# The Association Between Initial Solid Food and Atopy in Children with or without Family History of Atopic Disease

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## Abstract

Atopic diseases are the most common chronic diseases in childhood. Their incidence has a tendency to increase recently. The tendency of atopy could be triggered by many factors originated in the early life, including early introduction of solid food. To investigate the association between initial solid food and atopy, an analytic comparative study with historical cohort design was conducted from May to June 2006 in Pediatric Department of Hasan Sadikin Hospital Bandung. It was the second phase study of 'allergic prevalence and risk factors identification in the first two years of life'. Out of 800 children in Garuda, Padasuka, and Babakansari Primary Health Care Center who were included in the first phase of the study, 749 children were eligible to continue the second phase of the study, 284 children were randomized into two groups of children with and without family history of atopic disease consisting of 142 children each. They then underwent skin prick test. History of initiation time of solid food were obtained from their parents. To analyze the data chi-square and odds ratio with 95% confidence interval were used. Among 284 children who fullfilled the inclusion criteria, 50% had family history of atopic disease. Atopy was found in 28.2% children, 32.4% with family history of atopic disease and 23.9% without family history of atopic disease. There was no significant correlation between family history of atopic disease and atopy (p=0.113). There was a high risk for atopy related to initial solid food (OR = 4.50, 95%CI = 1.96-10.74, p < 0.001). The difference of atopy was strongly significant between children who had initial solid food at the age of ≤6 months and at the age of >6 months whether or not the children had family history of atopic disease (p=0.016 and p=0.002). Conclusions: A significant increase in the risk of childhood atopy occured if initial solid food is given at the age of ≤6 months, whether or not the children have family history of atopic disease. [**MKB**. 2010;42(1):27-31].

**Key words**: Atopy, atopic disease, initial solid food

# Hubungan antara Waktu Pemberian Makanan Pendamping ASI dan Kejadian Atopi pada Anak dengan atau Tanpa Riwayat Penyakit Atopik dalam Keluarga

## Abstrak

Penyakit atopik merupakan penyakit kronik yang paling sering ditemukan pada anak. Angka kejadian penyakit atopik cenderung meningkat dari tahun ke tahun. Kecenderungan atopi atau timbulnya penyakit atopik dapat dicetuskan oleh faktor faktor yang berpengaruh di awal kehidupan, salah satunya adalah pemberian makanan pendamping ASI (MP ASI). Untuk mengetahui hubungan antara waktu pemberian MP ASI dan kejadian atopi dilakukan penelitian analitik komparatif dengan rancangan *historical cohort.* Penelitian dilakukan pada bulan Mei-Juni 2006 di Bagian Ilmu Kesehatan Anak Rumah Sakit Hasan Sadikin Bandung. Penelitian ini merupakan fase kedua dari penelitian "Prevalens alergi dan identifikasi faktor risiko pada dua tahun pertama kehidupan". Penelitian dilakukan di Puskesmas Garuda, Padasuka, dan Babakansari. Dari 800 anak yang mengikuti fase I, sebanyak 749 anak dapat diteliti pada penelitian fase II. Dengan teknik sampling secara acak terpilih 142 anak, masing-masing dari

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kelompok dengan dan tanpa riwayat penyakit atopik dalam keluarga. Selanjutnya dilakukan pemeriksaan uji tusuk kulit dan ditanyakan mengenai riwayat pemberian MP ASI. Analisis statistik yang digunakan adalah uji kai-kuadrat dan *Odds ratio* dengan IK95%. Dua ratus delapan puluh empat anak memenuhi kriteria inklusi penelitian. Dari jumlah tersebut diperoleh 50% anak dengan riwayat penyakit atopik dalam keluarga. Atopi didapatkan pada 28,2% anak, 32,4% di antaranya dengan riwayat penyakit atopik dan 23,9% tanpa riwayat penyakit atopik dalam keluarga. Tidak terdapat hubungan yang bermakna antara anak dengan riwayat penyakit atopik dalam keluarga dan kejadian atopi (p=0,113). Dua ratus delapan (73,2%) anak mendapat MP ASI pada usia ≤6 bulan, 76 (26,8%) anak mendapat ASI pada usia >6 bulan. Kejadian atopi berbeda bermakna antara anak yang mendapat MP ASI pada usia ≤6 bulan dan >6 bulan (OR=4,50; IK95%=1,96-10,47; p<0,001), baik pada kelompok anak dengan riwayat penyakit atopik (OR=3,38; IK95%=1,12-10,86; p=0,016) maupun tanpa riwayat penyakit atopik (OR=6,08; IK95%=1,63-26,72, p=0,002) dalam keluarga. Kesimpulan: Pemberian MP ASI pada usia ≤6 bulan meningkatkan risiko terjadinya atopi, baik pada kelompok anak dengan atau tanpa riwayat penyakit atopik dalam keluarga. [**MKB**. 2010;42(1):27-31].

**Kata kunci**: Atopi, penyakit atopik, makanan pendamping ASI

## Introduction

The atopic disease such as rhinoconjunctivities, asthma, eczema are the most common chronic disease in childhood, is posing serious problems worldwide. Their incidence has a tendency to increase recently and their prevalence vary world wide.[1,2] Tendency of atopy or atopic disease could be triggered by many factors presenting in early stage of life. These include low birth weight, maternal smoking, and, possibly, early cessation of exclusive breastfeeding.[3]

Environment is an important determinant of atopic diseases. There may be a "window of opportunity" in the first few years of life when the developing immune system is particularly susceptible to being directed along an atopic pathway.[4]

Attempts to prevent or delay the development of allergic disorders have been concentrated in three areas. First, maternal exclusion diets during pregnancy. Second, maternal exclusion diets during lactation. The third area has centred on the introduction of foods other than milk to the infants diet.[5] Early exposure to cows milk and other foreign food proteins which were introduced in the first months of life could increase atopy.[6] Saarinen and Kajosaari have shown that early introduction of solid food is associated with a higher prevalence of atopic dermatitis at 6 months and respiratory illness at 10 years, compared with the introduction of solid foods after six months.[7] However, other studies have failed to confirm or even suggest that early solid feeding may increase the incidence of allergic later in life.[8,9] In 2001 the World Health Organisation (WHO) issued revised global recommendation that mothers should breastfeed exclusively for six months.[10]

Since the scientific evidence on the effect of solid feeding on the development of allergic disease is inconclusive and the magnitude of atopy could be predicted by knowing initial solid feeding especially in Indonesia, the related study is necessary. The aim of this study was to determine the association between initial solid food and atopy in children with or without family history of atopic disease.

## Methods

An analytic comparative study with historical cohort design was conducted on groups with and without family history of atopic disease as a part of the study on "Prevalence of allergic and identification of risk factors in the first two years of live" at Babakansari, Padasuka, and Garuda Primary Health Care Center in Bandung. The first phase study was a community survey that was done in May to August 2004. This study, as the second phase, was conducted in May to June 2006. Inclu-sion criteria were children who had completed phase I study and who was physically healthy. Those who changed their residence or consumed first generation antihistamine within three days, non-sedative antihistamine within seven days, or systemic or topical steroids within three weeks before skin prick test procedure, were excluded.

Out of 800 children joining the first phase, only 749 were eligible for the next phase, of which 204 children had family history of atopic disease. Samples of those with and without family history of atopic disease were taken randomly. Subjects

who met the inclusion criteria were brought to Hasan Sadikin Hospital Bandung. In the hospital, the study procedure was re-explained and written informed consent obtained. Afterwards, history, physical examination, and skin prick test were performed.

Atopy was defined as a positive skin prick test to any of the eight allergens tested. Solid food is the provision of any nutrient other than breast milk as the main source of nutrition.[11] Time of initial solid food (in months) was grouped into two categories, i.e., at the age of ≤6 months and >6 months.

Skin prick test was performed in the volar aspects of the forearms with *Dermatophagoides pteonyssinus*, *Blomia tropicalis*, cat hair, cock-croach, cow's milk, egg white, soybean, and peanut. Histamine was used as the positive control and saline as the negative control. A test was considered positive if the diameter of skin wheal was 3 mm or more compared to the negative control at least to one allergen 15 minutes after testing.

SPSS software version 11.5 for windows and EpiInfo version 6.0 were used to analyze the data. Significance tests for contingency tables were on the basis of 2 test for odds ratio of association with 95% confidence interval.

This study was approved by the Health Study Ethical Committee at the Faculty of Medicine Padjadjaran University/Hasan Sadikin Hospital Bandung.

## Results

Out of 300 subjects, nine children had already changed the residence and the parents of seven children refused the study. Therefore there were only 284 subjects in this study, each group with 142 children. The subject characteristics based on family history of atopic disease are seen in Table 1.

Atopy was found in 80 (28.2%) children. Prevalence of atopy on group with history of atopic disease was 52% greater than that of the other group, but the difference was not statistically

**Table 1 Subject's Characteristic Based on Family History of Atopic Disease**

| Characteristic | Family History of Atopic Disease | |
|---|---|---|
| | Positive | Negative |
| Sex | | |
| Boys | 64 (45.1%) | 66 (46.5%) |
| Girls | 78 (54.9%) | 76 (53.5%) |
| Age (months) | | |
| $\bar{X}$ (SD) | 36.40 (1.8) | 36.15 (1.8) |
| Range | 32.1–40.5 | 32.5–40.2 |
| Nutritional Status | | |
| Underweight | 32 (22.5%) | 39 (27.5%) |
| Well Nourished | 107 (75.4%) | 101 (71.1%) |
| Overweight | 3 (2.1%) | 2 (1.4%) |

**Table 2 Atopy Based on Family History of Atopic Disease**

| Family History of Atopic Disease | Atopy | | Non-atopy | | p |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Positive | 46 | 32.4 | 96 | 67.6 | 0.113 |
| Negative | 34 | 23.9 | 108 | 76.1 | |

Note: OR (95%CI) = 1.52 (0.87-2.56)

**Table 3 The Association Between Initial Solid Food and Atopy**

| Initial Solid Food (months) | Atopy | | Non-atopy | | p |
|---|---|---|---|---|---|
| | n | % | n | % | |
| ≤6 | 72 | 34.6 | 136 | 65.4 | <0.001 |
| >6 | 8 | 10.5 | 68 | 89.5 | |

Note: OR(95%CI) = 4.50 (1.96-10.74)

**Table 4 The Association Between Initial Solid Food and Atopy Based on Family History of Atopic Disease**

| Family History of Atopic Disease | Initial Solid Food (months) | Atopy | | Non-atopy | | Significancy |
|---|---|---|---|---|---|---|
| | | n | % | n | % | |
| Positive | ≤6 | 41 | 37.6 | 68 | 62.4 | p = 0.016 OR (95%CI) = 3.38 (1.12-10.86) |
| | >6 | 5 | 15.2 | 28 | 84.8 | |
| Negative | ≤6 | 31 | 31.3 | 68 | 68.7 | p = 0.002 OR(95%CI) = 6.08 (1.63-26.72) |
| | >6 | 3 | 7 | 40 | 73 | |

significant (OR= 1.52, 95%CI= 0.87-2.65, p= 0.113). The atopy prevalence based on family history of atopic disease was described in Table 2.

Initial solid food at the age of ≤6 months and >6 months children percentage were 73.2% and 26.8%, respectively. There were 72 (34.3%) atopy in children who had initial solid food at age of ≤ 6 months, on the other hand, only eight (10.5%) children who had initial solid food at the age of > 6 months became atopy. According to analytic statistic with chi-square calculation, there was a high risk for atopy related to initial solid food at the age of ≤ 6 months (OR = 4.50, 95% CI = 1.96-10.74, p < 0.001). Initial solid food at the age of ≤ 6 months was a risk factor related to atopy. The association between initial solid food and atopy was described in Table 3.

The difference of atopy was statistically significant between children who had initial solid food at the age of ≤ 6 months and > 6 months whether or not the subjects had family history of atopic disease (OR= 3.38, 95%CI= 1.12-10.86; p= 0.016 and OR= 6.08, 95%CI= 1.63-26.72, p= 0.002). The association between initial solid food and atopy based on family history of atopic disease was described in Table 4.

## Discussion

Atopy was proven by skin prick test and was found in 28.2% children and 32.4% of them had family history of atopic disease. Atopy is a personal and/or familial tendency to become sensitized and produce IgE antibodies in response to ordinary exposures to allergens.[12] Björksten *et al*. (cited by Koning *et al*)[13] described that if one of the parents had atopic disease, then there was 20-40% risk for their children to have atopic disease. If both of parents had atopic disease, then the risk increased to 60-80%, and if the child's brother/sister had atopic disease, then the child would have a 20-30% risk of atopic disease. Alford *et al*[14] found 39.8% atopy children if they had an atopic mother and 30.2% atopy children if their father had atopic disease. In this study it was found that 34 (23.9%) out of 142 children without family history of atopic disease were atopy. If there were no atopic parents, then the risk to become atopic was 10%.[13] However, Alford *et al*[14] described that children without family history of atopic disease had almost a-30% risk of atopy. The study revealed no statistically significant difference between atopy and family history of atopic disease (p = 0.113).

In this study, 208 of 284 (73.2%) children had initial solid food at the age of ≤ 6 months and 76 of 284 (26.8%) at the age of > 6 months. There are few data about the percentage of initial solid food. Foster *et al* (cited by Anderson *et al,*[15] in UK, 2% of babies were given solids by 4 weeks of age, 13% by 8 weeks, 56% by 3 months, and 91% by 4 months. In this study, statistically, there is a high significant difference of atopy between children who had initial solid food at the age of ≤ 6 months and > 6 months (p < 0.001). Saarinen and Kajosaari[7] have shown that early introduction of solid food is associated with a higher prevalence of atopic dermatitis at six months and respiratory illness at 10 years, compared with the introduction of solid foods after six months. Prospective cohort study by Oddy *et al*[3] suggested that skin prick test would be positive significantly in children who had been introduced with formula feeding before aged four months (p= 0.019). Study in Department of Child Health, Hasan Sadikin Hospital Bandung showed that incidence of atopic dermatitis in infants aged 6-12 months was significantly lower in those who had exclusive breastfeeding for at least four months compared with those without history of breastfeeding (p < 0.002).[16] Breast milk may provide direct protection against allergic sensitization through decreased exposure to food antigens, by enhanced maturation of the intestinal mucosal barrier and *via* immunoglobulin (Ig), such as secretory IgA, secreted in milk.[17]

The diet may exert a major effect on the composition and activity of gut microflora. In infants, it is thought that those who are breastfed have a natural predominance of bifidobacteria, while formula fed infants have a profile more complex and similar to the adult microflora, with streptococci, lactobacilli, bacteroides, clostridia, bifidobacteria, and enterobacteria. After weaning, the composition of the microflora gradually alters to resemble that of the adult.[18]

In this study, children without family history of atopic disease had higher risk to become atopy than children with family history of atopic disease. This was probably due to the data on family history of atopic disease which were probably not very accurate since they were based only on history without any further test, such as total and specific IgE or skin prick test to family member suspected of having history of atopic disease.

Confounding factors such as low birth weight, maternal smoking, and, possibly, early cessation of exclusive breastfeeding, were not considered in the analysis of data. These are the shortcomings in the study which need further study.

In summary, the results of the study indicated that a significant increase in the risk of childhood atopy occured if initial solid food is given at the age of ≤6 months, whether or not the children have family history of atopic disease.

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