Original Article

Seasonal variation in the month of first visit for atopic dermatitis patients

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ABSTRACT

The total number of new attendant patients diagnosed as having atopic dermatitis at our dermatology out-patient clinic during the 7 year period from 1989 to 1995 was 10,156. Patients from each year during this period were divided into eight age groups. The birth month and the month of first visit for each age group was obtained in average of 7 years. Only for subjects aged <1 year was there a definite tendency for higher birth numbers in autumn and lower birth numbers in spring. The percent birth rate for subjects <1 year of age was significantly higher in October and November and significantly lower in March and May in comparison with the expected percent birth rates calculated on the basis of birth months of the Japanese population. Similarly, patients aged <1 year, 1–2 and 3–5 years showed a tendency for higher numbers of first visits in spring and, in addition, patients aged <1 year showed a tendency for smaller numbers of first visits in summer. At school and college ages, between 6 and 20 years of age, a steep increase of first visits was observed in March and a smaller increase of first visits was observed between July and August. We investigated whether the distribution of birth month for subjects aged <1 year was statistically significant. The percent first visiting month was significantly higher in March and April and lower between July and October in comparison with the expected percentage first visiting month. We speculated that the uneven distribution of birth month was a reflection of a more marked distortion observed in the distribution of the month of first visit. The mean age at first visit (6.24 months) explains the difference between first visiting month and birth month. There were no definite social reasons for the increase in the number of first visits in spring for subjects aged <1 year. Therefore, the uneven distribution of the month of first visit for subjects aged <1 year could probably be the result of climatic effects.

Key words: atopic dermatitis, bias, birth, periodicity, risk factor, season.

INTRODUCTION

Atopic dermatitis (AD) is a multifactorial disease. The manifestation of AD is determined not only by hereditary traits but also by other factors, such as chemical irritants to the skin, bacterial colonization on the surface epidermis, IgE and/or contact allergy, climatic changes with changing seasons, psychological stresses etc. Of these, the most unusual is the effect of season on AD. There are some reports that AD is more frequent in subjects born in particular seasons1–2 and, in the present study, we investigated the hypothesis that the seasonal variation in the month of first visits observed for subjects with AD may be a factor influencing the seasonal variation seen in the birth month.

METHODS

New attendants at our out-patient clinic diagnosed as having AD according to the Japanese Dermatological Association Criteria for the diagnosis of AD3 were collected.
from medical records over a 7-year period (1989–95). The number of new AD patients each year during this period was 1281, 1162, 1170, 1288, 1943, 1598 and 1714, respectively, and the total number over 7 years was 10,156.

Table 1. Age distribution of patients

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0</td>
<td>1816</td>
<td>734</td>
<td>1077</td>
</tr>
<tr>
<td>1–2</td>
<td>1302</td>
<td>698</td>
<td>604</td>
</tr>
<tr>
<td>3–5</td>
<td>960</td>
<td>493</td>
<td>467</td>
</tr>
<tr>
<td>6–10</td>
<td>772</td>
<td>405</td>
<td>367</td>
</tr>
<tr>
<td>11–15</td>
<td>904</td>
<td>497</td>
<td>407</td>
</tr>
<tr>
<td>16–20</td>
<td>1476</td>
<td>874</td>
<td>602</td>
</tr>
<tr>
<td>21–30</td>
<td>2155</td>
<td>1363</td>
<td>792</td>
</tr>
<tr>
<td>31+</td>
<td>771</td>
<td>446</td>
<td>325</td>
</tr>
<tr>
<td>Total</td>
<td>10,156</td>
<td>5515</td>
<td>4641</td>
</tr>
</tbody>
</table>

Male patients exceeded female patients every year and the male:female ratio in the total patient population was 1.18 (Table 1). Patients from each year were divided into eight groups according to age (<1 year of age, 1–2, 3–5, 6–10, 11–15, 16–20, 21–30 and >30 years) and then further divided into groups by birth month or the month of first visit. Mean (± SD) data for these 7 years were obtained as patient numbers and as the percentage patient numbers for each of the resulting 96 groups.

The Student’s t-test was used for statistical analysis.

RESULTS

Birth month

The birth month of patients in each age group is summarized in Fig. 1. For patients aged <1 year, there were more subjects born between August and October and

Fig. 1 The birth month of atopic dermatitis patients in different age groups showing the number of patients born in each month.

(a) Patients less than 5 years of age. (■), <1 year; (●), 1–2 years; (▲), 3–5 years. (b) Patients between 6 and 20 years of age. (■), 6–10 years; (●), 11–15 years; (▲), 16–20 years. (c) Patients <21 years of age. (■), 21–30 years; (●), >30 years. (d) Patients of all ages.
fewer born between February and May. The birth month of the other age groups did not show any definite seasonal variation; however, all ages (total number of patients) showed some similarity to the trend seen for subjects aged <1 year. Therefore, it was thought that the uneven distribution in birth month could only be recognized at ages <1 year.

We then investigated whether the uneven distribution of birth month at ages <1 year was statistically significant. The expected monthly birth number was obtained for each year by calculations based on the total number of new AD patients for each year and the birth month for the Japanese population during each year. Then, the mean (± SD) of 7 years was obtained for expected birth month. Statistical tests were performed to compare the actual birth number and the expected birth number for each month. Only weak statistical significance (P < 0.05) was detected in April and September. Because the number of new patients aged <1 year varied for each year (229, 192, 201, 205, 328, 314 and 356 from 1989 to 1995, respectively) and because the population size was large enough, a statistical examination was also performed between actual percentage birth number and the expected percentage birth number for each month. Strong statistical significance (P < 0.001) was detected in March, April, October and November (Fig. 2). Therefore, it was concluded that the birth rate of AD patients aged <1 year was significantly lower in March and April and higher in October and November.

Month of first visit

The month of first visit for AD patients in each age group is summarized in Fig. 3. Patients aged <1 year showed a higher number of first visits between March and May and a lower number of first visits between July and September, forming a near normal distribution with a peak in March. At age 1–2 years, this tendency was similar but less prominent. At age 3–5 years, slightly higher numbers of first visits were observed between March and May. At ages 6–10, 11–15 and 16–20 years, completely different distribution patterns for month of first visit were seen compared with those seen for the ≤5 year age groups. Two peaks were observed for the month of first visit for patients between 6 and 20 years of age; one in March and the other in August or July. Subjects aged 21–30 years showed a plateau peak for the month of first visit between May and July and, for subjects >30 years of age, only a small peak was observed in July. For all ages, the month of first visit peaked in March and was followed by a high plateau between April and August with a sudden drop in numbers in September.

Although the two peaks seen in March and August (or July) for school and college age subjects (6–20 years) could be related to spring and summer vacations, respectively, there are no such explanations for the characteristic distribution pattern seen for subjects <1 year of age. Therefore, we tested this distribution pattern to determine whether it was statistically significant. The expected number of first visits for 12 months was calculated for each month from the total number of new AD patients for the year and the number of hospital working days in each month during the same year. Then, the mean ± SD of 7 years was obtained for each month for the expected number of first visits. Statistical tests were performed to compare actual and expected numbers of first visits during each month. Statistical significance was detected in March, July, August and September (all P < 0.01) and also in April, May and October (all P < 0.05). A statistical analysis was also performed to compare actual percentage number of first visits and expected percentage number of first visits. Statistical significance was detected in April, July, August, September and October (all P < 0.001), March and November (both P < 0.01) and May (P < 0.05; Fig. 4). It was therefore concluded that the first visit for AD patients aged <1 year occurred significantly more frequently between March and May and significantly less frequently between July and November.
Fig. 3  The month of first visit of atopic dermatitis patients in different age groups showing the number of patients seen in each month. (a) Patients less than 5 years of age. [●], < 1 year; [●], 1–2 years; [●], 3–5 years. (b) Patients between 6 and 20 years of age. [●], 6–10 years; [●], 11–15 years; [●], 16–20 years. (c) Patients >20 years of age. [●], 21–30 years; [●], >30 years. (d) Patients of all ages.

Fig. 4  Month of first visit of atopic dermatitis patients less than 1 year of age showing the percentage of patients seen in each month. [●], expected number of patients; [●], actual number of patients. *p < 0.001, †p < 0.01, ‡p < 0.05.

Fig. 5  The age of patients (<1 year of age) at their first visit (in months). Columns show the average number of patients per year. The bars indicate 1 SD.
Age at first visit

The age at first visit of patients <1 year is shown in Fig. 5. Patients visited most frequently between 3 and 5 months of age, with a peak at 4 months of age (approximately 43 patients/year; 16.6% of those seen each year). The number of first-time patients gradually decreased for those subjects aged 6–11 months, forming a slowly declining plateau with a relatively high number (approximately 16 patients a year were seen at 11 months of age; 6.2% of those seen each year). The mean age at first visit for subjects <1 year of age over the 7 year period was 6.24 months.

DISCUSSION

There are several reports that the distribution of birth month for AD patients is not equal throughout the year. Beck and Hagdrup\(^1\) in Odense analyzed the birth month of 210 patients with AD and observed a significantly higher prevalence of births during May–November in comparison with the expected distribution. Meffert et al.\(^2\) in Berlin and Yamamoto and Sasaki\(^3\) in Tokyo demonstrated that infants (0–2 years of age) born from September to November were affected more frequently with AD. Similarly, in the present study, for infants <1 year of age and with AD, significantly more were born in October and November and significantly fewer were born in March and May.

In contrast, we have been noticing for some years that infant patients with AD present less frequently in summer, in striking contrast with schoolchildren who more frequently present in summer. This was clearly confirmed in the present study.

In most areas of Japan, including our hospital area, there are usually three school vacations. In primary and junior high schools, for example, there are 14 days spring vacation at the end of March, nearly 40 days summer vacation starting late in July and approximately 14 days winter vacation (including approximately 5 days hospital out-patient off duty). It is evident that frequent first visits in March and August (or July) for school and college age patients are, at least in part, due to the timing of their vacations. The dramatic drop of numbers of first visits in September and a less marked drop in numbers in April probably reflect an after-vacation effect. However, in the present study, the number of new patients in March was unusually high in comparison with numbers in August taking into consideration the length of the vacation. There was no increase in the number of new patients in winter. Rather, winter was the season of least first visits to the hospital for all age groups (except for subjects aged <1 year). It is therefore evident that the influence of vacation time on new patient numbers is limited, even for school and college age subjects.

At ages <1 year, significantly more new patients visited in spring and significantly fewer patients came in summer. Summer vacation apparently did not increase the number of new patients. This also suggests that the increased number of new patients in spring is not due to an effect of vacation, but is due to other factors. In Japan, many social events, such as nursery, kindergartens, schools, colleges and even companies usually start their new year terms in April. This may increase new hospital visits of AD patients in May. For example, babies entering nursery and children entering kindergartens, if they have eczematous lesions, may be requested to undergo allergy tests in this country. High school students with AD who have finished college examinations may plan a thorough clinical test before they start college, because long study periods for examinations often exacerbate AD. Company workers who have changed their work place may find new hospitals to consult about their children’s AD. However, our analysis (data not shown) indicates that these social factors increase first visits of patients <1 year of age in March only to a limited degree. Thus, both significantly higher visits of new patients in spring and significantly lower visits of new patients in summer observed for subjects <1 year of age are not the result of social factors.

Therefore, the distribution of new out-patient visits for subjects <1 year of age with AD throughout the year must be accounted for by other reasons. Seasonal changes in AD are well known throughout the world\(^4\) and are usually seen as winter aggravation and summer amelioration of AD.\(^5\) However, in the present study, winter aggravation and summer amelioration were not reflected to first visiting month in any age group as evidenced by a winter increase and a summer decrease of patient numbers in a complete form. Rather, for school and college age patients, the distribution of the month of first visit (fewer first visits in winter and more in summer) was totally opposite to the recognized seasonal changes in AD. Only for subjects <1 year of age and, less markedly, for those 1–2 years of age was summer amelioration of AD, although not winter aggravation, reflected by the month of first visit. It is important to note that winter aggravation and summer amelioration of AD have been established as a result of a questionnaire study\(^6\) and not
by counting patient numbers. It is our opinion that spring
aggravation of AD, which is not known by questionnaire
study, actually exists in all ages, and that the March peak
observed in school and college ages is not necessarily
explained by social effects only.

Hellier, in England, reported that infant eczema
patients were seen more frequently between February
and April and fewer patients were seen between July and
November (except October). 7 Ratzer, in Scotland, ana-
alyzed skin diseases over 10 years and recognized an
apparent seasonal change only in dermatitis venenata
(more cases in April and May and fewer cases in July and
August) and acne vulgaris (more cases in winter and
fewer cases in summer). 8 Young, in the Netherlands,
studied the first visits of AD patients and found that
autumn was the most frequent season of first visits. 9
He also found that the ‘autumn group’ was more sensitized
to house dust than the ‘spring’ and ‘summer’ groups and
that the opposite was true for these groups with regard to
their sensitivity to pollen. Hellier later discussed the theory
that spring (and October) peaks were a manifestation of
a phase of instability found throughout the whole animal
kingdom that occurred during the change from winter
hibernation to the summer state and, to a lesser extent, in
the reverse order in the autumn. 10 Tupker et al. studied
the influence of season on non-specific skin reactivity in
AD and found increased irritant susceptibility and
increased flare reactivity to intracutaneously injected
bioactive agents in November compared with July. 11

Whatever the reason may be, the seasonal variation in
the month of first visit of patients with AD who are under
1 year of age was considerably more marked than the
variation seen in the birth month. The mean age at first
visit was 6.24 months. If time goes back 6 months from
first visiting month, then the birth month will be roughly
obtained. Thus, the spring peak for the first visiting month
becomes an autumn peak for the birth month and the
summer drop in first visiting month becomes a spring
drop in birth month. The less obvious distortion in the
distribution of birth months compared with month of first
visit can be explained by a wide distribution of age at first
visiting, from 1 month to 11 months with a peak at
4 months. It is our conclusion that the seasonal variation
in birth month for AD patients is influenced by the uneven
distribution of the month of first visit. A seasonal variation
in birth month has also been reported for bronchial
asthma and allergy sensitization. 12 Our observations
from the present study need to be confirmed elsewhere
in the world and not only for AD but also for other atopic
diseases.

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