Relationship Between Breast Milk Feeding and Atopic Dermatitis in Children

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Objective: To determine whether or not the breast milk feeding has a role in the prevalence of atopic dermatitis among children.

Methods: The target population of the study was all children participating in health check-up program for 3-year-old children in 60 municipalities locating 10 selected prefectures during designated 2 months between October and December 1997. Using a questionnaire, information on nutrition in infants (breast milk only, bottled milk only, or mixed), parity, mothers' age at birth, and a history of atopic dermatitis was obtained. Besides, data on potential confounding factors were obtained.

Results: Questionnaires from 3856 children (81.6% of those who were to participate in the programs, and 96.4% of children who participated them) were analyzed. After the adjustment for all potential confounding factors using unconditional logistic models, the risk of atopic dermatitis was slightly higher among children with breast milk (odds ratio [OR]= 1.16 with 95% confidence interval [CI] 0.96-1.40). Mothers' age at birth (OR for those who were more than 30 years or older in comparison with those who were younger than 30 years = 1.15; 95% CI, 0.96-1.37) and those with second or later parity orders (OR=1.14, 95% CI;0.95-1.35) showed odds ratios that were higher than unity without statistical significance.

Conclusion: Breast milk elevates the risk of atopic dermatitis slightly without statistical significance; the risk may be, however, higher in children in second or later parity orders.

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The etiology of atopic dermatitis is still unknown. Some papers from foreign countries showed that breast feeding for infants prevented the disease 1-8, while others told that no relationship existed between atopic dermatitis and breast

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feeding \(^6\), \(^7\). On the other hand, Japanese data revealed that atopic dermatitis was more prevalent among children with breast feeding than among those with bottle feeding \(^8\); from the Japanese results, some researchers guess that dioxins and furans in breast milk cause the dermatitis.

To discuss the relationship between breast milk and atopic dermatitis in children, we observed the prevalence of the disease and infant feeding in Tochigi prefecture using data for cider pollinosis \(^9\). According to the study, the following facts were observed. The breast feeding elevated the risk of atopic dermatitis slightly. However, the dermatitis was more prevalent among those with second or later parity orders.

To certify and get consistency of the results obtained by the aforementioned observation, we observed another data set obtained from 10 prefectures all over Japan using the identical questionnaire.

**METHODS**

The target population was all participants of health check-up programs conducted by Maternal and Child Health Act of 1965. All the 3-year-old children that participated in the program in 60 municipalities of 10 prefectures during designated 2 months between October and December 1997, were asked to join the study. The parents or guardians were sent a questionnaire by mail before the health check-up, and asked to bring the fulfilled questionnaire at the check-up.

The questionnaire was originally constructed to observe the prevalence of cider pollinosis among young women who have 3-year-old children, but included items about feeding of the child when he/she was an infant, whether or not for the child to have a history of atopic dermatitis and current eczema, and other potential confounding factors, such as mother's age, parity order, and mother's medical history (see Tables 3 and 4 in detail). The main dependent variables were whether a child had a history of atopic dermatitis, with a physician's diagnosis. In addition whether the child had current eczema, which was not a physician's finding at the health check-up but a self-administered answer by parents or guardians, was observed as a dependent variable supplementally because the eczema is a skin disorder as well. The main independent variable was the feeding methods when he/she was under 1 year of age; breast feeding, bottle feeding, or their mixture. Breast feeding effect and mixed feeding (both breast and bottle) effect in comparison with bottle feeding were observed as dummy variables in logistic models (see below). Sex, mother's age, parity order, mother's history associated with allergy (pollinosis, asthma, atopic dermatitis, allergic rhinitis, and urticaria), whether the mother was engaged in an occupation, whether to keep animals as a pet, whether to live with (a) smoker(s) were used as independent variables as well to control potential confounding factors.

Using unconditional logistic models, we calculated odds ratios and their 95 percent confidence intervals. If a 95 percent confidence interval did not include 1.0, we consider the finding with statistical significance. The SPSS 8.0 was used for the calculation.

**RESULTS**

A total of 4726 3-year-old children were to take the exam during the study period, and 3999 (84.6 percent) took it indeed. Of the 3999 participants of the exam, 3856 parents or guardians (81.6 percent of all target children, and 96.4 percent of the all target children, and 96.4 percent of the
Table 2 shows the numbers of municipalities and children (guardians), and prevalence of the history of atopic dermatitis and current eczema by prefecture. The prevalence of history of atopic dermatitis was slightly high in Akita prefecture and low in Okayama prefecture, but was between 10 and 30 percent in all the prefectures.

Table 2 shows the proportion of those with a history of atopic dermatitis and present eczema, by nutrition during infants. The prevalence of the all items was highest among those with breast feeding, followed by those with mixed feeding, and bottle feeding.

Odds ratios and their 95 percent confidence intervals for the history of atopic dermatitis are shown in Table 3. Mothers' histories of atopic dermatitis, allergic rhinitis, and urticaria were significant risk factors of children's atopic dermatitis, whereas mothers' histories of pollinosis and asthma, which were significant risk factors in the crude analyses, were not significant after adjustment of other factors. Breast feeding elevated the risk of atopic dermatitis in comparison with bottle feeding, but was not statistically significant. The second or later parity order was a significant risk factor in the crude analysis, but the significance diminished by the adjustment. However, the same trend still existed after the adjustment.

Table 4 shows the odds ratios and their 95 percent confidence intervals for present eczema. Mothers' histories of allergic disorders also played as risk factors for eczema, in spite of the lack of significance after the adjustment in some diseases. Breast feeding elevated the risk of eczema, but mixed feeding lowered in comparison with bottle feeding only. In these analyses, odds ratios that were higher than unity were observed for second parity order or later without statistical significance.

**DISCUSSION**

Same as the previous study in Tochigi prefecture 8, we defined the districts and period of time for the observation in the current study first, and obtained the items with very high response rate. These facts mean that this study includes less selection bias, and the validity did not decrease because of the selection bias. Besides, the study population extended to 10 prefectures all over the country as shown in Table 1; the exter-

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**Table 2. Frequency of the history of atopic dermatitis and present eczema by nutrition in infant.**

| nutrition in infant     | history of atopic dermatitis | present eczema | history of atopic dermatitis and/or present eczema |
|-------------------------|------------------------------|----------------|--------------------------------------------------|
| breast feeding          | 243/1087 (22.4)              | 210/1090 (19.3)| 313/1086 (28.8)                                  |
| breast and bottle feeding| 368/1858 (19.8)              | 299/1862 (16.1)| 474/1856 (25.5)                                  |
| bottle feeding          | 152/846 (18.0)               | 126/848 (14.9) | 197/845 (23.3)                                   |
| total                   | 763/3791 (20.1)              | 635/3800 (16.7)| 984/3787 (26.0)                                  |

**Table 3. Odds ratios and their 95% confidence intervals for the history of atopic dermatitis.**

| item                                      | crude | adjusted |
|-------------------------------------------|-------|----------|
| sex (female/male)                         | 0.85 (0.73-1.00) | 0.86 (0.73-1.01) |
| mother's age at birth (30+y.o./29 y.o. or younger) | 1.16 (0.99-1.36) | 1.15 (0.96-1.37) |
| parity (2nd or later/1st)                 | 1.17 (1.00-1.37) | 1.14 (0.95-1.35) |
| mother's past history (yes/no)            |       |          |
| pollinosis                                | 1.36 (1.12-1.66) | 1.14 (0.92-1.42) |
| asthma                                    | 1.58 (1.16-2.16) | 1.18 (0.84-1.66) |
| allergic rhinitis                         | 3.95 (2.98-5.23) | 3.67 (2.74-4.93) |
| urticaria                                 | 1.64 (1.34-2.01) | 1.54 (1.24-1.92) |
| mother's occupation (having/not having)   |       |          |
| keeping a pet (yes/no)                    | 1.08 (0.90-1.29) | 1.07 (0.88-1.28) |
| living with smoker (yes/no)               | 0.95 (0.80-1.12) | 0.98 (0.82-1.17) |
| feeding in infant (breast/bottle)         | 1.17 (0.97-1.40) | 1.16 (0.96-1.40) |
| feeding in infant (breast+bottle/bottle)  | 0.89 (0.72-1.09) | 0.91 (0.73-1.13) |
Table 4. Odds ratios and their 95% confidence intervals for the present eczema.

| item                                                  | crude          | adjusted       |
|-------------------------------------------------------|----------------|----------------|
| sex (female/male)                                     | 1.05 (0.88-1.24) | 1.05 (0.88-1.25) |
| mother's age at birth (30+y.o./29 y.o. or younger)     | 1.17 (0.99-1.39) | 1.17 (0.97-1.41) |
| parity (2nd or later/lst)                             | 1.10 (0.93-1.31) | 1.05 (0.87-1.26) |
| mother's past history (yes/no) polinosis               | 1.48 (1.20-1.82) | 1.31 (1.05-1.64) |
| asthma                                                | 1.57 (1.13-2.18) | 1.26 (0.89-1.79) |
| atopic dermatitis                                     | 3.22 (2.41-4.31) | 3.12 (2.31-4.22) |
| allergic rhinitis                                     | 1.42 (1.14-1.77) | 1.24 (0.97-1.57) |
| urticaria                                              | 1.46 (1.16-1.83) | 1.26 (1.00-1.60) |
| mother's occupation (having/not having)                | 1.09 (0.91-1.29) | 1.09 (0.91-1.31) |
| keeping a pet (yes/no)                                | 1.15 (0.95-1.39) | 1.15 (0.94-1.40) |
| living with smoker (yes/no)                           | 1.02 (0.85-1.22) | 1.09 (0.90-1.31) |
| feeding in infant (breast/bottle)                     | 1.25 (1.03-1.52) | 1.25 (1.03-1.53) |
| feeding in infant (breast+bottle/bottle)               | 0.91 (0.73-1.14) | 0.91 (0.72-1.15) |

Recent studies indicate that about 200-300 thousand yen per specimen is required. Therefore, even the measurement of dioxins in human bodies started in earnest a few years ago in Japan; few epidemiologic data exist in this country. Concerning such situations in Japan, we stress the importance of our data to discuss the relationship between dioxins and health effects even if we did not observe the concentration of the chemicals in the breast milk.

The prevalence of atopic dermatitis was 20.1 percent, and this is quite similar to the figure obtained in Tochigi prefecture. This value, about one fifth, was not so far from the results provided by some other studies in the past in Japan.

Breast feeding was a possible risk factor of atopic dermatitis without statistical significance after adjustment of other factors in the current study. This finding has already been revealed in the previous Tochigi study. The interpretation is; (1) by chance, (2) breast feeding as a real risk factor of atopic dermatitis, (3) existence of confounding factors which could not be adjusted in the study, and (4) combination of them. In particular, the small odds ratio (1.16) is vulnerable to confounding factors. From this study we cannot say that breast milk is a definite risk factor of atopic dermatitis in children.

In addition, even if breast milk is the risk factor of atopic dermatitis, our results did not support the hypothesis that dioxins and furans in breast milk cause the dermatitis. As well known, dioxins and furans are lipid-soluble and there is few pathways to excrete from human body. Therefore, their half-life time in human body is very long. Breast milk, which is rich in lipids, provides the largest opportunity to reduce the chemicals in the body. Thus, breast milk for children with second or later parity order is expected to contain less dioxins and furans than that for the first baby. However, the current data as well as Tochigi data show that second or later parity order is a small risk factor, and are inconsistent to the dioxin theory. Similar results in the supplemental observation for present eczema were obtained as well.
In conclusion, the findings in this study did not support the hypothesis that dioxins and furans in breast milk induce atopic dermatitis in children. Other mechanisms than the dioxin theory should be considered even if breast feeding is one of the risk factors of atopic dermatitis.

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