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Brief Report

Regional Differences in the Prevalence of Atopic Dermatitis among Schoolchildren in Japan and Its Associated Factors from 2006 to 2018

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Abstract: The trends in the prevalence of atopic dermatitis for each prefecture over recent years have not been investigated in Japan, and no studies investigating the factors associated with the prevalence using nationwide data have been conducted. We investigated the trends in the prevalence of atopic dermatitis among schoolchildren for each prefecture in Japan from 2006 to 2018 and identified the factors associated with regional differences in prevalence. The data on the atopic dermatitis prevalence in schoolchildren aged 6–17 years were collected as part of the School Health Statistics Research. The demographic, socioeconomic, medical, and environmental characteristics of the prefectures were examined for possible associations with the prevalence. The age-standardized prevalence rates of atopic dermatitis were calculated separately for boys and girls and by prefecture and year. We examined the associations between the age-standardized prevalence rates and prefectural characteristics using an ecological study. The age-standardized prevalence rates of atopic dermatitis tended to be stable for Japan as a whole, whereas the trend in the age-standardized prevalence rates differed across prefectures. In the regression analysis, the year was negatively associated and the number of medical clinics per 100,000 persons was positively associated with the age-standardized prevalence in girls. The taxable income per capita was positively associated with the age-standardized prevalence both in boys and in girls.

Keywords: Japan; atopic dermatitis; prevalence; child; regional difference

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1. Introduction

Atopic dermatitis is one of the major allergic diseases in the world, and the prevalence rates for the disease have been shown to vary significantly across different regions of the world [1–3]. The prevalence rates for atopic dermatitis have been shown to be high in resource-rich countries [4], and underreporting has been pointed out as a factor explaining low prevalence rates in some developing countries [5]. Some research has indicated that the estimated number of patients in Japan with atopic dermatitis has increased somewhat in recent years, with the estimated number increasing from 384,000 to 513,000 from 2005 to 2017 [6]. In addition, it is known that prevalence is particularly high in early childhood and decreases in adulthood [1]. It is important to determine the trend in the prevalence of atopic dermatitis and identify any regional differences in the prevalence among children in Japan in recent years.

Unfortunately, there have been few studies investigating regional differences in the prevalence of atopic dermatitis using nationwide data in Japan. The prevalence among children in prefectures has been estimated in some studies [7–9]; however, changes in prevalence over recent years for each prefecture have not yet been investigated. Accordingly, it is not known whether the prevalence of atopic dermatitis is increasing or decreasing among children in each prefecture in Japan, or whether there have been regional differences in any changes in the prevalence rates over recent years.

In addition, there are few studies investigating the factors related to the regional differences that have been identified in the prevalence of atopic dermatitis in Japan. An ecological study investigating the factors associated with the prevalence of atopic dermatitis was conducted in Osaka, one of the prefectures in Japan [10], but no study using nationwide data has been conducted. Increasing knowledge about possible changes in prevalence over time for each prefecture and identifying the factors related to any regional differences in changes in prevalence rates over time could help to lead to more effective, targeted preventive measures being taken in prefectures where the prevalence of atopic dermatitis is relatively high. We set out to investigate, in an ecological study, the possible associations between the prevalence of atopic dermatitis and variables such as the sociodemographic and medical characteristics of prefectures.

In this study, we investigated the prevalence of atopic dermatitis and changes in prevalence over time among schoolchildren for each prefecture in Japan. We also aimed to identify factors associated with any regional differences in prevalence using nationwide government statistical data by using an ecological study.

2. Materials and Methods

Data from the School Health Statistics Research conducted in Japan from 2006 to 2018 were used [11]. The School Health Statistics Research is conducted every year by the Ministry of Education, Culture, Sports, Science, and Technology and examines developmental and health statuses of schoolchildren in Japan. Target schools are randomly chosen from all over Japan using prefecture, type of school, and number of children as strata [12]. More than 7000 schools are surveyed and more than 3 million school children become survey subjects every year [12]. The diagnosis of atopic dermatitis is conducted by physicians. Data on atopic dermatitis prevalence among schoolchildren aged 6–17 years by prefecture and year are available and were used in this study [11].

Demographic, socioeconomic, medical, and environmental characteristics of prefectures were examined for possible associations with atopic dermatitis prevalence. Population and population density of prefectures were examined as demographic characteristics, the data for these variables having been obtained from the Ministry of Internal Affairs and Communications and from a survey on nationwide prefectural and municipal areas conducted by the Ministry of Land, Infrastructure, Transport and Tourism [13].

The proportion of residents receiving public assistance, taxable income per capita, and the proportion of high-school students going to university were used as socioeconomic characteristics. Data on number of public assistance recipients were obtained from the Ministry of Health, Labor and Welfare's National Survey on Public Assistance Recipients, and data on taxable income were obtained from a survey on municipal taxation status from the Ministry of Internal Affairs and Communications [13]. Data on number of high-school graduates and the number of graduates going to a higher educational institution were obtained from the School Basic Survey by the Ministry of Education, Culture, Sports, Science and Technology [13].

The environmental characteristics of prefectures we examined were the annual average temperature, annual daylight hours, annual average relative humidity, and mean average annual concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and suspended particulate matter (SPM). Data on annual average temperature, annual daylight hours, and annual average relative humidity were obtained from the Japan Meteorological Agency [13]. Data on air pollutant concentrations were obtained from the Environmental Database of the National Institute for Environmental Studies in Japan [14], and data on annual average concentration of major air pollutants collected by air pollution monitoring stations all over Japan are publicly available. We calculated the mean of the annual average concentration for each municipality, year, and air pollutant, and the mean of the annual average concentration for each prefecture, year, and air pollutant.

Medical characteristics examined were number of hospitals with an allergy department per 100,000 persons, number of hospitals with a dermatology department per

100,000 persons, and number of medical clinics per 100,000 persons. These data were obtained from the Survey of Medical Institutions by the Ministry of Health, Labor and Welfare [13].

For the statistical analysis, age-standardized prevalence rates of atopic dermatitis were calculated for boys and girls by prefecture and year. Age-specific population data were obtained from the Census [15], and the population for each age in all of Japan in 2015 was used as the standard population for the calculation. In addition, annual percentage change (APC) of the age-standardized prevalence over the analyzed periods was calculated for each prefecture by sex. A linear regression model was applied for logarithm of the age-standardized prevalence by using year as an explanatory variable, and the APC was calculated.

A linear mixed-effects model was used to examine associations between age-standardized prevalence rates and prefectural characteristics. Age-standardized prevalence was log-transformed in this analysis because the distribution was right-skewed. The random intercept and random slope of the year effect for each prefecture were included in the model. All predictor variables were converted to scaled scores, and a standardized partial regression coefficient was calculated for each explanatory variable in a multivariate analysis. Two-sided tests were used, and p-values less than 0.05 were judged as statistically significant. All statistical data were analyzed by the software R 3.6.3 [16].

3. Results

The age-standardized prevalence rates of atopic dermatitis for each prefecture and year are shown for boys in Table 1. For Japan as a whole, age-standardized prevalence tended to be stable across the years examined, but this differed across prefectures. The age-standardized prevalence increased by more than 1% in the analyzed periods for Hokkaido, Miyagi, Ibaraki, Tochigi, and Okayama. On the other hand, the prevalence in Fukui, Hyogo, Tottori, and Kagawa decreased more than 1% in the analyzed periods.

Table 1. Age-standardized prevalence of atopic dermatitis for each prefecture and year for boys.

	Year												
Prefecture	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
All of Japan	3.2	3.3	3.2	3.1	3.1	3.0	3.0	2.9	3.0	3.2	3.1	3.1	3.3
Hokkaido	3.3	3.0	2.7	3.5	2.2	2.9	3.4	2.5	3.8	4.1	4.4	4.4	4.4
Aomori	1.8	1.8	1.6	1.6	1.8	1.6	1.3	1.3	1.1	1.4	1.4	1.6	2.0
Iwate	2.3	3.2	3.0	2.7	2.6	NA	2.6	2.1	2.4	2.1	2.0	2.6	3.2
Miyagi	4.3	4.8	4.5	4.9	3.9	NA	4.1	4.3	3.9	4.9	4.6	4.3	6.1
Akita	3.8	4.1	3.8	3.5	3.6	3.5	3.6	3.3	3.6	3.6	3.6	4.0	3.9
Yamagata	4.1	4.0	3.9	4.0	3.3	3.5	3.4	3.8	3.7	4.3	3.9	4.2	3.8
Fukushima	2.9	3.3	2.8	2.9	2.9	NA	2.7	2.4	3.0	3.2	3.1	2.9	3.6
Ibaraki	2.7	2.9	3.1	2.8	3.3	3.5	3.6	4.3	4.2	4.3	4.7	5.4	5.6
Tochigi	2.4	2.9	3.0	2.7	3.0	3.0	2.5	2.9	3.4	2.7	3.1	3.3	3.7
Gunma	2.6	2.6	2.9	2.9	2.4	2.5	2.2	2.8	2.5	3.0	3.3	2.5	3.3
Saitama	2.1	2.7	2.3	2.5	2.7	2.8	2.1	1.7	2.2	2.5	1.8	2.7	2.2
Chiba	2.4	2.5	2.8	2.3	2.6	2.7	2.6	3.1	3.2	3.0	2.8	2.8	2.7
Tokyo	3.7	3.8	4.6	3.5	3.8	3.6	3.5	3.1	3.3	4.1	3.6	3.4	3.5
Kanagawa	3.8	2.5	2.4	2.2	2.1	2.3	2.7	2.6	2.4	2.7	2.7	2.7	3.1
Niigata	4.8	5.1	5.0	5.1	4.3	4.4	5.1	4.0	3.8	4.3	4.1	4.3	4.2
Toyama	4.0	3.7	4.2	3.8	4.0	3.5	2.8	2.8	2.6	3.4	3.2	2.7	3.5
Ishikawa	2.8	3.0	2.5	3.4	3.1	2.5	1.8	2.1	2.3	2.5	2.2	2.0	2.6
Fukui	6.0	6.1	7.0	7.1	6.7	6.6	7.5	6.5	3.0	2.8	3.7	4.1	3.8
Yamanashi	3.2	3.1	3.3	2.7	3.3	3.0	2.9	2.9	3.4	2.6	2.8	2.7	2.9

Table 1. *Cont.*

	Year												
Prefecture	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Nagano	2.9	3.9	3.7	3.7	4.1	3.5	3.7	3.0	4.1	3.7	4.0	3.3	3.6
Gifu	3.6	4.1	3.8	3.5	3.6	2.6	3.2	3.3	3.3	2.8	3.3	3.7	3.8
Shizuoka	3.9	3.5	3.2	3.6	2.7	2.9	2.3	2.0	2.6	3.3	2.7	2.5	3.0
Aichi	4.8	5.6	5.2	4.8	5.2	5.1	5.0	5.4	4.5	5.4	4.8	4.7	5.2
Mie	2.4	3.1	3.0	2.5	2.4	2.9	2.7	2.2	3.5	2.1	2.5	2.5	2.7
Shiga	2.7	2.7	3.3	3.0	2.5	2.5	2.6	2.8	2.2	2.8	2.7	2.7	2.8
Kyoto	4.1	4.0	4.0	3.9	4.1	3.1	3.9	3.6	3.9	3.5	3.9	3.9	4.8
Osaka	3.5	3.4	2.7	3.1	2.6	2.8	2.4	2.6	3.1	2.6	2.1	2.2	2.8
Hyogo	3.6	3.3	2.8	3.2	3.0	3.0	2.9	3.3	2.6	2.6	2.9	2.9	2.5
Nara	2.6	2.9	2.9	3.1	2.9	3.1	3.1	2.9	2.6	3.1	2.2	2.7	2.4
Wakayama	2.6	1.9	2.5	2.2	2.1	2.3	1.8	2.2	2.0	2.5	2.2	2.6	2.2
Tottori	6.9	6.6	6.6	6.7	6.9	6.7	6.0	4.8	4.5	4.8	5.1	4.9	4.9
Shimane	5.0	5.1	4.7	4.6	4.8	4.9	4.6	4.1	4.3	4.7	4.6	4.4	4.7
Okayama	2.8	2.8	3.5	3.6	3.5	2.9	4.1	3.2	3.5	3.9	3.8	3.5	4.0
Hiroshima	3.8	3.9	3.3	3.5	3.9	3.5	3.3	3.1	3.9	3.7	3.2	3.3	3.9
Yamaguchi	3.0	2.7	2.3	2.9	3.0	2.2	2.3	2.6	2.4	2.6	2.4	2.0	2.6
Tokushima	4.2	3.8	3.8	3.5	3.8	3.5	4.0	3.5	3.5	3.3	3.9	3.0	3.2
Kagawa	4.3	3.8	4.1	3.6	3.8	3.4	3.3	2.6	3.0	3.0	2.6	2.3	2.8
Ehime	1.8	2.2	1.9	1.9	2.7	2.4	2.3	2.0	2.6	2.8	NA	2.3	2.1
Kochi	2.8	2.4	2.5	2.9	2.8	2.4	2.5	2.7	2.4	2.2	2.7	2.6	3.3
Fukuoka	2.4	2.3	2.1	1.7	2.8	2.1	1.7	2.0	2.0	2.1	2.1	2.7	2.0
Saga	2.8	3.1	2.5	2.4	2.4	2.0	2.3	2.6	2.6	2.7	2.7	2.6	2.8
Nagasaki	2.9	2.8	2.4	2.5	3.1	2.8	3.1	2.8	2.6	2.6	2.4	2.9	3.1
Kumamoto	1.9	1.9	1.7	1.6	1.6	1.9	1.8	1.8	1.8	1.8	2.0	1.6	1.9
Oita	1.6	1.3	1.3	1.7	1.5	1.5	1.7	2.3	1.9	1.3	1.3	1.4	1.8
Miyazaki	1.9	1.5	1.9	1.4	1.8	1.6	1.5	1.3	1.4	1.5	1.6	1.5	1.4
Kagoshima	2.0	1.3	1.9	1.3	1.9	1.8	1.4	1.6	1.6	1.9	1.8	1.8	1.7
Okinawa	1.3	1.4	1.5	1.7	1.8	1.5	1.4	1.5	2.0	1.7	1.9	1.6	1.7

NA, not available.

Table 2 shows age-standardized prevalence rates of atopic dermatitis for each prefecture and year for girls. The rates among girls were slightly lower than the rates among boys. As was true among boys, the prevalence for girls tended to be stable across the years examined for Japan as a whole, but the prevalence increased by more than 1% in the analyzed periods for Hokkaido, Miyagi, and Ibaraki. On the other hand, the prevalence in Fukui, Osaka, Tottori, Tokushima, and Kagawa decreased more than 1% in the analyzed periods.

Table 2. Age-standardized prevalence of atopic dermatitis for each prefecture and year for girls.

	Year												
Prefecture	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
All of Japan	2.8	2.9	2.7	2.7	2.6	2.4	2.5	2.4	2.5	2.6	2.6	2.6	2.8
Hokkaido	2.9	2.9	2.5	2.9	2.0	2.0	3.0	2.1	3.3	3.5	4.0	4.1	4.2
Aomori	1.4	1.3	1.4	1.1	1.5	1.0	0.8	1.0	0.8	1.1	1.1	1.1	1.5
Iwate	1.7	2.2	1.8	2.1	1.9	NA	1.7	1.7	2.0	1.5	1.6	2.2	2.6
Miyagi	3.3	3.9	3.6	4.0	3.1	NA	3.3	3.4	3.0	4.2	3.7	3.5	4.8
Akita	3.1	3.6	2.9	2.9	2.9	2.5	2.9	2.9	3.0	2.7	3.1	3.2	3.3
Yamagata	3.8	3.1	3.1	2.8	2.9	2.5	2.8	3.0	2.9	3.2	3.1	3.0	3.2
Fukushima	2.4	2.6	2.1	2.0	2.1	NA	1.9	2.1	1.9	2.1	2.5	2.1	2.7
Ibaraki	2.6	2.5	2.4	2.5	2.8	3.0	3.2	3.9	3.6	3.5	4.4	4.8	5.0
Tochigi	2.4	2.3	2.3	2.1	2.4	2.6	2.1	2.2	2.4	2.1	2.5	2.9	3.3
Gunma	2.1	1.9	2.0	2.2	1.6	2.2	2.0	1.8	1.8	2.4	2.6	2.1	2.7
Saitama	1.6	2.3	2.1	1.9	2.0	2.1	1.3	1.4	1.6	1.7	1.8	2.3	1.8

Table 2. *Cont.*

	Year												
Prefecture	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Chiba	2.1	2.2	2.1	2.1	2.0	1.9	2.1	2.6	2.8	2.5	2.3	2.2	2.3
Tokyo	3.2	3.5	3.9	3.3	3.2	2.9	3.0	2.5	2.7	3.4	3.0	2.8	2.8
Kanagawa	3.0	2.0	2.1	2.4	1.8	1.7	2.5	2.2	1.8	2.2	2.3	2.3	2.8
Niigata	4.1	4.6	3.8	4.3	3.7	3.8	4.3	3.4	3.1	3.4	3.3	3.7	3.4
Toyama	3.4	3.1	3.3	2.8	2.8	2.3	2.3	2.5	1.7	2.2	2.6	2.5	2.7
Ishikawa	2.5	2.5	2.4	3.0	2.8	2.0	1.4	1.6	1.8	2.0	1.9	1.5	1.9
Fukui	5.5	5.8	6.2	6.2	6.2	6.1	6.9	6.0	2.3	2.2	2.7	3.4	3.3
Yamanashi	2.2	2.4	2.5	2.3	2.0	2.7	1.8	2.2	2.4	2.2	2.4	1.8	2.3
Nagano	2.7	3.3	2.8	3.6	3.4	2.9	2.9	2.5	3.8	3.1	3.1	2.6	3.0
Gifu	2.9	3.6	3.0	2.6	3.1	2.2	2.7	2.2	2.5	2.2	2.8	3.2	3.4
Shizuoka	3.6	3.5	2.9	3.2	2.3	2.5	2.1	1.7	2.4	2.7	2.4	2.0	2.6
Aichi	4.6	5.3	4.4	4.2	4.6	4.3	4.2	4.4	3.7	4.4	3.9	4.0	4.6
Mie	1.9	2.5	2.6	2.2	2.0	2.3	2.3	1.8	2.8	1.8	2.3	2.1	2.7
Shiga	2.3	2.4	2.7	2.5	2.1	2.1	2.3	2.3	1.9	2.4	2.2	2.3	2.2
Kyoto	3.5	3.6	3.5	3.3	3.4	2.6	3.2	3.0	3.4	3.0	3.2	3.0	4.2
Osaka	3.4	3.2	2.5	2.4	2.1	2.4	2.1	2.2	2.6	2.3	1.7	2.0	2.2
Hyogo	2.8	2.7	2.6	2.5	2.4	2.5	2.4	2.3	2.0	2.2	2.3	2.2	2.1
Nara	2.4	2.5	2.4	2.7	2.3	2.2	2.8	2.3	2.5	2.9	2.0	1.8	2.0
Wakayama	2.1	2.0	1.9	1.9	1.9	1.7	1.3	1.6	1.5	1.7	1.6	1.7	1.6
Tottori	6.7	6.1	6.1	6.0	6.4	5.9	5.5	4.1	4.2	3.8	4.5	4.5	4.4
Shimane	4.8	4.4	4.1	4.2	3.9	4.3	3.7	3.7	3.8	4.2	3.7	4.2	4.0
Okayama	2.6	2.3	3.0	3.0	3.4	2.6	2.8	3.1	2.9	2.9	3.2	3.1	3.5
Hiroshima	3.7	3.1	2.9	2.6	3.0	2.8	2.7	2.6	2.7	3.0	2.6	2.5	3.1
Yamaguchi	2.3	2.1	2.1	2.2	2.1	1.8	1.8	2.0	1.7	2.1	2.4	1.7	2.1
Tokushima	3.8	3.1	3.2	3.1	3.1	3.0	3.0	3.3	2.8	2.8	3.1	2.4	2.8
Kagawa	4.0	3.2	3.3	2.9	3.1	2.7	2.7	2.4	2.5	2.5	2.2	2.0	2.4
Ehime	1.6	2.0	1.7	1.9	1.9	2.2	1.8	1.9	2.0	2.1	3.1	1.8	1.8
Kochi	2.7	1.7	2.2	2.3	2.2	2.2	2.3	2.3	2.3	1.9	2.3	2.5	2.4
Fukuoka	1.8	1.9	2.0	1.4	2.6	1.5	1.5	1.6	1.8	2.0	1.6	2.3	1.6
Saga	2.6	2.7	2.4	2.1	2.2	1.6	1.9	2.2	2.3	2.4	1.9	1.8	1.8
Nagasaki	2.9	2.4	3.2	2.5	3.5	2.2	2.4	2.5	2.5	2.6	2.2	2.3	2.8
Kumamoto	2.0	1.8	1.4	1.3	1.8	1.3	1.9	1.6	1.8	1.7	1.9	1.4	1.4
Oita	1.4	1.1	1.6	1.9	1.6	1.5	1.5	2.2	1.8	1.3	1.5	1.1	1.3
Miyazaki	1.7	1.7	1.6	1.4	1.7	1.6	1.0	1.1	1.4	1.4	1.6	1.4	1.2
Kagoshima	1.7	1.3	1.7	1.4	1.4	1.6	1.7	1.6	1.2	1.9	1.8	1.8	1.8
Okinawa	1.2	1.5	1.6	1.9	1.7	1.4	1.3	1.5	1.7	1.7	1.7	1.6	1.8

NA, not available.

Table 3 shows the APC of the age-standardized prevalence for each prefecture. The APCs of Hokkaido, Ibaraki, and Okayama were significantly higher than zero for both boys and girls, and showed an increasing trend in age-standardized prevalence. On the other hand, the APCs of Niigata, Toyama, Ishikawa, Fukui, Osaka, Hyogo, Tottori, Tokushima, and Kagawa were significantly lower than zero for both boys and girls, and showed a decreasing trend in age-standardized prevalence.

Table 3. APC of age-standardized prevalence of atopic dermatitis for each prefecture.

	Men		**Women**	
Prefecture	**APC**	***p*-Value**	**APC**	***p*-Value**
All of Japan	−0.21 (−0.82, 0.40)	0.466	−0.56 (−1.44, 0.33)	0.196
Hokkaido	3.87 (0.84, 6.99)	0.017	4.30 (0.68, 8.05)	0.024
Aomori	−1.22 (−3.85, 1.49)	0.339	−1.68 (−4.82, 1.57)	0.276
Iwate	−0.94 (−3.54, 1.73)	0.447	0.53 (−2.12, 3.25)	0.669

Table 3. *Cont.*

	Men		Women	
Prefecture	**APC**	***p*-Value**	**APC**	***p*-Value**
Miyagi	0.99 (−1.07, 3.08)	0.313	0.98 (−1.22, 3.23)	0.349
Akita	−0.00 (−0.96, 0.97)	0.994	0.18 (−1.36, 1.74)	0.807
Yamagata	0.26 (−1.13, 1.67)	0.689	−0.35 (−1.87, 1.19)	0.625
Fukushima	0.63 (−1.07, 2.36)	0.428	0.22 (−1.85, 2.33)	0.818
Ibaraki	6.36 (5.42, 7.31)	0.000	6.40 (5.01, 7.80)	0.000
Tochigi	1.91 (0.37, 3.48)	0.020	1.76 (−0.24, 3.79)	0.079
Gunma	1.19 (−0.74, 3.15)	0.204	1.92 (−0.45, 4.34)	0.103
Saitama	−0.94 (−3.68, 1.87)	0.473	−0.74 (−3.66, 2.28)	0.598
Chiba	1.57 (0.27, 2.88)	0.022	1.31 (−0.32, 2.98)	0.105
Tokyo	−1.09 (−2.61, 0.45)	0.147	−1.86 (−3.40, −0.29)	0.024
Kanagawa	0.39 (−2.18, 3.02)	0.749	0.39 (−2.28, 3.14)	0.756
Niigata	−1.70 (−2.87, −0.51)	0.009	−2.16 (−3.52, −0.79)	0.005
Toyama	−2.62 (−4.65, −0.55)	0.018	−2.82 (−5.28, −0.29)	0.032
Ishikawa	−2.63 (−5.07, −0.12)	0.042	−4.02 (−6.78, −1.18)	0.010
Fukui	−6.24 (−10.15, −2.15)	0.007	−7.48 (−12.06, −2.66)	0.006
Yamanashi	−1.19 (−2.49, 0.13)	0.072	−0.77 (−2.69, 1.19)	0.402
Nagano	0.35 (−1.35, 2.07)	0.663	−0.23 (−2.34, 1.92)	0.814
Gifu	−0.74 (−2.84, 1.40)	0.457	−0.53 (−3.24, 2.25)	0.680
Shizuoka	−2.57 (−5.10, 0.02)	0.052	−3.39 (−6.20, −0.49)	0.026
Aichi	−0.24 (−1.29, 0.82)	0.620	−1.06 (−2.37, 0.27)	0.106
Mie	−0.67 (−2.95, 1.66)	0.538	0.26 (−2.07, 2.65)	0.812
Shiga	−0.63 (−2.21, 0.98)	0.403	−0.76 (−2.20, 0.70)	0.274
Kyoto	0.29 (−1.34, 1.96)	0.701	−0.22 (−2.14, 1.74)	0.811
Osaka	−2.74 (−4.63, −0.81)	0.010	−3.40 (−5.36, −1.40)	0.003
Hyogo	−2.01 (−3.30, −0.71)	0.006	−2.23 (−3.06, −1.40)	0.000
Nara	−1.21 (−2.86, 0.48)	0.142	−1.57 (−3.60, 0.50)	0.122
Wakayama	0.05 (−1.93, 2.08)	0.955	−2.05 (−3.58, −0.50)	0.014
Tottori	−3.72 (−5.16, −2.25)	0.000	−4.19 (−5.83, −2.53)	0.000
Shimane	−0.86 (−1.74, 0.02)	0.055	−1.04 (−2.20, 0.12)	0.075
Okayama	2.15 (0.47, 3.86)	0.017	1.75 (0.24, 3.28)	0.027
Hiroshima	−0.36 (−1.79, 1.08)	0.588	−1.33 (−2.90, 0.27)	0.094
Yamaguchi	−1.69 (−3.47, 0.12)	0.064	−0.81 (−2.47, 0.88)	0.310
Tokushima	−1.61 (−2.75, −0.46)	0.011	−1.98 (−3.19, −0.74)	0.005
Kagawa	−4.31 (−5.61, −2.99)	0.000	−4.40 (−5.62, −3.16)	0.000
Ehime	1.47 (−0.92, 3.91)	0.202	1.45 (−1.18, 4.15)	0.253
Kochi	0.40 (−1.32, 2.15)	0.621	0.41 (−1.51, 2.37)	0.652
Fukuoka	−0.23 (−2.77, 2.38)	0.849	−0.12 (−2.98, 2.82)	0.930
Saga	−0.00 (−1.83, 1.86)	0.997	−2.33 (−4.42, −0.20)	0.035
Nagasaki	0.06 (−1.37, 1.51)	0.929	−1.20 (−3.34, 1.00)	0.253
Kumamoto	0.15 (−1.15, 1.47)	0.806	−0.60 (−3.17, 2.05)	0.626
Oita	0.89 (−2.06, 3.93)	0.525	−0.84 (−4.05, 2.48)	0.585
Miyazaki	−1.72 (−3.31, −0.11)	0.039	−2.05 (−4.40, 0.37)	0.088
Kagoshima	0.78 (−1.75, 3.38)	0.513	1.60 (−0.41, 3.66)	0.108
Okinawa	2.05 (0.26, 3.86)	0.028	1.35 (−0.61, 3.36)	0.159

APC, annual percentage change.

The descriptive statistics for the predictor variables are shown in Table 4. The data from 47 prefectures from over a period of 13 years were used in this study, while there were some missing data.

Table 4. Characteristics of explanatory variables used in this study.

Explanatory Variable	Median (Interquartile Range)
Population	1,675,000 (1,124,446–2,833,000)
Population density (persons per hectare)	8.3 (6.3–12.3)
Proportion of public assistance recipients	1.2 (0.8–1.7)
Taxable income per capita (JPY 1000)	1274.4 (1115.2–1394.5)
Proportion of high-school graduates going to a higher educational institution	50.9 (44.7–55.5)
Annual average temperature (°C)	16.1 (14.7–16.9)
Annual daylight hours (h)	1943.6 (1776.2–2103.1)
Annual average relative humidity (%)	69.0 (66.0–73.0)
Mean of annual average SO_2 concentration (ppb)	1.7 (1.1–2.9)
Mean of annual average NO_2 concentration (ppb)	9.3 (6.8–12.3)
Mean of annual average CO concentration (0.1 ppm)	3.7 (3.0–4.5)
Mean of annual average SPM concentration ($\mu g/m^3$)	19.3 (16.7–22.4)
Number of hospitals with an allergy department per 100,000 persons	0.3 (0.2–0.5)
Number of hospitals with a dermatology department per 100,000 persons	2.5 (2.2–3.0)
Number of medical clinics per 100,000 persons	79.3 (71.3–88.4)

SPRC, standardized partial regression coefficient; CI, confidence intervals; SO_2, sulfur dioxide; NO_2, nitrogen dioxide; CO, carbon monoxide; SPM, suspended particulate matter.

Table 5 shows the results of the regression analysis. There were missing values in seven and eight observations of boys and girls, respectively, and those observations were not used in the analysis. As a result, the year was significantly and negatively associated and the number of medical clinics per 100,000 persons was significantly and positively associated with the age-standardized prevalence in girls. The taxable income per capita was significantly and positively associated with the age-standardized prevalence both in boys and in girls.

Table 5. Results of regression analysis.

	Boys		Girls	
Explanatory Variable	**SPRC (95% CI)**	***p*-Value**	**SPRC (95% CI)**	***p*-Value**
Year	−0.108 (−0.241, 0.023)	0.119	−0.152 (−0.299, −0.009)	0.045
Population	0.244 (−0.353, 0.844)	0.425	0.188 (−0.443, 0.825)	0.561
Population density	−0.411 (−0.965, 0.148)	0.157	−0.488 (−1.076, 0.106)	0.113
Proportion of public assistance recipients	−0.104 (−0.346, 0.123)	0.387	−0.063 (−0.322, 0.182)	0.632
Taxable income per capita (JPY 1000)	0.273 (0.088, 0.456)	0.004	0.439 (0.236, 0.638)	<0.001
Proportion of high-school graduates going to a higher educational institution	0.084 (−0.090, 0.263)	0.361	0.021 (−0.168, 0.211)	0.831
Annual average temperature (°C)	−0.088 (−0.264, 0.069)	0.300	0.049 (−0.139, 0.217)	0.593
Annual daylight hours (h)	−0.010 (−0.081, 0.059)	0.780	−0.048 (−0.125, 0.027)	0.220
Annual average relative humidity (%)	0.037 (−0.049, 0.124)	0.399	0.062 (−0.032, 0.157)	0.203
Mean of annual average SO_2 concentration (ppb)	−0.061 (−0.172, 0.045)	0.275	−0.083 (−0.202, 0.036)	0.179
Mean of annual average NO_2 concentration (ppb)	0.087 (−0.145, 0.312)	0.462	0.108 (−0.147, 0.352)	0.404
Mean of annual average CO concentration (0.1 ppm)	−0.053 (−0.131, 0.020)	0.170	−0.023 (−0.107, 0.058)	0.597
Mean of annual average SPM concentration ($\mu g/m^3$)	−0.020 (−0.133, 0.090)	0.726	−0.033 (−0.156, 0.088)	0.599
Number of hospitals with an allergy department per 100,000 persons	−0.043 (−0.148, 0.062)	0.432	−0.092 (−0.205, 0.025)	0.126
Number of hospitals with a dermatology department per 100,000 persons	0.064 (−0.080, 0.220)	0.403	0.060 (−0.098, 0.231)	0.468
Number of medical clinics per 100,000 persons	0.230 (−0.008, 0.472)	0.071	0.272 (0.016, 0.532)	0.046

SPRC, standardized partial regression coefficient; CI, confidence intervals; SO_2, sulfur dioxide; NO_2, nitrogen dioxide; CO, carbon monoxide; SPM, suspended particulate matter.

4. Discussion

In this study, we identified trends across time in the prevalence of atopic dermatitis in individual Japanese prefectures and identified the factors associated with this prevalence.

The prevalence of atopic dermatitis tended to be higher in boys than in girls. In a previous study, which investigated the prevalence of atopic dermatitis in children in Japan, the prevalence was also a little higher in boys [7]. According to a study on the relationships between atopic dermatitis and the indoor environmental factors among school children in Japan, the presence of mold in the home was a risk factor for boys but not for

girls [17]. Indoor environmental factors, such as mold and mites, are risk factors for atopic dermatitis [18,19], and sensitization to these allergens might differ according to gender. A previous study, in Belgium, also showed that sensitization to allergens, such as mites, was higher in boys than in girls among schoolchildren [20]. Moreover, in Norway, atopic dermatitis had an earlier onset in boys than in girls among children aged <6 years [21]. Therefore, the early onset of atopic dermatitis in boys among preschoolers might have affected this gender difference among schoolchildren in Japan. Furthermore, it was shown that boys suffer more often from atopic dermatitis, whereas girls suffer more often from eczema unrelated to atopy [22]. This might also have been related to the gender difference.

The taxable income per capita and prevalence were found to be significantly positively associated. This is consistent with reports of an association between high socioeconomic status and atopic dermatitis prevalence around the world [23] and in Osaka, Japan [10], but inconsistent with at least one report indicating that there are many studies showing no association [24]. In another study in Japan, the investigators found that the consultation rates for atopic dermatitis in children were positively related to income level [25], and it is possible that the lower consultation rates for atopic dermatitis symptoms among socioeconomically disadvantaged persons explain at least part of this association. Medical service use is also pointed out as a possible factor for the association between socioeconomic status and atopic dermatitis in Korea [26]. In fact, there is one study showing that income level is positively associated with the overall utilization of health care services in Japan [27]. In the School Health Statistics Research, some participants were diagnosed with atopic dermatitis by a physician in a context other than a medical checkup in school, whereas others were diagnosed by a physician during a medical checkup in school, which is free of charge. It is possible that the children in our study who were from low-income homes had fewer opportunities than the children who were not from low-income homes to be diagnosed with atopic dermatitis by a physician in a setting other than a medical checkup in school.

The hygiene hypothesis has been suggested as another possible explanation for the association between socioeconomic status and the prevalence of atopic dermatitis [26]. It is suggested that factors such as a decrease in exposure to endotoxin due to improvements in hygiene are possibly related to immune response against external antigens [28]. However, it is not certain whether hygiene environments differ depending on income level in Japan. Regarding another factor, smoking is known to be associated with the incidence of atopic dermatitis [29], but it is known that smoking prevalence is higher in lower income classes in Japan [30]. Obesity is another risk factor for atopic dermatitis [31], but it is also known to be associated with lower household income for women in Japan [32]. Therefore, it is considered that income or obesity do not explain the association between income and the prevalence of atopic dermatitis.

The year was significantly negatively associated with the prevalence for girls in the present study, and a non-significant negative association was observed in boys. The number of patients with atopic dermatitis is known to be increasing in Japan [6], whereas the prevalence in children in Japan did not increase in the present study. This disparate set of findings suggests that the treatment rate, rather than the prevalence, of atopic dermatitis has increased in recent years. Smoking is a risk factor for atopic dermatitis [29], and its prevalence continues to decrease in Japan [33]. Therefore, the decreasing prevalence of smoking might be a factor for the effect of year on the prevalence of atopic dermatitis. Breastfeeding is another risk factor of atopic dermatitis in Japan [34], whereas the association between breastfeeding and atopic dermatitis is not conclusive [35]. However, the prevalence of breastfeeding increased from 2005 to 2015 [36], and other factors are thought to be related to the effect of year.

The number of medical clinics per 100,000 residents was also positively associated with atopic dermatitis prevalence for girls in the present study. One possible explanation for this finding is that atopic dermatitis may be more likely to be diagnosed in prefectures with more medical clinics. If medical clinics do not exist in a neighborhood, a child might

not be diagnosed with atopic dermatitis, even if he or she meets the diagnostic criteria for the condition. Although a statistically significant difference in the number of medical clinics per 100,000 residents was not observed for boys, a positive association with prevalence was observed.

In this study, we also found that trends in age-standardized prevalence rates over time differed by prefecture, and it is important to understand the reasons for the increasing prevalence over the years in some prefectures. In addition, it was revealed that regional income levels and the prevalence of atopic dermatitis are related in Japan, and a study investigating the reasons for this association is needed. Furthermore, a study targeting individuals and collecting various kinds of data from participants is needed. In addition, an epidemiological study using a single set of diagnostic criteria for atopic dermatitis may be needed in order to understand the reason for the association between income and the prevalence of atopic dermatitis.

One limitation of the present study involves the fact, mentioned above, that the diagnoses of atopic dermatitis were obtained from the participants in one of two different settings. Therefore, there might be regional differences in the proportion of the two types of diagnoses, depending on the prefecture. Second, this is an ecological study, and an ecological fallacy might actually explain the results. Third, air pollution monitoring stations in Japan are not evenly distributed across prefectures, which raises the possibility that measurements of air pollution concentrations may be less accurate in prefectures with relatively few stations. Fourth, we could not obtain data on the number of clinics by type for each year, and used the number of medical clinics as a whole in the analysis instead. Fifth, the data on some risk factors, such as water hardness, diets, smoking prevalence, genetic factors, and the prevalence of breastfeeding, for each prefecture and year, could not be obtained. These are also risk factors for atopic dermatitis [37,38]. Sixth, the data on the severity or body sites of atopic dermatitis were also not available in the School Health Statistics Research data, and it would be meaningful to survey these factors in an epidemiological study in the future.

5. Conclusions

In this study, we examined the prevalence of atopic dermatitis and changes in its prevalence rates over time among schoolchildren in each prefecture in Japan and identified the factors associated with regional differences in this prevalence. We found that the age-standardized prevalence of atopic dermatitis tended to remain stable across the years that were examined for both boys and girls, but the trend in the prevalence varied across prefectures. We also found that, in Japan as a whole, the year was negatively associated with the age-standardized prevalence of atopic dermatitis in girls, whereas the number of medical clinics per 100,000 persons was positively associated with the prevalence. The taxable income per capita was positively associated with the age-standardized prevalence rates both in boys and in girls. Our findings suggest the importance of gaining a better understanding of the reasons for the increasing prevalence of atopic dermatitis over the years in some prefectures, as well as an understanding of the association between this prevalence and taxable income per capita.

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References

1. Laughter, M.R.; Maymone, M.B.C.; Mashayekhi, S.; Arents, B.W.M.; Karimkhani, C.; Langan, S.M.; Dellavalle, R.P.; Flohr, C. The global burden of atopic dermatitis: Lessons from the Global Burden of Disease Study 1990–2017. *Br. J. Dermatol.* **2021**, *184*, 304–309. [CrossRef] [PubMed]
2. Nutten, S. Atopic dermatitis: Global epidemiology and risk factors. *Ann. Nutr. Metab.* **2015**, *66* (Suppl. S1), 8–16. [CrossRef] [PubMed]
3. Urban, K.; Chu, S.; Giesey, R.L.; Mehrmal, S.; Uppal, P.; Nedley, N.; Delost, G.R. The global, regional, and national burden of atopic dermatitis in 195 countries and territories: An ecological study from the Global Burden of Disease Study 2017. *JAAD Int.* **2020**, *2*, 12–18. [CrossRef] [PubMed]
4. Hadi, H.A.; Tarmizi, A.I.; Khalid, K.A.; Gajdács, M.; Aslam, A.; Jamshed, S. The epidemiology and global burden of atopic dermatitis: A narrative review. *Life* **2021**, *11*, 936. [CrossRef] [PubMed]
5. Al-Afif, K.A.M.; Buraik, M.A.; Buddenkotte, J.; Mounir, M.; Gerber, R.; Ahmed, H.M.; Tallman, A.M.; Steinhoff, M. Understanding the burden of atopic dermatitis in Africa and the Middle East. *Dermatol. Ther. (Heidelb.)* **2019**, *9*, 223–241. [CrossRef]
6. The Patient Survey. Available online: https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00450022&tstat=000001031167 (accessed on 18 October 2021).
7. Research Report for Allergic Diseases. Available online: https://www.gakkohoken.jp/uploads/books/photos/v00057v4d80367f62adc.pdf (accessed on 18 October 2021).
8. Saeki, H.; Iizuka, H.; Mori, Y.; Akasaka, T.; Takagi, H.; Kitajima, Y.; Tezuka, T.; Tanaka, T.; Hide, M.; Yamamoto, S.; et al. Prevalence of atopic dermatitis in Japanese elementary schoolchildren. *Br. J. Dermatol.* **2005**, *152*, 110–114. [CrossRef]
9. How Allergic Diseases in Japan is in the Progress of Change. Available online: https://allergyportal.jp/wp/wp-content/uploads/2020/04/21074358/epidemiological_investigation_2020.pdf (accessed on 18 October 2021). (In Japanese)
10. Yura, A.; Shimizu, T. Trends in the prevalence of atopic dermatitis in school children: Longitudinal study in Osaka Prefecture, Japan, from 1985 to 1997. *Br. J. Dermatol.* **2001**, *145*, 966–973. [CrossRef]
11. The School Health Statistics Research. Available online: https://www.e$-$stat.go.jp/stat$-$search/files?page=1&toukei=00400002&tstat=000001011648 (accessed on 18 October 2021).
12. Overview of the School Health Statistics Research. Available online: https://www.mext.go.jp/b_menu/toukei/chousa05/hoken/1268826.htm (accessed on 18 October 2021). (In Japanese)
13. State of Prefecture and Municipality (System of Social and Demographic Statistics). Available online: https://www.e-stat.go.jp/regional-statistics/ssdsview (accessed on 18 October 2021).
14. The Environmental Database. Available online: https://www.nies.go.jp/igreen/ (accessed on 18 October 2021).
15. The Census. Available online: https://www.e$-$stat.go.jp/stat$-$search/files?page=1&toukei=00200521&result_page=1 (accessed on 18 October 2021).
16. R: A Language and Environment for Statistical Computing. Available online: https://www.R-project.org/ (accessed on 18 October 2021).
17. Ukawa, S.; Araki, A.; Kanazawa, A.; Yuasa, M.; Kishi, R. The relationship between atopic dermatitis and indoor environmental factors: A cross-sectional study among Japanese elementary school children. *Int. Arch. Occup. Environ. Health* **2013**, *86*, 777–787. [CrossRef]
18. Xu, F.; Yan, S.; Zheng, Q.; Li, F.; Chai, W.; Wu, M.; Kan, H.; Norback, D.; Xu, J.; Zhao, Z. Residential Risk Factors for Atopic Dermatitis in 3- to 6-Year Old Children: A Cross-Sectional Study in Shanghai, China. *Int. J. Environ. Res. Public Health* **2016**, *13*, 537. [CrossRef]
19. Kim, J.; Lee, S.; Woo, S.Y.; Han, Y.; Lee, J.H.; Lee, I.Y.; Lim, I.S.; Choi, E.S.; Choi, B.W.; Cheong, H.K.; et al. The indoor level of house dust mite allergen is associated with severity of atopic dermatitis in children. *J. Korean Med. Sci.* **2013**, *28*, 74–79. [CrossRef]
20. Govaere, E.; Van Gysel, D.; Massa, G.; Verhamme, K.M.; Doli, E.; De Baets, F. The influence of age and gender on sensitization to aero-allergens. *Pediatr. Allergy Immunol.* **2007**, *18*, 671–678. [CrossRef] [PubMed]
21. Mohn, C.H.; Blix, H.S.; Halvorsen, J.A.; Nafstad, P.; Valberg, M.; Lagerløv, P. Incidence Trends of Atopic Dermatitis in Infancy and Early Childhood in a Nationwide Prescription Registry Study in Norway. *JAMA Netw. Open* **2018**, *1*, e184145. [CrossRef] [PubMed]
22. Möhrenschlager, M.; Schäfer, T.; Huss-Marp, J.; Eberlein-König, B.; Weidinger, S.; Ring, J.; Behrendt, H.; Krämer, U. The course of eczema in children aged 5-7 years and its relation to atopy: Differences between boys and girls. *Br. J. Dermatol.* **2006**, *154*, 505–513. [CrossRef] [PubMed]
23. Chung, J.; Simpson, E.L. The socioeconomics of atopic dermatitis. *Ann. Allergy Asthma Immunol.* **2019**, *122*, 360–366. [CrossRef] [PubMed]
24. Bajwa, H.; Baghchechi, M.; Mujahid, M.; Kang-Dufour, M.S.; Langan, S.M.; Abuabara, K. Mixed evidence on the relationship between socioeconomic position and atopic dermatitis: A systematic review. *J. Am. Acad. Dermatol.* **2022**, *86*, 399–405. [CrossRef]

25. Abe, A. Health Disparity in Children: Is There a Difference in the Effect of Past Illness? *J. Health Care Med. Community* **2012**, *22*, 255–269. (In Japanese)
26. Lee, K.S.; Rha, Y.H.; Oh, I.H.; Choi, Y.S.; Choi, S.H. Socioeconomic and sociodemographic factors related to allergic diseases in Korean adolescents based on the Seventh Korea Youth Risk Behavior Web-based Survey: A cross-sectional study. *BMC Pediatr.* **2016**, *16*, 19. [CrossRef]
27. Fujita, M.; Sato, Y.; Nagashima, K.; Takahashi, S.; Hata, A. Income Related Inequality of Health Care Access in Japan: A Retrospective Cohort Study. *PLoS ONE* **2016**, *11*, e0151690. [CrossRef]
28. Matsuda, A. A reconsideration of the hygiene hypothesis based on the latest basic research achievements. *Jpn. J. Allergol.* **2019**, *68*, 29–34. (In Japanese)
29. Kantor, R.; Kim, A.; Thyssen, J.P.; Silverberg, J.I. Association of atopic dermatitis with smoking: A systematic review and meta-analysis. *J. Am. Acad. Dermatol.* **2016**, *75*, 1119–1125.e1. [CrossRef]
30. Fukuda, Y.; Nakamura, K.; Takano, T. Socioeconomic pattern of smoking in Japan: Income inequality and gender and age differences. *Ann. Epidemiol.* **2005**, *15*, 365–372. [CrossRef] [PubMed]
31. Zhang, A.; Silverberg, J.I. Association of atopic dermatitis with being overweight and obese: A systematic review and metaanalysis. *J. Am. Acad. Dermatol.* **2015**, *72*, 606–616.e4. [CrossRef] [PubMed]
32. Nakamura, T.; Nakamura, Y.; Saitoh, S.; Okamura, T.; Yanagita, M.; Yoshita, K.; Kita, Y.; Murakami, Y.; Yokomichi, H.; Nishi, N.; et al. Relationship Between Socioeconomic Status and the Prevalence of Underweight, Overweight or Obesity in a General Japanese Population: NIPPON DATA2010. *J. Epidemiol.* **2018**, *28* (Suppl. S3), S10–S16. [CrossRef] [PubMed]
33. Okui, T. An age-period-cohort analysis of the difference in smoking prevalence between urban and non-urban areas in Japan (2004–2019). *Epidemiol. Health* **2020**, *42*, e2020072. [CrossRef] [PubMed]
34. Ito, J.; Fujiwara, T. Breastfeeding and risk of atopic dermatitis up to the age 42 months: A birth cohort study in Japan. *Ann. Epidemiol.* **2014**, *24*, 267–272. [CrossRef] [PubMed]
35. Karino, S.; Okuda, T.; Uehara, Y.; Toyo-oka, T. Breastfeeding and prevalence of allergic diseases in Japanese university students. *Ann. Allergy Asthma Immunol.* **2008**, *101*, 153–159. [CrossRef]
36. Overview of the Results of National Nutrition Survey on Preschool Children. Available online: https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000134208.html (accessed on 18 October 2021).
37. Martin, M.J.; Estravís, M.; García-Sánchez, A.; Dávila, I.; Isidoro-García, M.; Sanz, C. Genetics and Epigenetics of Atopic Dermatitis: An Updated Systematic Review. *Genes* **2020**, *11*, 442. [CrossRef]
38. Kantor, R.; Silverberg, J.I. Environmental risk factors and their role in the management of atopic dermatitis. *Expert Rev. Clin. Immunol.* **2017**, *13*, 15–26. [CrossRef]