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Original Article

Association between cord blood IgE levels in newborns and family history of atopic diseases

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ABSTRACT

Background Cord blood-IgE (CB-IgE) levels have been used widely as a specific marker of atopic diseases. In some previous studies, CB-IgE levels in subjects with and without a family history of atopic diseases have been controversial.

Objective To determine the CB-IgE level in newborns and to identify the association between CB-IgE and family history of atopic diseases.

Methods A cross-sectional study was done to compare the CB-IgE levels in neonates with or without a family history of atopic diseases in mother, father, or siblings. Subjects of this study were 124 newborns who consecutively born in Puskesmas Kiaracondong, Bandung, during the period of March 2001 to July 2002. Subjects were divided into 2 groups based on history of atopic diseases. Measurements of CB-IgE levels were done by sandwich ELISA methods. Data were analyzed by c^2 statistics, t test, ANOVA, and Dunkan's test.

Results The mean CB-IgE levels in the group with and without a family history of atopic diseases were 3.2±2.5 IU/ml and 0.5±0.5 IU/ml (P<0.001), respectively. The mean CB-IgE levels in male and female infants with a family history of atopic diseases were 3.3±2.7 IU/ml and 3.03±2.2 IU/ml (P>0.05), respectively. Based on the cut-off point (1.3 IU/ml), CB-IgE levels had significant positive association with a family history of atopic diseases (OR 156, 95%CI 29.61;1104.24). CB-IgE levels in neonates with 1, 2, and 3 atopic family members were 1.67±0.78 IU/ml, 3.76±2.11 IU/ml, and 6.6±2.7 IU/ml, respectively (F=32.603; P<0.001).

Conclusion Most newborns with a family history of atopic diseases showed high levels of CB-IgE, but there were no correlation with gender. The probability of having atopic diseases increase in concord with the number of family with atopic diseases **[Paediatr Indones 2006;46:199-203]**.

Keywords: *cord blood-IgE, newborn, family history of atopic diseases*

Atopy is the inherited propensity to respond immunologically to such common naturally occurring allergens with the continuing production of IgE antibodies. It is specifically associated with the generation of elevated level of IgE antibodies as part of type I hypersensitivity reaction.[1-3] Atopic diseases are responsible for a wide range of allergic disorders including asthma, atopic dermatitis (AD), rhinitis, urticaria, conjunctivitis, and food allergy.[4] Family and twins studies showed that both genetics and environmental factors were involved in the atopic diseases.[5-9] Kjellman *et al*[9] found that the incidence in infants was higher (72.2%) if both parents had similar atopic manifestations than one atopic parent.

Results of studies on the association between neonatal IgE levels and family history of atopic diseases have been varied.[10-14] Factors that can influence the results are technique in IgE measuremens, differences of cut-off points, and family history definition. The aim of this study was to investigate the

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association between the CB-IgE levels in newborns and family history of atopic diseases.

Methods

This was a cross-sectional study, comparing the CB-IgE levels in neonates with or without a family history of atopic diseases in mother, father, or siblings. Subjects of this study were 124 newborns consecutively born in Puskesmas Kiaracondong, Bandung, during the period of March 2001 to July 2002. Then based on family questionnaire, the subjects were divided into 2 groups, i.e. group of newborns with or without hidtory atopic diseases in their families. The inclusion criteria were healthy babies with spontaneous deliveries and parents agreed to enroll their children in the study and signed informed consent. The exclusion criteria was maternal smoking. The subjects were selected consecutively.

Medical record forms were filled by the authors and trained medical staffs, consisted of mother's name, sex, birth weight, birth height, mother's age, gestational's age, family member with atopic diseases, and IgE. Birth weight and height were measured immediately after birth by using baby scale and infantometer. Family history of atopic diseases included asthma, AD, rhinitis, urticaria, and food allergy. The cut-off point of cord blood IgE was 1.3 kU/l, based on Croner's study.[10]

Two ml of cord blood was taken as soon as the baby was delivered by the medical staffs (doctors or midwives) who were in charged for the delivery process. The specimens were measured by Cobas core total IgE, which was a method used to detect the IgE level with enzyme immunoassay (ELISA) technique in Department of Clinical Pathology, Hasan Sadikin Hospital, Bandung.

All data were recorded, tabulated, and analyzed using SPSS version 11.0. Nominal data analyzed with c^2 test, while numerical data were analyzed by t-test or ANOVA and Dunkan's test. $P<0.05$ was considered statistically significant. The odds ratio (OR) with CI 95% was calculated as appropriate.

Results

The characteristics of subjects of both atopic and non-atopic groups are shown in **Table 1**.

TABLE 1. SUBJECT'S CHARACTERISTICS IN ATOPIC AND NON-ATOPIC GROUPS

Characteristics	Group	
	Atopic (n=62)	Non-atopic (n=62)
Sex		
Male	32 (51.6)	32 (51.6)
Female	30 (48.4)	30 (48.4)
Birth weight (gram)		
$\bar{X}$ ±SD	3053.2 (306.1)	3098.4±346.3
Median	3000	3050
Range	2500-3800	2500-4000
Birth height (cm)		
$\bar{X}$±SD	49.0±1.2	48.6±1.4
Median	49	49
Range	47-52	45-52
Mother's age (year)		
$\bar{X}$±SD	25.9±5.2	27.2± 5.6
Median	25	28.5
Range	17-41	18-38
Gestational's age (week)		
$\bar{X}$±SD	38.7±1.1	38.8±1.1
Median	38.5	39
Range	37-41	37-41

n=number of sample; $\bar{x}$=mean; SD=standard deviation.

The mean CB-IgE levels in newborns with and without family history of atopic diseases are shown in **Table 2** , while CB-IgE levels in newborns using cut-off point 1.3 IU/ml are shown in **Table 3**.

father, siblings, or combination) in this study are shown in **Table 4**. Anova test shows that there is significant association between the number of the family and IgE levels.

TABLE 2. THE MEAN CORD BLOOD-IGE LEVELS IN NEWBORNS

CB-IgE Levels (IU/ml)	Group		Total (n=124)	P value
	Atopic (n=62)	Non-atopic (n=62)		
Male				
$\bar{X}$(SD)	3.3 (2.7)	0.5 (0.5)	1.9 (2.4)	
Median	2.1	0.6	1.1	
Range	1.1-13.4	0-2.2	0-13.4	t=0.44
Female				P=0.35
$\bar{X}$(SD)	3.03 (2.2)	0.6 (0.4)	1.8 (2.0)	
Median	2.3	0.5	1.2	
Range	1.1-9.6	0-1.4	0-9.6	
Total				
$\bar{X}$(SD)	3.2 (2.5)	0.5 (0.5)	1.9 (2.2)	t=9.3
Median	2.3	0.6	1.1	P<0.001
Range	1.1-13.4	0.0-2.2	0-13.4	

TABLE 3. THE MEAN CB-IGE LEVELS IN NEWBORNS WITH CUT-OFF POINT 1.3 IU/ML

CB-IgE levels (IU/ml)	Atopic	Non-atopic	
T	n	n	n
≥1.3	52	2	54
<1.3	10	60	70

Table 3 shows that 52/54 (96%) newborns with IgE >1.3 IU/ml belonged to the atopic group, while only 10/70 (14%) of those with IgE<1.3 IU/ml belonged to atopic group. There was a significant positive association between IgE levels and family history of atopic diseases (OR 156, 95%CI; 29.61,1104.24).

CB-IgE levels in newborns based on number of family members with history of atopic diseases (mother,

Discussion

By using 1.3 IU/ml as cut off point, we found that IgE-bearing cells have been observed as early as the 11th week of gestation in fetus, yet cord blood contains a little of IgE. The mean IgE levels are higher in the atopic population than those in non-atopic population.[1] In our study, CB-IgE levels in newborns with a family history of atopic diseases are higher than those in newborns without atopic diseases in their families. There was significant difference between the CB-IgE levels **(Table 2)**. This is consistent with the finding of Croner *et al*.[10] Further support to the influence of gender comes from several studies reporting significantly higher CB-IgE levels in males than in females,[10] al-

TABLE 4. CORD BLOOD-IGE IN NEWBORNS BASED ON THE NUMBER OF FAMILY MEMBERS OF FAMILY WITH HISTORY OF ATOPIC DISEASES

CB-IgE levels	N (%)	$\bar{X}$(SD)	Median	Range
1. One atopy	31 (50)	1.67 (0.78)	1.4	1.39-1.96
2. Two atopies	21 (34)	3.76 (2.11)	3.4	2.79-4.72
3. Three atopies	10 (16)	6.59 (2.73)	6.0	4.64-8.54
Total	62 (100)	3.2 (2.50)	2.3	1.10-13.40
F= 32.603; P<0.001				

$\bar{X}$= mean, SD=standard deviation

though conflicting information exists.[13,14] In our study there was no significant differences between the CB-IgE levels in male and female babies **(Table 2)**. This was similar with Velazquez *et al*'s study.[13]

Many differences of CB-IgE cut-off points have been proposed. Our study used cut-off point of 1.3 IU/ml, based on Croner's study,[10] that had large samples whereas the other study had no cut-off point as the number of subjects was not enough to make certain cut-off point. **Table 3** showed 83.9% newborns with a family history of atopic diseases have CB-IgE levels ≥1.3 IU/ml. According to Croner *et al*,[10] atopic diseases developed in 73% of infants with an initially high CB-IgE levels (≥1.3 IU/m) and a family history. This statement will need further investigation that newborns with CB-IgE levels ≥1.3 IU/m have more risks to have atopic diseases in the future than those who have lower CB-IgE levels (<1.3 IU/ml).

Epidemiological studies have established that genetic factors play role in the development of atopic diseases. A negative parental history of atopic diseases is associated with low frequency of atopy in offspring. The risk increases if one the parent has atopy and it becomes higher if the other family member also has atopy.[3] No significant difference between atopic mothers and fathers was found in our study, but there were significant difference between mean of CB-IgE levels in newborns and the number of family who had atopic diseases histories **(Table 4)**. From the study, babies with ≥2 members of their families that had atopic diseases histories, had higher levels of mean CB-IgE levels compared with only 1 member of their families had atopic diseases histories. This results was similar with Kjellman *et al* study,[9] which showed that genetic is one of the factors that play role in atopic disease development. If both parents had atopic diseases histories, the IgE levels of their children were higher than if only one parent had history of atopic diseases.

The characteristic of subjects based on sex, birth weight, birth length, mothers' age, gestational age, did not have significant difference between newborns in atopic and non-atopic groups **(Table 1)**. This was similar with the findings of previous study.[13]

In conclusion, most newborns with a family history of atopic diseases showed high levels of CB-IgE, but there were no correlation with gender. Probability of having atopic diseases increases in concordance with the number of family with atopic diseases and it still needs further investigation.

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