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Letter to the Editor

Pediatric admissions due to travel-related asthmatic attacks in Japan: A retrospective case series and case–control study

Dear Editor,

Limited information is available regarding the clinical characteristics of childhood asthma attacks during travel. Traveling with a child is often accompanied by physical fatigue; mood disturbances; and exposure to cold and dry external environments, air pressure and oxygen saturation changes,¹ and secondhand smoke.² Such external stimuli can synergistically trigger asthma attack exacerbation.³ Urayasu City has the largest amusement park in Japan, and our hospital is the only tertiary hospital with a pediatric emergency room in the city. Here we investigate the patient characteristics of travel-related asthmatic attacks in Japan. This study will establish characteristics of travel-related asthma admissions.

We performed a single-institute, retrospective surveillance study. A 3-year patient registry of asthma admissions (April 2010–March 2013) from the department of pediatrics of a single hospital was used for patient enrollment. The registration included all asthma inpatients below 16 years with the informed consent of caregivers. The diagnostic criteria and severity were based on the Japanese Pediatric Guidelines for the Treatment and Management of Asthma (JPGL) editions 2008⁴ and 2012.⁵ Travel in this study was defined as any activity that took place away from the home for more than one night. Day trips were excluded. The non-traveling patients were defined as the control group. Statistical analyses were performed using the Mann–Whitney's U-test and Fisher's exact test. *p* values of <0.05 were considered to be significant.

We enrolled 243 registered patients (195 cases). Twenty-seven episodes (27 cases) occurred in travelers (Table 1). All episodes in travelers (100%) and 141 episodes in non-travelers (65%) were initial admissions to the hospital (*p* < 0.01). The mean age of the travelers was higher than that of the non-travelers (*p* = 0.02). No patient in the traveler group was from a foreign country. The rate of asthma attacks without any respiratory comorbidities (e.g., pneumonia) was higher in the traveler group (*p* = 0.02). The duration of hospital stays in the traveler group was significantly shorter than that in the non-traveler group (*p* < 0.01). The traveler group also had a higher rate of transfer to other hospitals than the non-traveler group (*p* < 0.01).

The characteristics of the travel are summarized in Supplementary Table 1. Major means of transportation (*n* = 17, with written medical records) were airplanes for 10 patients (59%). The distribution of the patient's residences in Japan is shown in Supplementary Figure 1. Table 2 summarizes the prevalence of asthma diagnoses and therapy before the initiation of travel. Twelve patients (44%) from the traveler group had previously

been diagnosed with asthma before admission. Three patients (11%) were suspected with asthma; the rate of these patients in the traveler group was higher than that for patients in the non-traveler group (*p* = 0.03). Five patients (19%) had not been diagnosed with asthma, although they had recurrent episodes of periodic wheezing, which had fulfilled the JPGL criteria for asthma. Twenty-two patients (81%) had symptoms of upper respiratory infections before their travels. Seven patients had an asthma attack immediately before travel. Nine patients with antecedent symptoms had visited a medical facility to alleviate their symptoms. In five cases of travelers without preceding infections, three cases (60%) had already been diagnosed with bronchial asthma. All three diagnosed patients were administered one of the controller medications (leukotriene receptor antagonist in two cases and inhaled corticosteroid in one case). No patient in the traveler group without preceding infections had traveled on aircrafts. No patients in the traveler group had provided a written referral letter on admission.

Table 1
Patient characteristics of asthma admission in the hospital.

	Traveler	Non-traveler	<i>P</i> value
Number of episodes	27	216	(–)
Number of cases	27	168	(–)
Median age (year)	4.4 (range 1–12)	3.2 (range 0–13)	0.02
Male	16 (59%)	129 (60%)	N.S.
Residents of Urayasu area [†]	area 0 (0%)	Urayasu area	<0.01
Initial admission of our hospital	27 (100%)	141 (65%)	<0.01
Severity of attack	Severe 8 (30%) Moderate 19 (70%)	Status asthmaticus 1 (0.5%) Severe 38 (18%) Moderate 147 (68%) Mild 21 (10%) Undetermined 9 (4%)	N.S.
Asthma attack with respiratory comorbidity	3 (11%)	80 (37%)	0.02
Ratio of ISP administration	3 of 27 (11%)	23 of 216 (11%)	N.S.
Previously diagnosed asthma [‡]	13 (48%)	136 (63%)	N.S.
Hospital stay (days)	3.3 ± 1.4 (range 1–6)	8.7 ± 7.2 (range 1–73)	

ISP, isoproterenol; N.S., not significant.

Analyzed by Fisher's exact test.

[†] Resident of Urayasu area was defined as an inhabitant of Urayasu city or two cities adjacent to Urayasu (Edogawa, Tokyo and Ichikawa, Chiba, Japan).[‡] Previous diagnosis of asthma was based on the interview with the patient and/or caregiver(s).

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Table 2
Pretravel diagnosis and treatment of asthma (N = 27).

	Overall traveler (N = 27)	Traveler with infection (N = 22)	Traveler without infection (N = 5)	Non-traveler (N = 216)	P value*
A. Pre-travel diagnosis of asthma					
Previously diagnosed asthma	12 (44%) [†]	9 (41%)	3 (60%)	136 (63%)	0.06
Asthma suspected	3 (11%)	2 (9%)	1 (20%)	4 (2%)	0.03
Underdiagnosis suspected [‡]	7 (26%)	7 (32%)	0 (0%)	30 (14%)	N.S.
Initial attack [§]	5 (19%)	4 (18%)	1 (20%)	38 (18%)	N.S.
	Overall traveler (N = 12)	Traveler with infection (N = 9)	Traveler without infection (N = 3)	Non-traveler (N = 136)	P value*
B. Treatment to previously diagnosed asthma before admission					
LTRA	6 (50%)	4 (44%)	2 (66%)	115 (85%)	0.01
ICS	2 (17%)	1 (11%)	1 (33%)	44 (33%)	N.S.
SFC	0 (0%)	0 (0%)	0 (0%)	5 (4%)	N.S.
Theophylline	1 (8%)	1 (11%)	0 (0%)	13 (10%)	N.S.
On demand medication only	2 (17%)	2 (22%)	0 (0%)	7 (5%)	N.S.
No therapy/Unknown	2 (17%)	2 (22%)	0 (0%)	22 (16%)	N.S.

LTRA, leukotriene receptor antagonist; ICS, inhaled corticosteroid; SFC, salmeterol/fluticasone propionate combination product.

Analyzed by Fisher's exact test.

*P value: overall traveler vs. non-traveler.

[†] History of admission with asthma attack was observed in 4 travelers (including one traveler without preceding infection).[‡] Not diagnosed as asthma, although they had recurrent episodes of periodic wheezing.[§] Not diagnosed, and did not fulfill the JPGL (Japanese Pediatric Guideline for the Treatment and Management of Asthma) criteria.

There were one or more conflicts during care administration between an attending doctor and caregiver(s) in nine cases (33%). The most common conflict was a request from the caregiver(s) to decrease the hospital stay, which was observed in eight cases (30%). Later, six (22%) patients were transferred to their own city hospitals. Five cases (18%) were discharged before they achieved complete asthmatic remissions at their parents' requests. Six cases (22%) were transferred to other hospitals in their residential areas for continuation of their admissions.

This study was the first case series and case–control study regarding travel-related asthma attacks in Japan. More than 90% children have traveled for the first time by ≤ 3 years, and the initial age of travel continues to decrease in Japan.⁶ Travel-related conditions, such as changes in temperature and barometric pressure, can trigger asthma exacerbations.³ Recommendations for air travel in patients with chronic respiratory disease from the British Thoracic Society have stated that there has been no data to predict when it was safe to fly after an acute asthma attack.⁷

Here no patient in the traveler group had a pre-travel consultation without a prior attack or had a referral letter. As part of the pre-travel preparations, the British Thoracic Society recommends that patients with chronic respiratory conditions should visit their physicians before travel⁸ and the Japanese Society of Travel Medicine published and recommended self-reporting medical records for children before travel.⁹ The duration of the hospital stays for the travelers was shorter than those for the non-travelers. The travel schedule that was planned before admission may have strongly restricted the duration of therapy for an asthma attack.

Major limitations of this study included a lack of clinical data because of the retrospective nature of the study, a geographic and institutional bias in our hospital because it was a single institute case series, and a recall bias from the history-taking of the patients. Additionally, it was difficult to assess the risk factors for asthma attacks during travel directly from this study because of the nature of case control studies.

In conclusion, we clarified the clinical characteristics of inpatient travelers with asthma at a hospital adjacent to the largest amusement park in Japan. The major characteristics of these patients included tourists, higher ages at admission, absence of chronic medical conditions, shorter duration of admission, and

frequent conflicts with caregiver(s). The major underlying conditions included insufficient diagnoses and treatment of their asthmatic attacks before traveling. Further multicenter studies are mandatory to confirm these results and to establish appropriate guidance regarding pre-travel visits for travelers with asthma.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.alit.2016.06.007>.

Conflict of interest

The authors have no conflict of interest to declare.

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Supplementary Table 1. Characteristics of travel.**A. Purpose of travel**

	Number of patients (%)
Tourism	21 (78%)
Tourism and Travel to relatives	3 (11%)
Travel to relatives	1(4%)
Total	27 (100%)

B. Admission date in travel

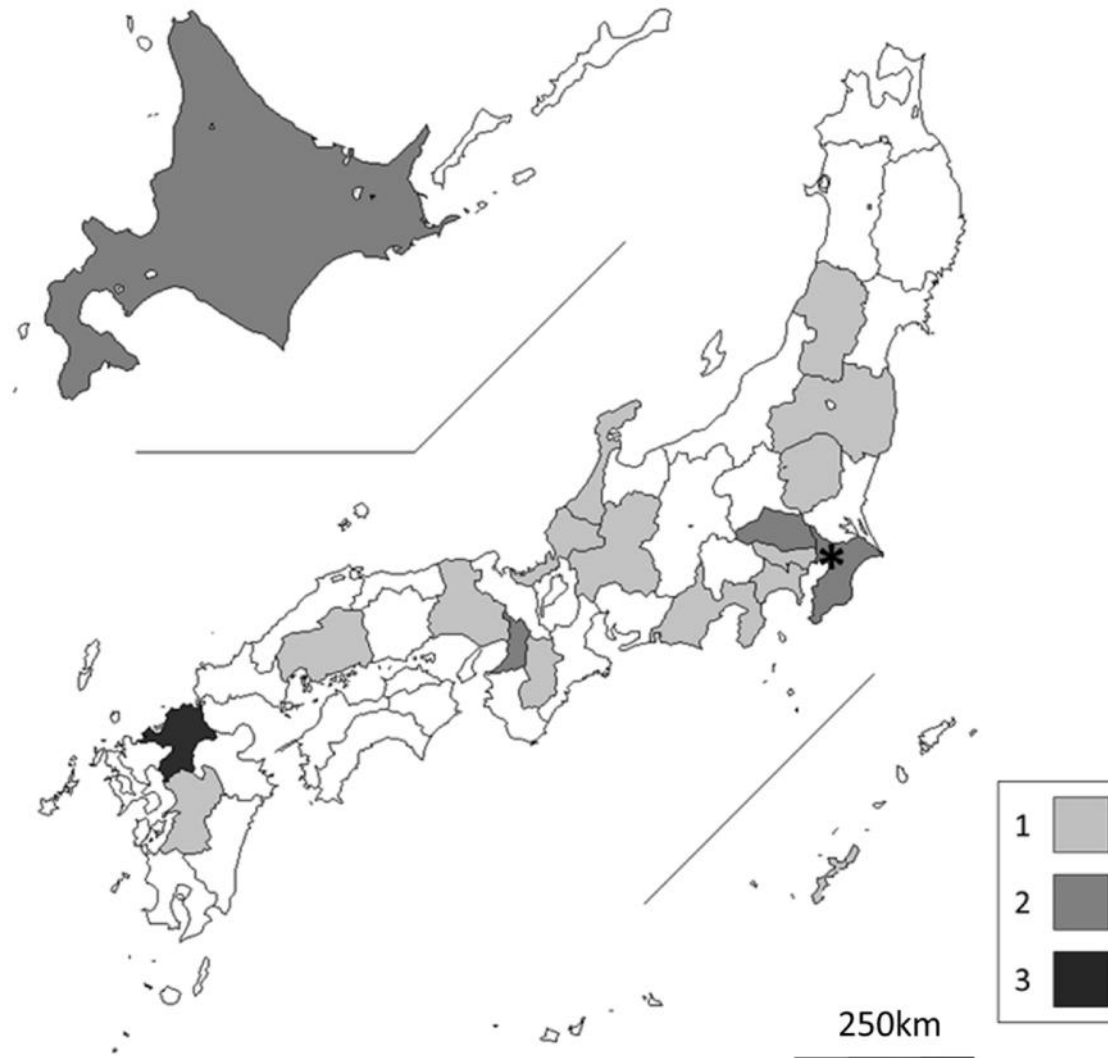
	Number of patients (%)
Day 1 (the day travel started)	10 (37%)
Day2	6 (33%)
Day3	4 (15%)
Unknown	7 (26%)
Total	27 (100%)

C. Major transportation device

	Number of patients (%)
Aircraft	7 (26%)
Train (including Super-express)	3 (11%)
Automobile	4 (15%)
Unknown	13 (48%)
Total	27 (100%)

D. Route to admission

	Number of patients (%)
Ambulance transport from first aid station in amusement parks	16(59%)
Walking in to the emergency room	7 (26%)
Referral from nocturnal clinic	3 (11%)
Referral from other hospital	1 (4%)
Total	27 (100%)



Supplementary Fig. 1 Residences of patients with travel-related asthma admission ($n = 27$). Asterisk shows the location of our hospital. The color gradation shows the number of patients per prefecture.