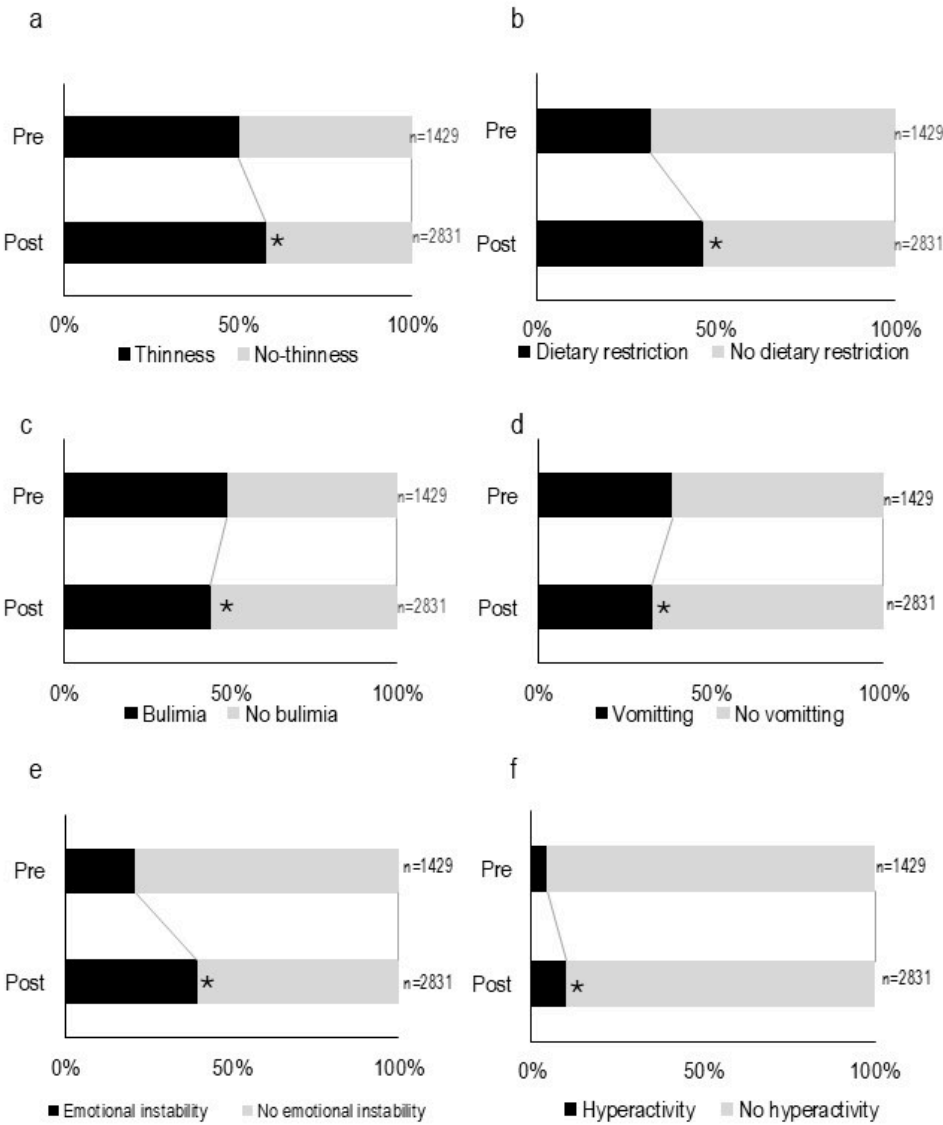


Figure 3
Changes in recorded consultation content between the pre-pandemic period and the period following the COVID-19 pandemic onset

- (a) Thinness
- (b) Dietary restriction
- (c) Binge eating
- (d) Vomiting
- (e) Emotional instability
- (f) Hyperactivity

pre: pre-pandemic, post: post-onset.

Pre-pandemic: April 2018–December 2019; Post-onset: January 2020–March 2023, including both the earlier pandemic and post-emergency periods. *P* values were calculated using Pearson's chi-square test and adjusted for the six comparisons using the Holm method.

* Holm-adjusted $p < 0.05$.

Figure 4

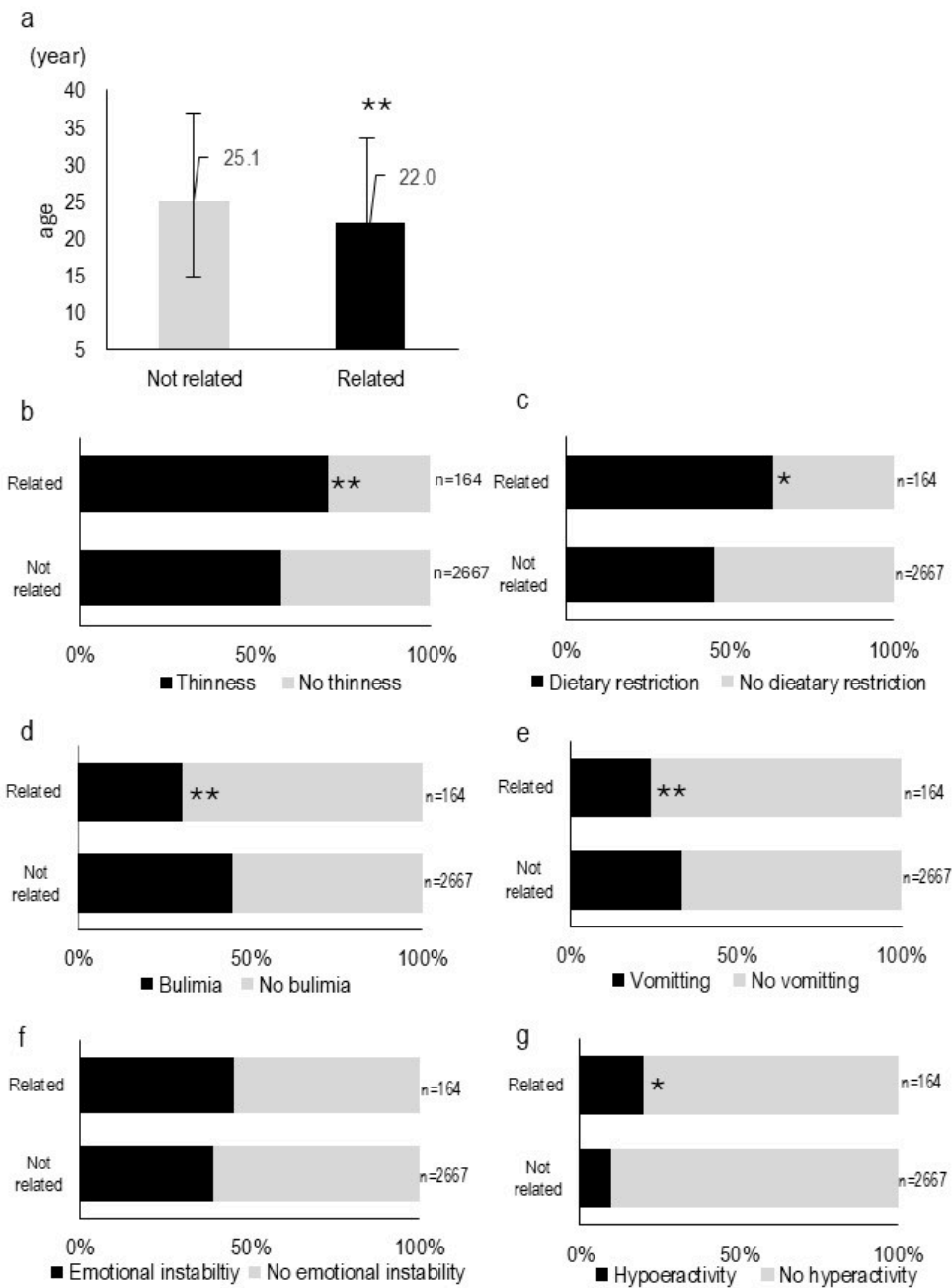


Figure 4

Comparison of characteristics recorded in COVID-19-related and unrelated consultation records

(a) Mean age

Error bars indicate standard deviations. The between-group difference was evaluated using Welch's t-test.

- (b) Thinness
- (c) Dietary restriction
- (d) Binge eating
- (e) Vomiting
- (f) Emotional instability
- (g) Hyperactivity

For panels b–g, p values were calculated using Fisher's exact test and adjusted for the six comparisons using the Holm method. *Holm-adjusted $p < 0.05$.

Related: consultation records in which symptom onset or exacerbation was considered associated with the COVID-19 pandemic; Not related: consultation records without such an association. Consultations obtained during the pre-pandemic period were not eligible for this classification and are not included in this figure.