











Original Article

Children's daily lives and well-being: Findings from the CORONA-CODOMO survey 1st wave

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Abstract **Background:** The coronavirus disease 2019 pandemic has changed people's lives dramatically. Few data on the acute effects of the pandemic on children's daily lives and well-being have been published to date. This study aimed to capture its effects on Japanese children during the first peak of the outbreak.

Methods: We conducted a web-based, anonymous cross-sectional survey targeting Japanese children aged 7–17 years and parents/guardians of children aged 0–17 years. Eligible individuals were invited to participate in the survey from April 30 to May 31, 2020. This self-report questionnaire examined daily life and behaviors, psychological symptoms, well-being, quality of life, and positive parenting or abusive behaviors at the very beginning of the outbreak.

Results: A total of 2,591 children and 6,116 parents/guardians participated in our survey. Sixty-two percent of children reported screen time exceeding 2 h. Twenty percent of children reported abusive behaviors by family members. Nine in ten parents/guardians of school-aged children reported that their child had at least one acute stress symptom in the past month. Average mental health subscale scores from KINDL^R questionnaire on quality of life were lower than the national average for all grades. Nearly half of parents/guardians refrained from seeking medical care for the child's symptoms.

Conclusions: The COVID-19 pandemic had serious acute impacts on Japanese children's daily lives, well-being, family relationships, and health-care utilization, including some impacts that are potentially long-lasting; thus, proactive interventions and services are needed, as well as longitudinal surveys.

Key words child, COVID-19, outbreak, survey, well-being.

The coronavirus disease 2019 (COVID-19) pandemic has changed children's lives dramatically. In spring 2020, many governments conducted quarantine and required citizens to avoid going out unnecessarily. Most governments also instituted nationwide school closures, but its effect on disease control has been controversial.^{1,2} In Japan, the government asked all primary, secondary, and high schools to close by March 2, 2020, prior to the declaration of a state of emergency that called for the restriction of people's activities.³ Schools were

originally scheduled to be in session until early April and 99% of public schools complied.⁴ A state of emergency was declared on April 7, 2020, in seven prefectures where the outbreak continued unabated. It was extended to the entire country on April 16, 2020. Citizens were urged to refrain from going outside to reduce interpersonal contacts. Initially, the state of emergency was scheduled to end on May 6, 2020, but on May 4, 2020, it was extended to May 31, 2020. It was lifted in stages, region by region, starting on May 14, 2020, and nationwide on May 25, 2020. Thus, 80% of primary and secondary schools remained closed until mid-May 2020.^{5,6}

This unusually long period of school closure and prolonged home confinement likely caused negative impacts on children⁷ due to (i) changes in daily routines⁴; (ii) fear, frustration, boredom, and lack of in-person contact⁸; and (iii) changes in the

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parent-child relationship due to conflicts among family members, increased financial stress, or both.⁹

The impacts on children's daily lives and well-being during this pandemic have been reported in some countries,^{10,11} but little has been evaluated in Japan. The environment and circumstance of children differ among countries, and it is essential to understand the situation of children in Japan in order to improve it.

To capture the early and long-term influence of the COVID-19 pandemic on children in Japan, to find solutions, and to disseminate information to minimize its adverse effects, we launched the CORONA-CODOMO project. This serial cross-sectional study evaluates children's well-being related to the pandemic and provides informative and educational materials to the general public. In this report, we describe our first survey and show the highlights of the findings.

Methods

Ethics

This study was approved by the institutional review board of the National Center for Child Health and Development on April 27, 2020 (approval number 2020–21).

Study population

Our anonymous web-based survey included children aged 7–17 years and parents/guardians of children aged 0–17 years. Any child and/or parent/guardian who could answer the questionnaire in Japanese were eligible.

The survey was hosted on the National Center for Child Health Development website. Eligible individuals were invited to complete the survey from April 30 to May 31, 2020. Consent for survey participation and responses were all obtained online. The survey was advertised through social media platforms (the official Twitter and Facebook accounts of the National Center for Child Health and Development, official LINE account of the CORONA-CODOMO project, and the official Twitter, Facebook, and LINE accounts of Kids Public, a cooperating company), media coverage (national and local TV and newspapers that reported about this survey), and website links and banners embedded on information search website for children (Yahoo! Kids) during the survey period.

Outline of the questionnaire

The study flowchart is shown in Figure 1. The flow differed slightly depending on whether the parent/guardian and child participated together. The parent's/guardian's consent was required for a child to participate. When the parent/guardian was involved, he/she answered the questionnaire first, followed by the child if the child wanted to participate in the survey.

The survey consisted of 38 questions for children and 82 questions for parents/guardians plus 11 basic demographic

questions for either. Most questions for parents/guardians were the same, regardless of the child's age. Questions about well-being and acute stress symptoms varied based on the child's age. The same questions were posed to children with age-appropriate phrases.

For most questions, “do not know/do not want to answer” was a response option. Both parent/guardian and child respondents were asked twice in the middle whether they would like to continue answering the survey or quit.

All the questions in this survey and their tabulation results by age groups are shown in the report (in Japanese)^{3,12} released on our project website https://www.ncchd.go.jp/center/activity/covid19_kodomo/report/CxC1_finalrepo_20210306revised.pdf.

Survey topics

Demographics

Demographic questions included the child's age, grade, gender, family structure (living with both parents or not, presence of siblings, birth order, number of people living in the household), number of rooms in the home, employment status of each parent, and geographic location (postcode).

Context of COVID-19 within the family

Children and parents/guardians were asked about the direct influence of the COVID-19 pandemic, such as concerns related to COVID-19 as an infection, and changes in life due to the restriction of activities. Parents/guardians were asked additional questions such as how much they were refraining from going out and why, whether they had refrained from receiving medical care, how they felt about news and media coverage regarding COVID-19, and changes in their financial situation since January 2020.

Influence of COVID-19 on children's daily lives

Children and parents/guardians were asked about the following items over the previous week: whether the child attended school, whether any adults stayed with the child at home, duration of the child's studying time and method (i.e., use of online devices), screen time, and opportunities for exercise, going out, and interacting with friends.

Well-being and quality of life

For children aged <3 years, parents/guardians were asked about the child's well-being during the past week through five questions on a five-level Likert scale. One question pertained to general well-being (general health). Four questions pertained to flourishing (parent/guardian-child attachment, self-regulation and resiliency, positive affect, and child's learning aspiration level). The items on flourishing were developed to assess the development of positive social-emotional skills by

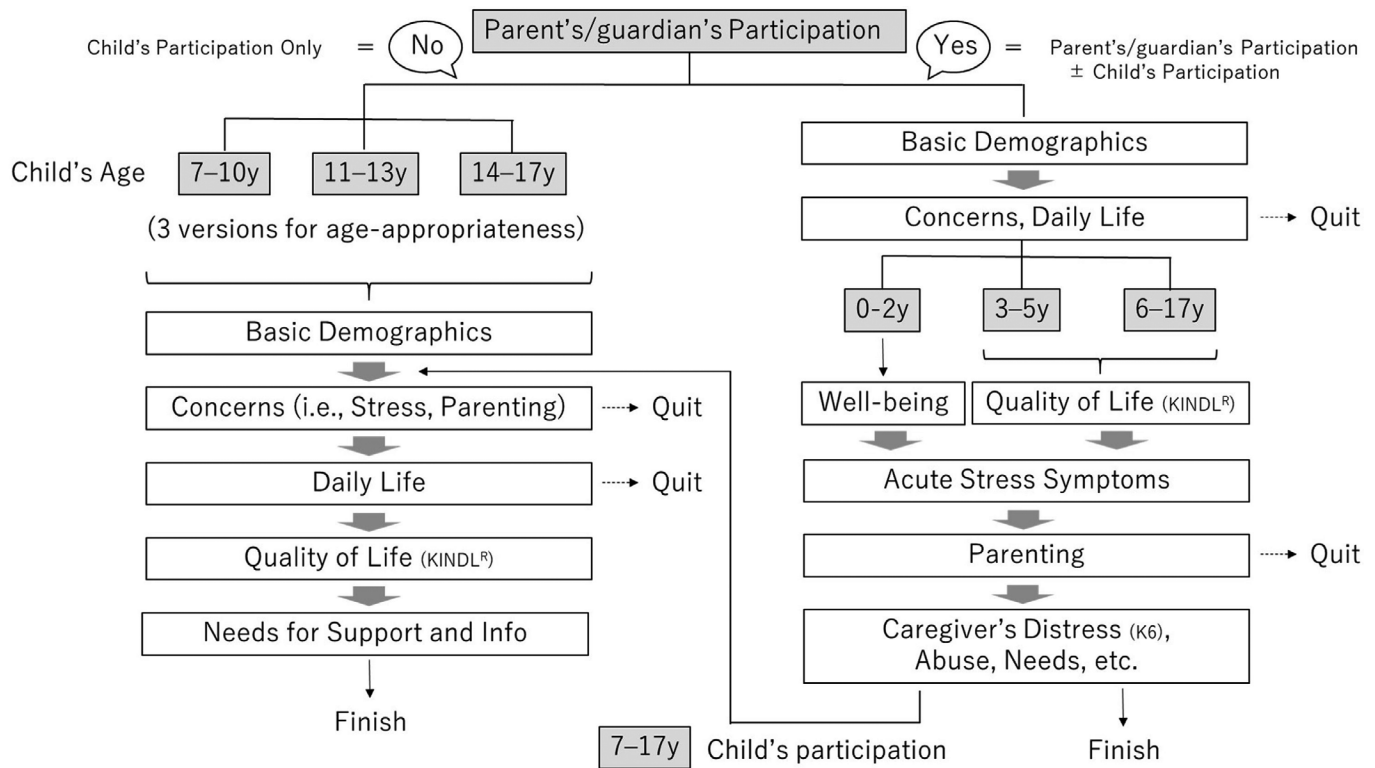


Fig. 1 Survey flow.

the Child and Adolescent Health Measurement Initiative. They have been used in the National Survey of Children's Health in the United States.¹³

For older children, the KINDL^R questionnaire,¹⁴⁻¹⁶ a validated generic instrument for assessing health-related quality of life in children aged ≥ 3 years and adolescents, was used. It consists of 24 items with six dimensional sub-scales. Parents/guardians were asked about their children's well-being or quality of life during the previous week through 16 items in four sub-scales ("Physical well-being," "Emotional well-being," "Self-esteem," and "Family") based on the parental version of the Japanese KINDL^R questionnaire. Children were asked to complete the KINDL^R. Eight items on two sub-scales ("Friends" and "Everyday functioning (School)") were excluded because most children were likely not attending school or regularly meeting friends during this period. Average scores in the general population by grade were used as the reference for KINDL^R responses.¹⁷

Acute stress symptoms

We used original questions based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria of trauma and stressor-related disorders¹⁸ to measure acute stress among children. Children were asked to indicate all the symptoms they had from a list. Parents/guardians were asked to answer the frequency of each symptom of the child over the last month using a five-level Likert scale. All the questions

are common regardless of the child's age, except for one: "My child does not show interest or participate in play that he/she used to like or enjoy with family and friends" was used for children aged < 6 years whereas "My child expresses loneliness, even when he/she is with someone else" was used for older children. Parents/guardians were also asked about the duration and impact of symptoms (Appendix S1 in the supplementary material).

Parenting, abuse, and domestic violence

We asked about several aspects of positive parenting behavior and abusive behavior. For positive parenting, children were asked to choose all applicable answers that described their family from four choices. Parents/guardians were asked about the frequency of interactions with the child over the last month using a five-level Likert scale for six questions. The four positive parenting behaviors included: (i) avoiding over-exposing the child to news and media coverage regarding COVID-19; (ii) explaining the situation regarding COVID-19 to the child with simple words; (iii) empathizing with the child without denying the child's feelings, and (iv) letting the child play and self-express freely.

For abusive behavior, children were asked to choose all applicable descriptions of how they were treated by family members: being slapped; being threatened or insulted; being yelled at; and being denied necessities such as food. Parents/guardians were asked to choose all descriptions of how

they treated their child from six choices. In addition to the four items presented to children, choices included shaking the child violently and sexual abuse or exposure to sexual content.

Parents/guardians were asked about domestic violence among adults by choosing all applicable answers from two choices (cursed or threatened another adult; struck another adult). Parents/guardians were also asked whether the frequency of child abuse or domestic violence increased compared to January 2020, which type was most troublesome, and what kinds of information or support the parent/guardian wanted.

Parent's/guardian's psychological distress and stress management strategies

We used the Kessler Psychological Distress Scale (K6)^{19,20} to measure non-specific psychological distress among parents/guardians over the last month. Scores ≥ 5 and ≥ 13 were considered to indicate moderate and severe distress, respectively.²¹

Parents/guardians were also asked, using 5-level Likert scales, whether they were able to perform self-care, strategies used to relieve stress over the previous month, and whether they were able to contact confidants over the past month.

Needs for support and information

The last part of the questionnaire consisted of questions regarding needs for support and information. Children were asked to choose all applicable answers from six choices of things they wanted to know or type of help needed, followed by an open-ended question about what they wanted or wanted to know. Parents/guardians were asked to choose all applicable answers regarding what they wanted to know specifically about COVID-19 (3 choices), what support they wanted for their child (10 choices), and what support they wanted for themselves (11 choices), followed by an open-ended question about what they wanted or wanted to know.

Statistical analysis

Data were analyzed with Stata software version 15.1 (Stata-Corp LP, College Station, TX, USA). Descriptive statistics were performed to summarize demographic and other selected characteristics of respondents. Continuous and categorical variables were presented as means \pm standard deviation (SD) and proportions as appropriate. We used χ^2 tests and *t*-tests to compare the proportions of categorical and continuous variables by gender, respectively. The threshold for significance was $P < 0.05$.

Results

From April 30 to May 31, 2020, there were 7,341 participants (4,750 parents/guardians only; 1,225 children only; and 1,366 children and parents/guardians) who responded to the survey after excluding 137 duplicates that had exact same answer for

all questions, including free text comments. Sixty percent of responses occurred during the first week, 76% by the time that the state of emergency declaration was lifted in 37 prefectures (May 14, 2020), and 96% by the time the declaration was lifted nationwide (May 25, 2020). When taking into account the status of the declared state of emergency in the area of residence, at least 95% of the respondents were under the state. Ninety percent of parents/guardians and 94% of children completed the whole questionnaire.

The demographic characteristics of the respondents are summarized in Table 1. The mean age of the children was 7.5 ± 4.4 years. Most parent/guardian respondents were mothers (94%). Special support for education was being used due to health or behavioral issues by 11% of children. Two percent of parents/guardians reported that a family member was or had been affected by COVID-19.

Forty-seven percent of parents/guardians reported they only left the home for daily necessities. Among parents/guardians who reported that they had scheduled appointments for their child in the past month (59% overall), 65% went to the doctor as usual, 12% used telemedicine or online prescription, and 30% canceled the appointment. Among parents/guardians who answered that their child had symptoms in the past month for which they would have usually sought medical care (38%); 45% reported they had refrained from visiting the doctor.

Among parents/guardians whose children attended preschool or nursery school, 84% reported their children had not gone to school or other places in the previous week. Thirteen percent of parents/guardians of children in grades 1–3 and 32% of parents/guardians of children in grades 4–6 indicated that their children had been home alone.

Table 2 summarizes the impact of the pandemic and changes in daily life on children, based on answers from school-aged children aged ≥ 6 years and parents'/guardians' answers for children aged < 6 years (early childhood). Fifty-seven percent of parents/guardians of early childhood and 63% of school-aged children reported that the children's daily screen time exceeded 2 h, and 8% of early childhood and 15% of school-aged children had reported screen time exceeding 6 h, respectively. In secondary school or younger, the percentage of children with more than 2 h of screen time per day was greater for boys than for girls (66% vs 59%; $P < 0.001$), while there was no difference in high school (86% vs 84%; $P = 0.685$). Compared with January 2020, 73% of school-aged children reported longer screen time, 73% reported less physical activity, and 15% reported their sleep schedules changed by more than 2 h. There were no gender differences in proportions of longer screen time (78% vs 77%; $P = 0.462$) or less exercise time (76% vs 75%; $P = 0.490$). In early childhood, while boys had a smaller percentage of children who were more than 2 h out of rhythm than girls (9% vs 12%; $P = 0.003$). Only the responses of those whose prefecture of residence was under the declaration of state of emergency are shown in Appendix S1 in the supplementary material.

Forty-seven percent of primary school children reported that they were not in touch with friends, and boys were more

Table 1 Basic demographics of children by respondent type

	Parent/guardian only		Both		Child only	
	<i>n</i> = 4,750		<i>n</i> = 1,366		<i>n</i> = 1,225	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Grade						
Not attending pre-school	1,139	24	-	-	-	-
Preschool	1,611	34	-	-	-	-
Grades 1–3 (primary school)	887	19	419	31	212	17
Grades 4–6 (primary school)	478	10	512	37	602	49
Grades 7–9 (secondary school)	354	7	198	14	247	20
Grades 10–12 (high school)	233	5	101	7	130	11
Don't know/don't want to answer	48	1	136	10	34	3
Gender						
Boy	2,557	54	669	49	309	25
Girl	2,148	45	691	51	859	70
Don't know/don't want to answer	45	1	6	0	57	5
Residential area						
Hokkaido	89	2	27	2	12	1
Tohoku	83	2	24	2	7	1
Kanto	2,606	55	789	58	405	33
Chubu	384	8	99	7	54	4
Kinki	436	9	111	8	64	5
Chugoku	106	2	28	2	17	1
Shikoku	31	1	8	1	3	0
Kyusyu/Okinawa	159	3	52	4	28	2
Don't know/don't want to answer	856	18	228	17	635	52
Status of the state of emergency at response						
On	4,153	87	1,226	90	1,050	86
Off	410	9	106	8	66	5
Can't be identified due to regional data missing	187	4	34	2	109	9
Special needs						
Yes	502	11	154	11	-	-
No	4,248	89	1,212	89	-	-
Attended school in the past week						
Yes	736	15	158	12	211	17
No	3,541	75	1,206	88	924	75
Not enrolled	470	10	0	0	5	0
Don't know/don't want to answer	3	0	2	0	44	4
Missing	-	-	-	-	41	3
Parents' co-dwelling and employment status						
Child lives with both parents, both working	2,806	59	807	59	676	55
Child lives with both parents, one is working	1,497	32	384	28	358	29
Only father living together, any working status	190	4	82	6	42	3
Only mother living together, any working status	175	4	72	5	88	7
Other/missing	82	2	21	2	61	5
Number of rooms in the home						
5 or more	863	18	364	27	407	33
4	1,480	31	470	34	378	31
3	1,701	36	405	30	261	21
2	635	13	110	8	60	5
1	61	1	11	1	19	2
Don't know/don't want to answer	10	0	6	0	100	8
Subjective household financial status						
Very good	187	4	50	4	-	-
Good	1,134	24	332	24	-	-
OK	2,509	53	721	53	-	-
Somewhat difficult	762	16	208	15	-	-
Very difficult	149	3	52	4	-	-
Don't know/don't want to answer	9	0	3	0	-	-

Table 1 *Continued*

	Parent/guardian only		Both		Child only	
	<i>n</i> = 4,750		<i>n</i> = 1,366		<i>n</i> = 1,225	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Financial status compared to January 2020						
Better than before	156	3	44	3	-	-
Unchanged	3,389	71	971	71	-	-
Worse than before	1,146	24	332	24	-	-
Don't know/don't want to answer	59	1	19	1	-	-

Table 2 Daily life in the past week

	Par-ent/guardian's answer		Child's answer							
	Early childhood (0–5 years old)		Grades 1–3 (6–8 years old)		Grades 4–6 (9–11 years old)		Grades 7–9 (12–14 years old)		Grades 10–12 (15–17 years old)	
	<i>n</i> = 2,750		<i>n</i> = 600		<i>n</i> = 1,086		<i>n</i> = 432		<i>n</i> = 230	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Sleep pattern compared to January 2020										
Changed by 2 h or more	177	6	60	10	157	14	84	19	59	26
Changed by less than 2 h	1,122	41	291	49	490	45	201	47	89	39
Unchanged and regular	1,286	47	211	35	327	30	100	23	54	23
Always irregular	74	3	22	4	81	7	39	9	25	11
None of the above	49	2	5	1	10	1	6	1	2	1
Don't know/don't want to answer	42	2	11	2	21	2	2	0	1	0
Physical activity										
None	155	6	22	4	84	8	84	19	73	32
Several times a week	948	34	242	40	366	34	182	42	96	42
Almost every day, <30 min	655	24	140	23	283	26	89	21	31	13
Almost every day, 30 min–2 h	780	28	148	25	245	23	53	12	24	10
Almost every day, >2 h	106	4	40	7	99	9	22	5	5	2
Don't know/don't want to answer	106	4	8	1	9	1	2	0	1	0
Physical activity level compared to January 2020										
Less than before	1,986	72	435	73	781	72	326	75	177	77
Unchanged	435	16	67	11	143	13	57	13	30	13
More than before	189	7	74	12	137	13	39	9	21	9
Don't know/don't want to answer	140	5	24	4	25	2	10	2	2	1
Screen time (per day)										
<30 min	244	9	31	5	68	6	7	2	6	3
30 min to 2 h	783	28	208	35	366	34	97	22	30	13
2–4 h	890	32	202	34	330	30	141	33	62	27
4–6 h	465	17	84	14	168	15	81	19	58	25
6–8 h	155	6	27	5	62	6	42	10	28	12
>8 h	70	3	32	5	59	5	52	12	42	18
Don't know/don't want to answer	143	5	16	3	33	3	12	3	4	2
Screen time compared to January 2020										
Shorter than before	41	1	31	5	55	5	18	4	19	8
Unchanged	502	18	107	18	213	20	85	20	56	24
Longer than before	2,082	76	454	76	785	72	321	74	151	66
Don't know/don't want to answer	125	5	8	1	33	3	8	2	4	2

out of touch than girls (52% vs 43%; $P = 0.001$). On the other hand, 66% of secondary school children and 80% of high school children reported that they exchanged messages via

LINE, a popular messenger application among young Japanese people, and other means. Girls were significantly more likely than boys to communicate through message exchange in

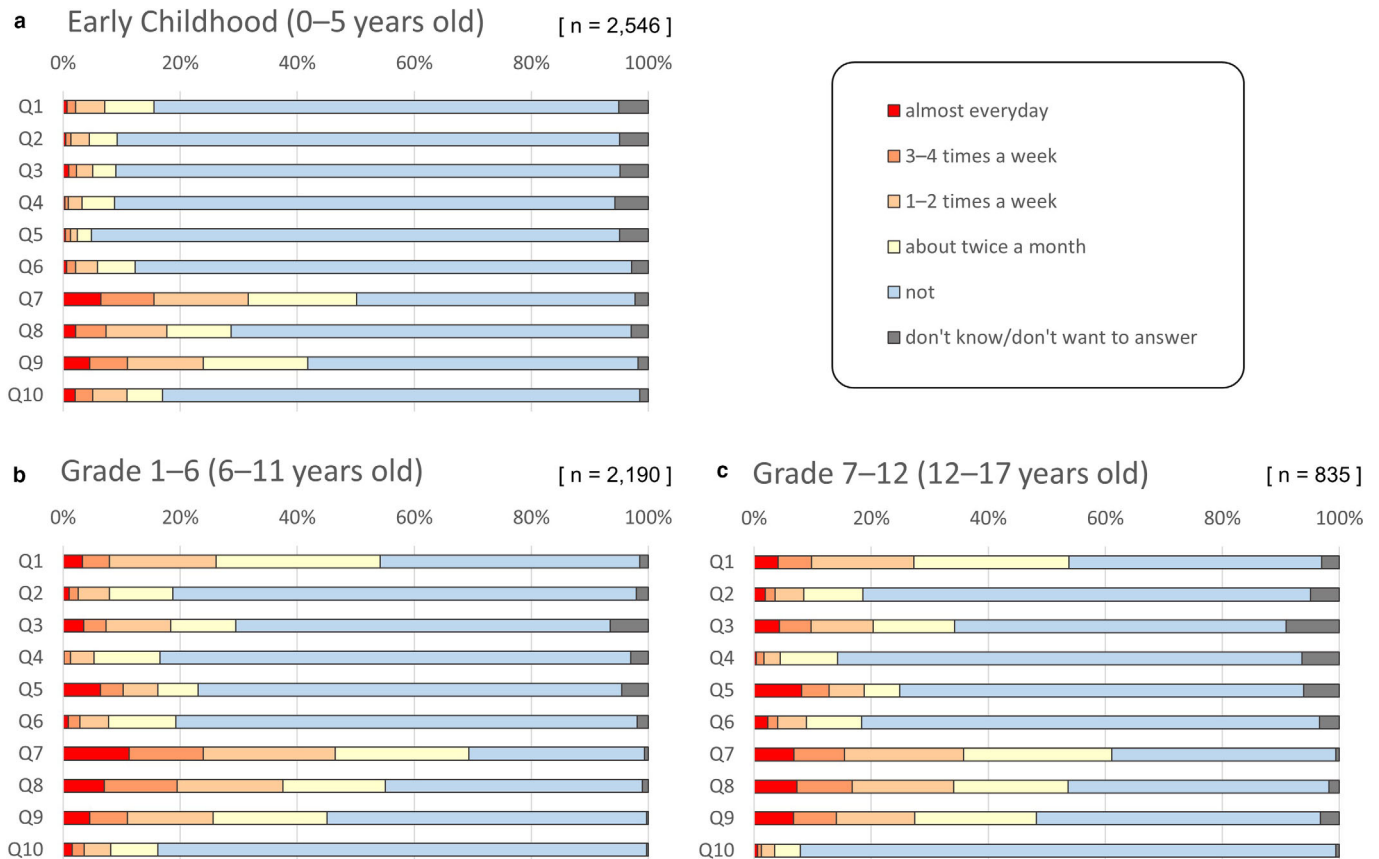


Fig. 2 Frequency distribution of 10 acute stress symptoms. The frequency distribution of 10 acute stress symptoms reported by parents/guardians of children in early childhood (a), of primary school age (b), and of secondary school age or older (c). Q1: My child seems uncomfortable, scared, or sad (such as suddenly starting to cry or hiding) when thinking about issues related to COVID-19 (such as life-style changes). Q2: When my child remembers something related to COVID-19 she/he may have a tantrum, or pretend play is related to COVID-19. Q3: My child dislikes and tries to avoid places and activities that remind her/him of things related to COVID-19 (such as television images). Q4: My child seems to have COVID-19-related or other nightmares. Q5: My child avoids conversations that remind her/him of things related to COVID-19 and dislikes meeting people that remind her/him of it. Q6: My child doesn't participate or show interest in play that he/she used to like or enjoy with family and friends (asked for children in early childhood, aged 0–5); or my child expresses loneliness, even when he/she is with someone else (asked for school-aged children, aged 6–17). Q7: My child is easily irritated, has outbursts of emotions even in an understandable situation, or has severe tantrums. Q8: My child can't concentrate or pay attention as much as before the pandemic. Q9: My child has trouble falling asleep and wakes up many times during the night. Q10: My child hurts him/herself on purpose or is violent towards family and pets.

secondary school (boys, 59% vs girls, 71%; $P = 0.014$), and the same trend, though not as significant, was seen in high school (boys, 75% vs girls, 84%; $P = 0.083$).

Average scores on the KINDL^R “emotional well-being” subscale about quality of life among child respondents were lower than the national average for all grades and both genders (Appendix S1 in the supplementary material).

Seventy-one percent of parents/guardians of children in early childhood and 88% of parents/guardians of school-aged children reported that the children had at least 1 acute stress symptom in the previous month, with 20% and 26% reporting such symptoms lasting over 1 month, respectively. Figure 2a, b,c shows the frequency distribution for each symptom for three age categories. Irritable or aggressive behavior (Q7) was the most common symptom across all ages; 59% of parents/guardians responded that their children had this symptom.

The second most frequent symptom among early childhood was difficulty sleeping (Q9); 24% reported this symptom 1–2 times a week or more (Figure 2a). The second and third most frequent symptoms among school-aged children were poor concentration (Q8) and discomfort when thinking of COVID-19 related issues (Q1), respectively (Figure 2b,c). The frequency distributions for three age categories by gender are shown in Appendix S1.

One in five children reported abusive behaviors by family members, among which psychological abuse, being yelled at (16%), and being threatened or insulted (8%) were the most common (Figure 3). Physical abuse (being slapped) and neglect (lack of necessities) were reported by 6% and 0.6%, respectively. Most behaviors were reported more frequently by younger children. Among primary school age, boys were significantly more likely than girls to be yelled at (24% vs 14%;

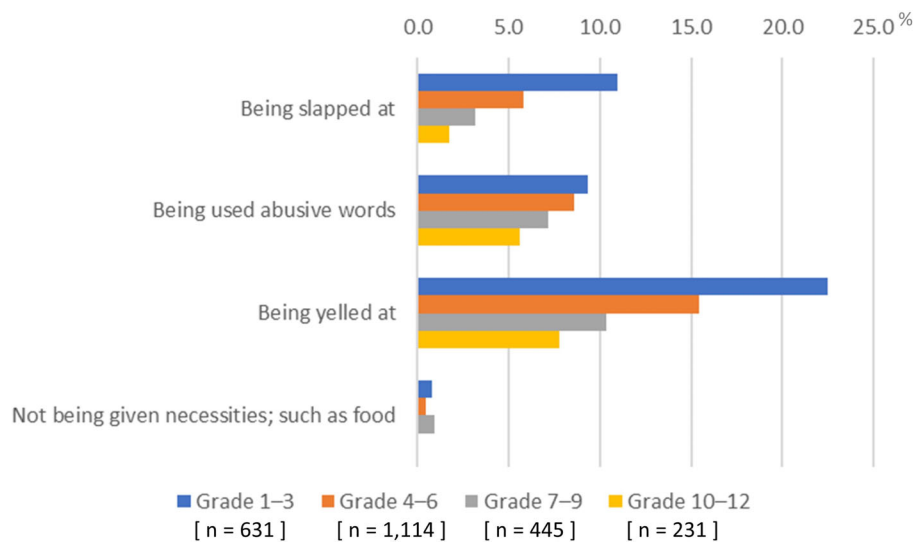


Fig. 3 Abusive behaviors by family members reported by children.

$P < 0.001$), while there was no gender difference in older age (14% vs 10%; $P = 0.101$). Thirty-two percent of parents/guardians reported that abusive behaviors directed at children or domestic violence had increased.

Moderate mental distress on the K6 scale was reported by 45% of parents/guardians, with severe distress reported by 16% of parents/guardians. Thirty-nine percent of all parents/guardians reported that they were able to perform self-care and use stress relief strategies over the past month “none of the time” (13%) or “rarely” (26%).

Discussion

The COVID-19 pandemic had a serious impact on children’s well-being during the first peak of the outbreak in Japan. The impact included changes in daily life, high rates of acute stress symptoms, and increased prevalence of abusive behaviors.

In Japan, many schools remained closed for approximately 3 months after the sudden call for a nationwide closure. Our survey was conducted in the midst of the national school closure. Several weeks after the state of emergency was announced, many nurseries closed. As school starts in April in Japan, this long period of closure from March to May might have been particularly stressful for children because most of them could not attend important life events such as graduation and entrance ceremonies.

Most children reported that they had not gone to school during the previous week. Most children reported less exercise time, altered sleep patterns, and longer screen time. These changes are consistent with reports from other countries,¹⁰ and their long-term impacts are concerning.

Acute stress symptoms are not unexpected in the periods of unusually stressful situations like disasters,^{22–24} which might be applicable with regard to the COVID-19 outbreak.^{8,25}

However, if a child’s symptoms are severe or prolonged, special attention may be necessary to help them find ways to calm themselves and to cope with the situation. It is important for parents/guardians to understand the child’s situation, to encourage emotional expression, positive reframing, and acceptance,²⁶ and to seek medical care when needed.

Most children reported longer screen time than before. Various negative physiological and psychological effects of longer screen time have been reported, such as poor sleep, depressive symptoms, and attention-deficit/hyperactivity disorder-related behaviors.²⁷ Our findings of irregular sleep patterns, acute stress symptoms, and poor mental health might be associated with longer screen time. However, digital devices might have some benefits; many older children reported keeping in touch with friends via such devices. Parents/guardians are encouraged to pay attention to the quality of content in addition to setting limits on screen time.^{28–30}

We found an increase in abusive behaviors from family members reported by children. The World Health Organization warned that the COVID-19 pandemic and society’s response to it have a huge impact on the prevalence of violence against children.³¹ Potential explanatory pathways include³²: (i) economic insecurity and poverty-related stress; (ii) social isolation; (iii) infection-related insecurity and instability; (iv) exposure to exploitative relationships due to lifestyle changes, and (v) inability to escape the perpetrator temporarily. As has been reported in other countries,³³ our study also demonstrated high distress levels as well as lack of self-care opportunities among parents/guardians, which may have contributed to the observed increase in abusive behaviors from family members^{34,35} and poor mental health reported by children.^{26,36} Adequate care for parents/guardians and children and promoting positive discipline skills are important in this high-stress situation.

A change in health care utilization was also reported. Nearly half of parents/guardians whose child had symptoms reported that they had refrained from taking their child to the doctor. That means some children might have underutilized health care, which has been reported in Italy³⁷ and the United Kingdom.³⁸

Our study has some limitations. First, there may be sampling bias because the survey was announced through social media platforms and media coverage. To fill out the questionnaire on a computer or a smartphone, an Internet connection was required. The majority of subjects lived in the Kanto area. The actual percentage of children in Japan with special needs in our context is unknown but the percentage of 11% among our samples seemed to be higher than expected in general Japanese children,³⁹ likely due to recruitment using networks of a medical institution. The proportion of respondents whose family members had experienced COVID-19 was likely to be higher than the one in the general population expected based on the domestic infection situation at the time of the survey. Those with family members infected may have been more interested and participated in this study. Differences in distributions of characteristics among groups in which both child and parent/guardian responded, parent/guardian only, and child only, suggest the presence of bias. As a result of such bias, the findings of our study may not be generalizable to children or parents/guardians in Japan or overseas. Second, the effect of recall bias cannot be ruled out in questions asking about the situation before the pandemic. Third, there may be measurement error or misclassification depending on the respondents' level of understanding of the questions. However, we held multiple discussions with pediatricians, children's psychiatrists, and psychologists, during the development of the questionnaire to minimize such information bias. Nonetheless, our study helps understand the lives and well-being of children during the COVID-19 pandemic in Japan. A system that can investigate the actual situation of children promptly and listen to their voices in emergency situations is also needed.

The influence of the COVID-19 pandemic on children's acute stress symptoms and their environment needs to be monitored carefully over the long term. Our CORONA-CODOMO project also plans to conduct cross-sectional surveys with repeated sampling every 1–2 months to monitor children's well-being, adding new items as needed in response to changing social conditions.

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Disclosure

The authors declare no conflict of interest.

Author contributions

M. Hangai conceived the study. M. Hangai, N.S., Y.O., M.S., K.T., M. Hosozawa, Y.Y., and N.M. designed the study. M. Hangai, A.P., M.S., and N.M. prepared and analyzed the data, and constructed the figures. M. Hangai and N.M. wrote the first draft of the manuscript. T.I. and N.M. obtained funding. T.I. supervised the study. All authors contributed data to the study, contributed to the data interpretation, critically reviewed the manuscript, and approved the final manuscript for submission. All authors read and approved the final manuscript.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix A. Acute Stress Symptoms Questions for Parents/guardians and Children.

Appendix B. Daily Life in the Past Week (limited to the respondents under a declaration of state of emergency).

Appendix C. Children's "Emotional Well-being" Scores Based on the KINDL^R questionnaire.

Appendix D. Frequency Distribution of 10 Acute Stress Symptoms by gender.