Regional Differences in Kawasaki Disease Incidence Reduction Before and After the Onset of the Coronavirus Disease 2019 Pandemic

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Objective To assess regional differences in reduction of the incidence of Kawasaki disease during the mitigation period for the coronavirus disease 2019 pandemic, with a hypothesis that more sparsely populated regions have fewer opportunities for human-to-human contact, resulting in a greater reduction in the incidence of Kawasaki disease.

Study design A retrospective ecological study was conducted using data from patients hospitalized for Kawasaki disease as well as infectious diseases surveillance reports in Shiga Prefecture, Japan, during 2015-2020. We defined the periods before and after the onset of pandemic as January 2015-March 2020 and as April 2020-December 2020, respectively. We compared the reductions in the incidence of Kawasaki disease among 6 administrative regions in the prefecture according to the density of the populations.

Results A total of 1290 patients with Kawasaki disease were identified. The incidence of Kawasaki disease (per 100 000 person-years) was significantly reduced after the coronavirus disease 2019 pandemic onset (period before pandemic onset, 105.6 [95% CI 99.8-111.8]; period after pandemic onset, 68.6 [95% CI 56.7-83.0]). During the period after pandemic onset, the incidence of Kawasaki disease was significantly reduced in May, compared with the corresponding period in previous years. The number of patients aged 2-4 years was significantly reduced after the pandemic onset. Notably, greater reductions in the incidence of Kawasaki disease were found in regions with lower population densities.

Conclusions Assuming that there were fewer opportunities for human-to-human contact in more sparsely populated regions during the pandemic mitigation period, our findings support the hypothesis that human-to-human contact may be associated with development of Kawasaki disease. *(J Pediatr 2022;250:54-60)*.

Kawasaki disease is an acute, self-limiting pediatric vasculitis affecting the coronary arteries that has been reported in many countries and areas worldwide as well as in children of all races and ethnicities, but Kawasaki disease has the greatest incidence in Japan.[1-6] Some studies indicated an association between host genetics and Kawasaki disease susceptibility.[7-11] However, the etiology of Kawasaki disease remains unknown, and extensive studies have failed to identify a causative pathogen.

To address the coronavirus disease 2019 (COVID-19) pandemic, infection-mitigation measures such as mask wearing, social distancing, and school closures were globally implemented beginning in 2020. After the onset of the COVID-19 pandemic, some studies found that mitigation measures were associated with decreases in other infectious diseases.[12-16] The incidence of Kawasaki disease also decreased during the pandemic mitigation period compared with previous years.[17-22]

The reduction in the incidence of Kawasaki disease during the pandemic mitigation period suggests that potentially transmissible agent(s) may trigger Kawasaki disease.[21] This hypothesis is supported by previous findings such as potential occurrence through sibling-to-sibling transmission inside households[23-25] and temporal- and municipal-level clustering.[26-28] Based on the transmissible agent theory, we assessed the reductions in the incidence of Kawasaki disease after the onset of the COVID-19 pandemic by focusing on the factors of person, time, and place, which are commonly used in descriptive epidemiologic studies. Among these 3 factors, no study has focused on place. Therefore, we investigated the regional differences in reduction of the incidence of Kawasaki disease, with a hypothesis that children have fewer opportunities for human-to-human contact in more sparsely populated regions during the pandemic mitigation period, resulting in a greater reduction in the incidence of Kawasaki disease. We also assessed the associations between the reduced numbers of patients with Kawasaki disease and 10 pediatric infectious diseases before and after the onset of the pandemic.

Methods

A retrospective ecological study was conducted using data obtained from patients hospitalized for Kawasaki disease and infectious diseases surveillance reports in Shiga Prefecture, Japan. The study period was January 1, 2015, through

COVID-19	Coronavirus disease 2019

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December 31, 2020. The Japanese government implemented COVID-19 mitigation measures, including nationwide school closures, beginning on March 2, 2020. Schools reopened on June 1, 2020, in Shiga Prefecture, but standard mitigation measures, such as mask wearing and social distancing, were mandated nationwide in Japan throughout 2020. Therefore, we defined the periods before and after the onset of the pandemic as January 2015-March 2020 and April 2020-December 2020, respectively. We assessed the differences in reduction of the incidence of Kawasaki disease between the periods before and after the onset of the pandemic focusing on factors of person (basic characteristics of patients with Kawasaki disease), time (monthly trends), and place (regional differences). The Ethics Committee of Shiga University of Medical Science approved the study and waived the requirement for informed consent from individual participants (R2020-139).

Study Setting

Shiga Prefecture is located in the center of Japan (**Figure 1**, A; available at www.jpeds.com). It has an area of about 4000 km^2 and a population of about 1.4 million.[29] The population of children aged 0-15 years averaged across 2015-2020 was 213 000 and the male-to-female sex ratio was 1.06.[30]

Shiga Prefecture has 7 administrative districts that surround a large lake (Lake Biwa) (**Figure 1**, B). The characteristics of the 7 districts regarding population of children aged 0-15 years, habitable area, and population density are summarized in **Table I** (available at www.jpeds.com). For the study, we merged District 7 with the neighboring District 6 because the population in District 7 is less than one-third of the populations in the other districts. This arbitrary merging resulted in the division of Shiga Prefecture into six regions (regions A-F).

Data Source for Kawasaki Disease

Using a questionnaire, we obtained information on patients with Kawasaki disease from 14 hospitals in Shiga Prefecture. These hospitals comprised all hospitals to which patients who developed Kawasaki disease across Shiga Prefecture eventually would be admitted for treatment by pediatricians with expertise in Kawasaki disease. The collected patient data included sex, age (months), date of Kawasaki disease onset, date of hospitalization, and diagnosis (complete Kawasaki disease or incomplete Kawasaki disease). Patients who were readmitted within 1 week after discharge or transferred between 2 hospitals were recorded for 1 admission only. We also collected ZIP codes for the patients to determine their districts of residence, and only patients who lived in Shiga Prefecture were included in the analysis. The data covered almost all patients who developed Kawasaki disease in Shiga Prefecture during 2015-2020 because <2% of patients moved from Shiga Prefecture to other prefectures for treatment during the study period. This was further verified using separate data from the nationwide Kawasaki disease survey conducted biennially in Japan (data not shown).[1]

The diagnosis of Kawasaki disease was based on the 5th and 6th editions of the Japanese guidelines.[31,32] To summarize, patients presenting at least 5 of the 6 major signs or patients with coronary artery lesions but only 4 of the 6 major signs were diagnosed with complete Kawasaki disease.

Infectious Diseases Surveillance in Shiga Prefecture

The Shiga Prefecture Infectious Disease Information Center, a public health institute, reports weekly numbers of patients with infectious diseases in each district of Shiga Prefecture, as part of the National Epidemiological Surveillance of Infectious Diseases Program in Japan.[33] This program provides sentinel surveillance, and the number of pediatric sentinel sites in each district is determined by its population. There was no interruption of reporting during the study period. We obtained the numbers of patients with 10 common pediatric infectious diseases (respiratory syncytial virus infection, pharyngoconjunctival fever, group A streptococcal pharyngitis, infectious gastroenteritis, varicella, hand–foot–mouth disease, erythema infectiosum, exanthema subitum, herpangina, mumps) from the surveillance data.

Statistical Analyses

First, we compared the basic characteristics of patients who developed Kawasaki disease in Shiga Prefecture before and after the onset of the COVID-19 pandemic. We calculated the incidence of Kawasaki disease per 100 000 person-years based on the population of children aged 0-15 years in Shiga Prefecture, which was obtained from the Japanese Government Statistics.[30,34] A Poisson regression analysis was employed to compare the incidence between the before and period after pandemic onsets, with a significance test for the regression coefficient of the period effect (ie, a significance test for the rate ratio, with a null hypothesis that the incidence rate ratio is 1). We further compared the proportions for diagnosis (complete Kawasaki disease, incomplete Kawasaki disease), sex, and age category (8 groups: 0, 1, 2, 3, 4, 5, 6-10, 11-15 years) using the χ^2 test and the median age using the Mann–Whitney *U* test.

Second, we examined the monthly trends in the incidence of Kawasaki disease before and after the onset of the pandemic. A Poisson regression analysis was similarly performed to compare the incidence in each month with a significance test for the rate ratio. In this analysis, an approximate 95% prediction interval was estimated based on the incidence in 2015-2019 using the method proposed by Simpson[35] for visualization purposes. Assuming that the monthly incidence remained the same as in 2015-2019, the incidence in the corresponding months in 2020 would be included within the prediction interval range with a 95% probability. We also compared the age-specific incidence before and after the onset of the pandemic. The incidence in 2015-2019 (April-December) and 2020 (April-December) were assessed with stratification for the 8 age groups. In this analysis, the data for January-March in all examined years were excluded to avoid introducing bias (seasonality effect), and the person-years were calculated with the population of children in each age group. An approximate 95% prediction interval was also determined with an estimation based on the incidence in 2015-2019.

Third, we investigated the regional differences in the incidence of Kawasaki disease according to the population densities before and after the pandemic onset. In addition to the incidence, the percent changes in the incidence in 2020 (April-December) were compared with those in 2015-2019 (April-December) based on the 6 regions in Shiga Prefecture; the data for January-March in all years were excluded from the analysis. For assessment of the associations between percent changes in the incidence of Kawasaki disease and the density of the populations, we fitted a linear regression model with the percent change in the incidence in each region as the dependent variable and the log-transformed population density as the independent variable. We also performed a robust regression analysis by M-estimation, which minimizes the impact of outliers on regression coefficient estimates.[36]

Finally, we assessed the association between the percent changes in patient numbers for Kawasaki disease and 10 common pediatric infectious diseases before and after the pandemic onset. The percent changes in the numbers of patients with Kawasaki disease and the specific infectious diseases were calculated using the annual average for the reported numbers of patients in 2015-2019 (April-December) and 2020 (April-December). Based on the percent changes for all six regions in Shiga Prefecture, Spearman correlation coefficients were determined to explore the correlations between the percent changes in the numbers of patients with Kawasaki disease and the 10 specific infectious diseases.

All categorical variables are presented as percentage of patients, and age is presented as median with IQR in addition to percentage of patients in categorized groups. The incidence of Kawasaki disease is presented as the calculated value with 95% CI. Statistical analyses were performed with SAS 9.4 (SAS Institute Inc), and the significance level was set at $P < .05$.

Results

A total of 1320 patients were diagnosed with Kawasaki disease and hospitalized in Shiga Prefecture during 2015-2020. We excluded 30 patients who resided outside of Shiga Prefecture, and thus 1290 patients with Kawasaki disease were finally included in the analysis. In the comparisons of the basic characteristics of the patients before and after the COVID-19 pandemic onset (January 2015-March 2020 vs April-December 2020; Table II), the incidence of Kawasaki disease per 100 000 person-years was significantly reduced from 105.6 (95% CI 99.8-111.8) to 68.6 (95% CI 56.7-83.0), with an estimated percent change of −35.0% (95% CI −46.7% to −20.7%). No significant difference in the proportion of complete Kawasaki disease (83% vs 81%; $P = .637$) and male sex (57% vs 61%; $P = .418$) was found. The median age of patients with Kawasaki disease was significantly younger in the period after pandemic onset (2.3 years vs 1.7 years; $P = .013$), with an indication that the age distribution shifted toward a lower age group.

The monthly incidence of Kawasaki disease before and after the COVID-19 pandemic onset is shown in Figure 2, A. The incidence recorded after the pandemic onset (April-December 2020) was below the lower boundary of the

Table II. Comparisons of patients with Kawasaki disease in Shiga Prefecture before and after the onset of the pandemic: January 2015-March 2020 vs April 2020-December 2020

Characteristics	Period before pandemic onset (January 2015-March 2020) n = 1184	Period after pandemic onset (April 2020-December 2020) n = 106	P value
Person-years*	1 121 211	154 416	
Incidence of Kawasaki disease per 100 000 person-years (95% CI)	105.6 (99.8-111.8)	68.6 (56.7-83.0)	<.001†
Diagnosis, No. (%)			
Complete Kawasaki disease	982 (83)	86 (81)	.637‡
Incomplete Kawasaki disease	202 (17)	20 (19)	
Sex, No. (%)			
Male	678 (57)	65 (61)	.418‡
Female	506 (43)	41 (39)	
Age, y, median (IQR)	2.3 (2.6)	1.7 (2.3)	.013§
Age, y, No. (%)			
0	185 (16)	24 (23)	.172‡
1	321 (27)	34 (32)	
2	248 (21)	17 (16)	
3	143 (12)	9 (8)	
4	135 (11)	8 (8)	
5	56 (5)	8 (8)	
6-10	83 (7)	6 (6)	
11-15	13 (1)	0 (0)	

*Person-years were calculated using the population of children aged 0-15 years.
†Poisson regression analysis.
‡χ^2 test.
§Mann–Whitney *U* test.

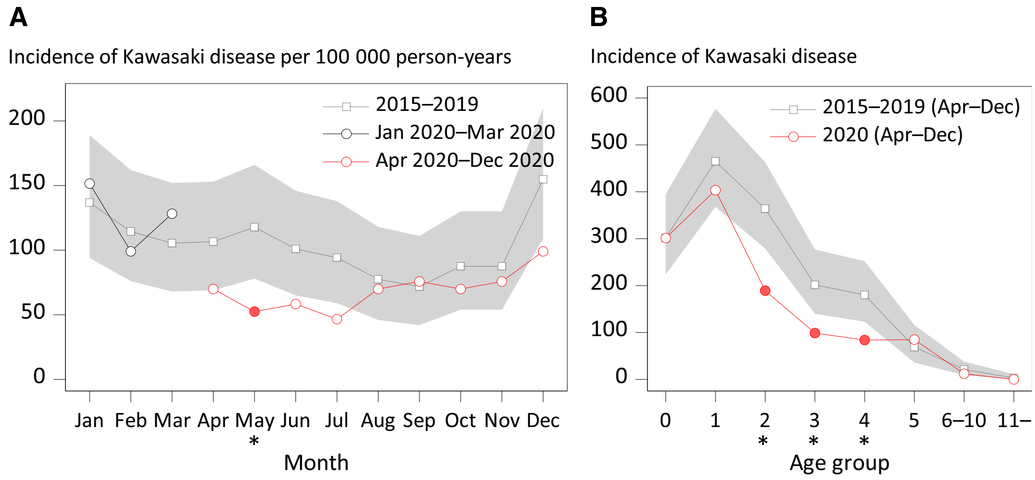

Figure 2. Incidence of Kawasaki disease in Shiga Prefecture before and after the pandemic onset: monthly and age-specific trends. **A,** Monthly incidence of Kawasaki disease. **B,** Age-specific incidence of Kawasaki disease. The *shaded areas* represent the approximate 95% prediction intervals estimated using the incidence in 2015-2019. Data for January-March were excluded from the analysis in **B**. *$P < .05$.

approximate 95% prediction intervals in May, June, July, and December. Among these months, the incidence in May was significantly lower in the period after pandemic onset (percent change in May: −55.5% [95% CI −77.5% to −12.0%; $P = .020$]). The results for all months are shown in **Table III** (available at www.jpeds.com). In the comparisons of the age-specific incidence (**Figure 2**, B), the incidence of patients aged 2-4 years with Kawasaki disease recorded after the pandemic onset (April-December 2020) was below the lower boundary of the approximate prediction intervals estimated using the incidence recorded in the corresponding period in previous years (April-December in 2015-2019). Statistical analyses demonstrated that the incidence of patients with Kawasaki disease aged 2-4 years was significantly lower in the period after pandemic onset (percent changes in patients aged 2, 3, and 4 years: −48.0% [95% CI −68.4% to −14.4%; $P = .010$], −51.0% [95% CI −75.2% to −3.0%; $P = .041$], and −53.4% [95% CI −77.4% to −3.9%; $P = .039$], respectively). The results for all age groups are shown in **Table IV** (available at www.jpeds.com).

A χ^2 test of independence was performed to evaluate the association between regions (A-F) and periods (before vs period after pandemic onsets) in the incidence of Kawasaki disease. The result was $P = .068$, which favored a detailed analysis of the regional differences in reduction of the incidence of Kawasaki disease. The regional differences in the incidence of Kawasaki disease before and after the pandemic onset are shown in **Table V**. The percent changes in the incidence of Kawasaki disease were larger in regions with smaller population densities. A scatter plot was created to show the association between percent change in the incidence of Kawasaki disease and population density among the 6 regions (**Figure 3**). Fitting of a linear regression model to the data (dependent variable: percent change in the incidence of Kawasaki disease; independent variable: log-transformed population density) was satisfactory ($R^2 = 0.789$) and generated a significant

Table V. Regional differences in the incidence of Kawasaki disease before and after the onset of the pandemic in Shiga Prefecture, Japan

		2015-2019			2020					
Regions*	Population density,/km^2	No.	Person-years	Incidence†	No.	Person-years	Incidence†	Percent change (%)	95% CI	*P* value‡
A	403	185	189 133	98	31	36 579	85	−13.4	−40.8 to 26.7	.460
B	331	227	211 310	107	32	41 527	77	−28.3	−50.5 to 3.9	.079
C	167	88	88 841	99	13	16 987	77	−22.7	−56.8 to 38.3	.385
D	108	63	78 602	80	6	14 930	40	−49.9	−78.3 to 15.8	.106
E	103	143	128 530	111	15	24 629	61	−45.3	−67.8 to −6.8	.026
F	80	95	105 890	90	9	19 765	46	−49.2	−74.4 to 0.5	.052

The period after the pandemic onset was April-December 2020. Therefore, the data for January-March in all examined years were excluded from the analysis to avoid introducing bias (seasonality effect).
*The 6 regions consist of 7 administrative districts as shown in **Figure 1**.
†Per 100 000 person-years.
‡For the rate ratio using Poisson regression analysis (null hypothesis: rate ratio = 1).

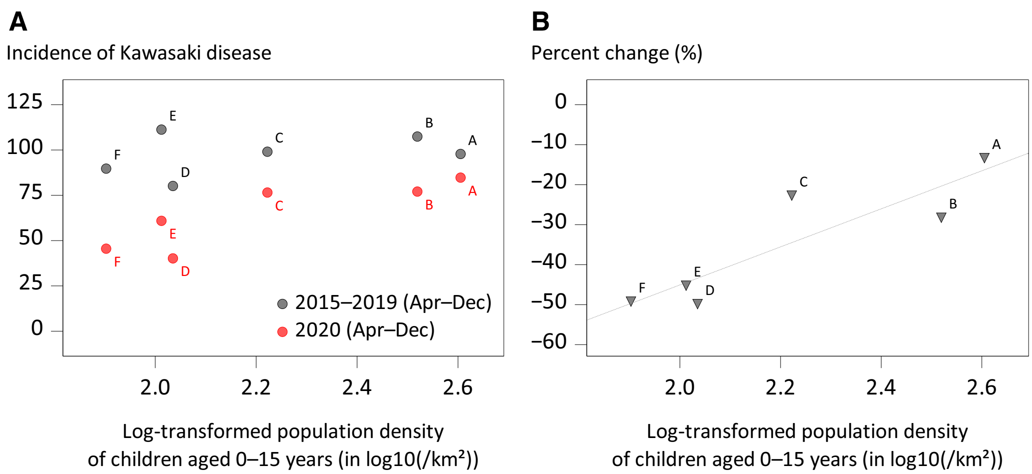

Figure 3. Population densities and the incidence of Kawasaki disease in Shiga Prefecture, Japan. **A,** Incidence of Kawasaki disease in regions A–F. **B,** Percent changes in the incidence of Kawasaki disease in 2020 (April-December) compared with the incidence in 2015-2019 (April-December) in regions A-F. The *dashed line* in **B** shows the regression line.

positive coefficient for log-transformed population density (coefficient: 47.6; 95% CI 13.4-81.7; P = .018). A robust regression analysis produced a consistent result (coefficient: 47.9; 95% CI 21.5-74.3; P < .001). The results of the regression analyses between the incidence of Kawasaki disease and population density are summarized in **Table VI** (available at www.jpeds.com). A separate analysis confirmed that the age distributions of the children did not differ significantly among the 6 regions in the study (data not shown). Similar results were obtained when the analyses focused on patients aged 0-4 years only and excluded those aged ≥5 years (data not shown).

The numbers of patients with common pediatric infectious diseases that were reported to the infectious diseases surveillance program in Shiga Prefecture decreased after the onset of the COVID-19 pandemic (**Table VII**; available at www.jpeds.com). Among the 10 specific infectious diseases examined, the numbers of patients for 9 diseases (excepting exanthema subitum) were decreased dramatically. The monthly trends in the numbers of reported patients with the infectious diseases also differed markedly between the periods before and after the pandemic onset (**Figure 4**; available at www.jpeds.com). Additional analyses showed no significant correlations between the percent changes in the incidence of Kawasaki disease and infectious diseases for any combinations (**Table VIII**; available at www.jpeds.com).

Discussion

Our data indicated that the incidence of Kawasaki disease was significantly reduced before and after the COVID-19 pandemic onset in Shiga Prefecture, Japan. This finding is consistent with recent studies from both inside and outside Japan.[17-22] However, our study yielded additional findings. First, during the period after the pandemic onset, the incidence of Kawasaki disease was significantly reduced in May, compared with the corresponding period in previous years. Second, the number of patients aged 2-4 years was significantly reduced after the pandemic onset. Third, greater reductions in the incidence of Kawasaki disease were found in regions with lower population densities. Finally, the incidence of common pediatric infectious diseases (excepting exanthema subitum) declined much greater than that of Kawasaki disease after the pandemic onset, which may result in no regional correlation in the association between both diseases for a percent change in patient numbers.

Our study included all patients who developed Kawasaki disease throughout a single prefecture during the examined years encompassing the COVID-19 pandemic. The onset of the pandemic was defined as the time when the nationwide COVID-19 mitigation measures were formally implemented in Japan (March 2020). After the pandemic onset, standard mitigation measures, such as mask wearing and social distancing, were mandated throughout 2020. Our results indicated that the estimated percent change in the incidence of Kawasaki disease was 35% after the pandemic onset. This finding is similar to that in a previous study conducted on nationwide samples in Japan,[21] despite the fact that our study was exclusively conducted in a single prefecture. This similarity indicates that we employed a valid study setting that can be considered to represent nationwide Japan. Our study also revealed that the incidence of Kawasaki disease showed the greatest reduction in May, approximately 2 months after the pandemic onset. A study in Korea reported similar findings that the incidence of Kawasaki disease was greatly decreased in April, at 2 months after the introduction of nationwide COVID-19 mitigation measures in February 2020, compared with the corresponding period in the previous 10 years.[19] Notably, the results showed marked differences from the reduction patterns observed in common pediatric infectious diseases (**Figure 4**). Dramatic reductions were found in the numbers of patients with almost all infectious diseases after the onset of the COVID-19 pandemic in prompt response to nationwide mitigation measures. Although the incidence of both Kawasaki disease and common pediatric infectious diseases declined, no significant regional correlations between the percent changes in the numbers of patients with Kawasaki disease and specific infectious diseases were found in our study, consistent with previous findings.[21] These findings suggest that currently recognized and reported pediatric infectious diseases are unlikely to be the triggering agent for Kawasaki disease, but it is noteworthy that the epidemic curve of Kawasaki disease appears similar to viral and bacterial infections in this regard.

The present results further indicate that the reduction in the incidence of Kawasaki disease after the pandemic onset was associated with regional population density. We found that the reduction in the incidence of Kawasaki disease was likely to be small in regions with high population density but large in regions with low population density. This may be the first report of this finding among epidemiologic studies focusing on Kawasaki disease. Although the cause of Kawasaki disease remains a medical mystery, studies support the hypothesis that transmissible agents may trigger Kawasaki disease, based on findings such as occurrence among sibling cases inside households,[23-25] temporal- and municipal-level clustering,[26-28] susceptible age distribution likely affected by transplacental immunity,[37,38] and seasonality, with large epidemics recorded in specific years.[1,27,39-41] Given the hypothesis of fewer opportunities for human-to-human contact in more sparsely populated regions, our results suggest that Kawasaki disease may be triggered by as-yet unidentified agent(s) transmitted through human-to-human contact. Kawasaki disease may be associated with unidentified respiratory pathogens that are potentially acquired from both within and outside the household, which may support the hypothesis.[21] However, it remained unclear whether human-to-human contact was inversely proportional to the regional population density during the period after the pandemic onset. Furthermore, our results showed that there was no reduction in the incidence of Kawasaki disease among 5-year-old children, which cannot be adequately explained. This result may have arisen because of the relatively low incidence in this age group, with only a small number of patients collected in our survey. Further studies are needed to verify these findings.

The present study has some limitations. First, the study assessed only 6 regions in a single prefecture with a small number of patients with Kawasaki disease. Studies with larger numbers of regions and patients are warranted to confirm our findings. Second, the study did not consider other potential factors that may affect the development of Kawasaki disease, such as previously reported environmental factors.[42-44] Third, the basic characteristics of the patients with specific pediatric infectious diseases were not compared because these data were not available. Finally, because the study was conducted in one prefecture in Japan, it is necessary to verify whether the results can be generalized to patients in other regions. ■

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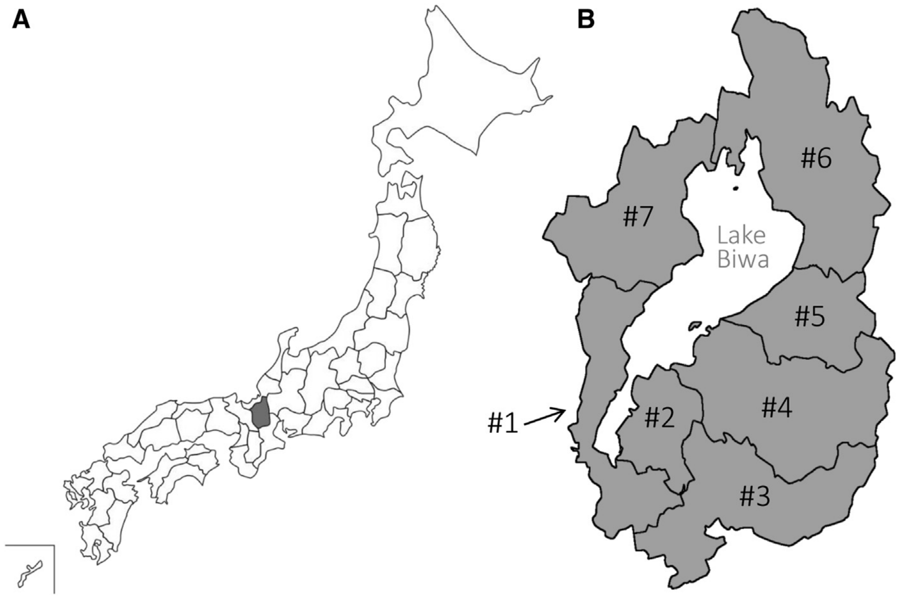

Figure 1. Shiga Prefecture in Japan and its 7 administrative districts. **A,** The *shaded area* shows Shiga Prefecture. **B,** Shiga Prefecture consists of 7 administrative districts. Both maps have north at the top.

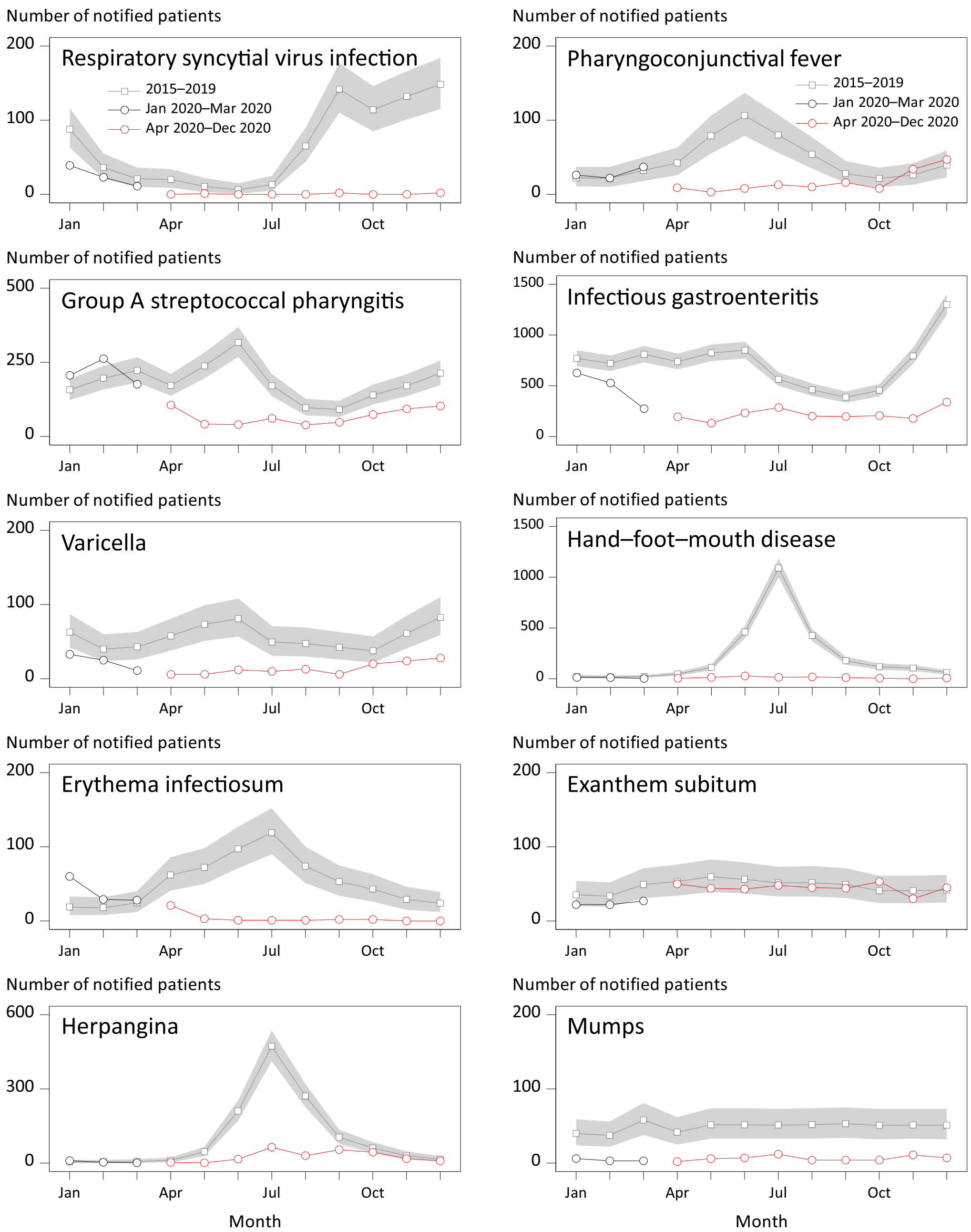

Figure 4. Monthly trends in the numbers of patients with 10 pediatric infectious diseases notified to the infectious disease surveillance program in Shiga Prefecture, Japan. The *shaded areas* represent the approximate 95% prediction intervals estimated using the numbers of patients notified in 2015-2019.

Table I. Seven administrative districts and 6 regions in Shiga Prefecture, Japan*

Districts	Population of children aged 0-15 y†	Habitable area, km^2	Population density,/km^2	Number of pediatric sentinel sites‡	Region name§
1	50 158	125	403	7	Region A
2	56 186	170	331	6	Region B
3	20 785	192	108	4	Region D
4	34 035	331	103	5	Region E
5	23 517	141	167	4	Region C
6	22 048	231	95	4	Region F*
7	5875	118	50	2	Region F*
Total	212 605	1307	163	32	–

*Region F consists of District 6 plus District 7.
†Averaged population in 2015-2020.
‡Further pediatric sentinel sites have been added since April 2020, but the data for these additional sites were deleted to maintain the same numbers of sentinel sites in the regions throughout the study period.
§Region names were assigned in order of population density.

Table III. Monthly incidence of Kawasaki disease before and after the onset of the pandemic in Shiga Prefecture, Japan

	2015-2019			2020					
Months	No.	Person-years	Incidence*	No.	Person-years	Incidence*	Percent change (%)	95% CI	*P* value†
January	122	89 145	137	26	17 157	152	10.7	−27.5 to 69.1	.637
February	102	89 145	114	17	17 157	99	−13.4	−48.2 to 44.7	.583
March	94	89 145	105	22	17 157	128	21.6	−23.6 to 93.4	.409
April	95	89 145	107	12	17 157	70	−34.4	−64.0 to 19.6	.169
May	105	89 145	118	9	17 157	52	−55.5	−77.5 to −12.0	.020‡
June	90	89 145	101	10	17 157	58	−42.3	−70.0 to 11.0	.099
July	84	89 145	94	8	17 157	47	−50.5	−76.0 to 2.2	.057
August	69	89 145	77	12	17 157	70	−9.6	−51.1 to 66.8	.746
September	64	89 145	72	13	17 157	76	5.5	−41.9 to 91.6	.859
October	78	89 145	87	12	17 157	70	−20.1	−56.5 to 46.8	.470
November	78	89 145	87	13	17 157	76	−13.4	−51.9 to 55.8	.631
December	138	89 145	155	17	17 157	99	−36.0	−61.3 to 5.9	.083

The period after the pandemic onset was April-December 2020.
*Per 100 000 person-years.
†For the rate ratio using Poisson regression analysis.
‡$P < .05$.

Table IV. Age-specific incidence of Kawasaki disease before and after the onset of the pandemic in Shiga Prefecture, Japan

	2015–2019			2020					
Age groups, y	No.	Person-years	Incidence*	No.	Person-years	Incidence*	Percent change (%)	95% CI	P-value†
0	133	44 093	302	24	7965	301	−0.1	−35.3 to 54.3	.996
1	215	46 248	465	34	8424	404	−13.2	−39.5 to 24.7	.444
2	172	47 259	364	17	8983	189	−48.0	−68.4 to −14.4	.010‡
3	97	48 125	202	9	9110	99	−51.0	−75.2 to −3.0	.041‡
4	88	48 878	180	8	9535	84	−53.4	−77.4 to −3.9	.039‡
5	34	49 554	69	8	9428	85	23.7	−42.7 to 167.1	.589
6-10	54	254 564	21	6	49 640	12	−43.0	−75.5 to 32.4	.191
11-15	8	263 584	3	0	51 332	0	−100.0		Not performed
Total	801	802 304	100	106	154 416	69	−31.2	−43.9 to −15.8	<.001‡

The period after the pandemic onset was April-December 2020. Therefore, the data for January-March in all examined years were excluded from the analysis to avoid introducing bias (seasonality effect).
*Per 100 000 person-years.
†For the rate ratio using Poisson regression analysis.
‡$P < .05$.

Table VI. Regression analysis between the incidence of Kawasaki disease and regional population density in Shiga Prefecture, Japan

Dependent variables	Independent variables	Regression method	Regression coefficient	95% CI	P value
Incidence during 2015-2019*	Log-transformed population density	Linear	14.2	−37.1 to 65.5	.484
		Robust	15.9	−28.2 to 60.0	.480
	Population density	Linear	0.027	−0.084 to 0.138	.532
		Robust	0.029	−0.065 to 0.124	.543
Incidence during 2020†	Log-transformed population density	Linear	54.9	10.7-99.1	.026
		Robust	53.5	17.8-89.2	.003
	Population density	Linear	0.111	0.005-0.218	.044
		Robust	0.111	0.026-0.196	.011
Percent change	Log-transformed population density	Linear	47.6	13.4-81.7	.018
		Robust	47.9	21.5-74.3	<.001
	Population density	Linear	0.098	0.015-0.180	.030
		Robust	0.104	0.063-0.145	<.001

The data for January-March in all examined years were excluded from the analysis to avoid introducing bias (seasonality effect).
*The period before the pandemic onset was April-December 2015-2019.
†The period after the pandemic onset was April-December 2020.

Table VII. Percent changes in the numbers of patients with 10 pediatric infectious diseases notified to the infectious disease surveillance program before and after the onset of the pandemic in Shiga Prefecture, Japan

Specific infectious diseases	Reported number of patients*		Percent change (%)
	Period before pandemic onset (2015-2019)	Period after pandemic onset (2020)	
Respiratory syncytial virus infection	651	5	−99.2
Pharyngoconjunctival fever	477	148	−69.0
Group A streptococcal pharyngitis	1610	606	−62.4
Infectious gastroenteritis	6367	1963	−69.2
Varicella	533	125	−76.5
Hand–foot–mouth disease	2596	104	−96.0
Erythema infectiosum	573	31	−94.6
Exanthem subitum	444	402	−9.5
Herpangina	1221	239	−80.4
Mumps	454	57	−87.4

The period after the pandemic onset was April-December 2020. Therefore, the data for January-March in all examined years were excluded from the analysis to avoid introducing bias (seasonality effect).
*Reported numbers of patients during the period before pandemic onset are presented as mean numbers from 2015 through 2019.

Table VIII. Correlations between the percent changes in the numbers of patients with Kawasaki disease and 10 pediatric infectious diseases notified to the infectious disease surveillance program based on assessments in the 6 regions in Shiga Prefecture, Japan

Specific infectious diseases	Spearman correlation coefficient	*P* value
Respiratory syncytial virus infection	−0.580	.228
Pharyngoconjunctival fever	−0.257	.623
Group A streptococcal pharyngitis	−0.086	.872
Infectious gastroenteritis	0.086	.872
Varicella	−0.429	.397
Hand–foot–mouth disease	0.143	.787
Erythema infectiosum	−0.580	.228
Exanthem subitum	−0.771	.072
Herpangina	0.257	.623
Mumps	0.314	.544

The period after the pandemic onset was April-December 2020. Therefore, the data for January-March in all examined years were excluded from the analysis to avoid introducing bias (seasonality effect). The reported numbers of patients during the period before pandemic onset are presented as mean numbers from 2015 through 2019.