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Cross-sectional Study

Determinant factors of recurrence atopic dermatitis symptoms in children: A cross-sectional study

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ABSTRACT

Background: Atopic dermatitis (AD) is a common health problem found in children. Understanding of the determinants of AD-related factors includes gender, family history, childbirth history, and exclusive breastfeeding.
Objective: Analyzing gender, family history, childbirth history, and exclusive breastfeeding on recurrence of AD symptoms in children.
Methods: This study employed a cross-sectional design with a purposive sampling method. The procedure for collecting data in this study included data on participant recurrence, gender, family history of atopy disease, childbirth history, and exclusive breastfeeding. The analysis used Chi-square and eta correlation test with $p < 0.05$.
Results: The results showed that 56.0% of male participants experienced recurrent atopic dermatitis symptoms and 56.7% of female participants did not experience recurrence (OR = 1.664; $p = 0.349$). It was reported that 61.3% of participants did not experience recurrent atopic symptoms with a family history of 1 atopic person and 71.4% of participants experienced recurrence with 2 atopic families (F = 2114; $p = 0.349$). Most participants who were delivered through cesarean delivery did not experience recurrent atopic dermatitis symptoms as much as 56.0%, while participants who had a history of spontaneous delivery mostly experienced recurrent atopic dermatitis symptoms as much as 52.9% (OR = 1.500; $p = 0.467$). There was a significant association between participants who received exclusive breastfeeding and recurrent atopic dermatitis symptoms (OR = 4.444; $p = 0.032$).
Conclusion: Recurrent of AD is influenced by exclusive breastfeeding and not influenced by gender, family history of atopy disease, and history of childbirth.

1. Introduction

Atopic dermatitis (AD) is a chronic, relapsing, inflammatory skin disorder, with remission and exacerbation episodes with symptom-free periods [1]. This disease has a description of itchy, red, dry, and irritated skin conditions, and is included in the atopic disease category [1,2]. The prevalence of atopic dermatitis is estimated at 15–20% in children. The incidence has increased 2–3 times over the last decade in some industrialized countries. As many as 50% of people with atopic dermatitis experience allergic symptoms in their first year of life, and as many as 85% have onset under the age of 5 years [3]. Approximately 75% of patients experience remission before adolescence, and the remaining 25% develop atopic dermatitis into adulthood or experience a relapse after several years of being symptom-free [4]. This disease is a serious health problem, where its recurrence and chronicity can affect the quality of life, finances, social life, and work, and have an impact on the psyche of the sufferer which can develop into mental problems, both in children and adults [5].

Atopic dermatitis recurrence is often associated with gender as some literature stated that men aged <2 years often experience AD or eczema recurrence [6]. The results of the skin prick test showed that boys have a higher AD positive rate than girls [7]. In addition, AD is found in

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children with parental history of AD where the recurrence risk is >80% [8], and around 70% family history with combined AD increases AD risks [9]. Childbirth history, such as cesarean section (C-section), increases AD risk by 12.6% [10]. The administration of exclusive feeding for ≤6 months to AD babies is effective to prevent AD symptoms in the first year of birth [11,12], therefore it is recommended to replace exclusive breastfeeding with partially hydrolyzed whey formula for AD children aged >6 months to minimize recurrence [11,13]. Some risk factors influence AD recurrence in children, namely gender [6,7], family history of the atopic disease [8], C-section delivery [10], and exclusive breastfeeding [11,13].

Over the last few years, the data have shown an increasing number of pediatric patients with AD in the hospital. In 2019, there were 45 pediatric patients with AD, and the number increased to 51 patients in 2020. Based on the explanation above, the researchers were interested in analyzing risk factors of AD recurrence in children. This study aimed to analyze the correlation between gender, family history of AD, history of childbirth, and exclusive breastfeeding on AD recurrence in children.

2. Methods

2.1. Participants

The participants of this study were pediatric patients with AD who met inclusion and exclusion criteria. Participant inclusion criteria were children aged 2 months–18 years, patients diagnosed with AD [14,15], and children with a history of exclusive breastfeeding. Participant exclusion criteria included participants who were not willing to take part in this study, children with malnutrition, and other skin diseases (scabies, etc.) Participants/caregivers received an explanation regarding the aim of this study and filled out a consent form.

2.2. Study design

A cross-sectional study was carried out from September 2020 to May 2021. The number of participants in this study was 55 children who were obtained by purposive sampling method. This study was reported by the Strengthening the Reporting of Cohort Studies in Surgery (STROCSS) 2019 guideline [16]. In the COVID-19 pandemic, the data collection procedure in this study followed the COVID-19 protocol applied in the hospital [17,18]. The data included characteristics of participants, signs, and symptoms of AD, gender, family history of atopic disease, history of childbirth, and exclusive breastfeeding that were collected using observation sheets.

2.3. Assessments of recurrence of atopic dermatitis symptom

Recurrence of AD symptoms is an episodic symptom that requires escalation of treatment or additional medical advice [4]. The assessment is categorized into two: yes = recurrence of AD symptom dan no = the first case of AD symptom. The diagnosis criteria of AD used the Indonesian version of scoring atopic dermatitis (SCORAD), which had been declared valid and reliable [14]. SCORAD is the best AD scoring among instruments used to assess AD severity, such as patient-oriented scoring atopic dermatitis (PO-SCORAD), eczema area and severity index (EASI), etc. [19].

2.4. Assessment of family history of atopic disease

Family history of AD includes parent, sibling, dan other family members who have been diagnosed with AD by the doctor [20]. The assessment of the family history of AD used family medical records in the hospital, online interviews with family/caregivers due to the COVID-19 pandemic. The data was taken from the father, mother, and sibling. Atopic disease assessed in this study included asthma, allergic rhinitis, and atopic dermatitis [3].

2.5. Assessment of childbirth

The childbirth history is the history of the mother's delivery process when giving birth to a child with AD that includes two methods, namely spontaneous delivery and C-section [21]. The childbirth history in this study was assessed using the mother's medical record in the hospital and through online or phone interviews. The childbirth history has a risk factor for the child to have atopic dermatitis, thus it was also collected in this study [22].

2.6. Assessment of exclusive breastfeeding

Exclusive breastfeeding is a type of breastfeeding exclusively given for 6 months without being given any other food or drink [23]. In this study, exclusive breastfeeding was assessed with yes and no questions, in which both data were obtained from the patient's medical record and interview with the participant's mother.

2.7. Statistical analysis

Data analysis was performed using univariate and bivariate techniques. Univariate analysis was used to analyze the data by describing the collected data and presented in the frequency distribution table. Bivariate analysis was conducted to explain the association between two variables by analyzing using the Kolmogorov Smirnov test to obtain data distribution. Normal data distribution was analyzed using the Chi-square test (parametric), while non-normal distribution was analyzed using eta correlation (non-parametric). The association between two variables was declared significant if $p < 0.05$. Measurement data were analyzed using IBM SPSS Statistics software version 21.0 (IBM Corp., Armonk, NY, USA).

3. Results

3.1. Characteristics of participants

Most participants were children (aged 25–120 months) as much as 50.9%. In addition, most participants were female as much as 54.5%. Atopic history in the participant's family was found in only 1 person (56.4%) that was only the mother, father, or siblings. Maternal delivery history based on anamnesis found spontaneous labor as much as 61.8%. There were 76.4% of participants actively consumed exclusive breastfeeding for 6 months (Table 1).

Table 1
Characteristics of participants.

Characteristics	n (%)
Age	
02–24 months	26 (47.3)
25–120 months	28 (50.9)
121–216 months	1 (1.8)
Sex	
Male	25 (45.5)
Female	30 (54.5)
Family history of atopy	
1 person	31 (56.4)
2 persons	14 (25.5)
3 persons	10 (18.2)
History of childbirth	
Cesarean Section	21 (38.2)
Prevaginal	34 (61.8)
Exclusive breastfeeding	
Yes	42 (76.4)
No	13 (23.6)

3.2. Determinant factor in recurrent of atopic dermatitis symptoms

Most male participants experienced recurrent atopic dermatitis symptoms as much as 56.0%. Meanwhile, most female participants did not experience recurrent atopic dermatitis symptoms as much as 56.7% (OR = 1.664; $p = 0.349$). Most participants who had a family history of atopic of 1 person did not experience recurrent symptoms of atopic dermatitis as much as 61.3%. Meanwhile, most participants with a family history of atopic of 2 persons experienced recurrent atopic dermatitis symptoms as much as 71.4%. Participants who had a family history of atopic of 3 persons, the number of participants who experienced recurrent atopic dermatitis symptoms, and those who did not was similar (F = 2114; $p = 0.349$; Table 2).

Most participants who were delivered by surgery did not experience recurrent symptoms of atopic dermatitis as much as 56.0%. Meanwhile, participants who had a history of spontaneous delivery mostly experienced recurrent atopic dermatitis symptoms as much as 52.9% (OR = 1500; $p = 0.467$). Most participants who received exclusive breastfeeding experienced recurrent symptoms of atopic dermatitis as much as 57.1%. Meanwhile, most participants who did not receive exclusive breastfeeding did not experience recurrent atopic dermatitis symptoms as much as 52.9% (OR = 4.444; $p = 0.032$; Table 2).

4. Discussion

This study found no correlation between sex and recurrence of AD symptoms despite some literature reporting that sex affects hormonal composition where dehydroepiandrosterone have roles in clinical manifestation of AD [6,7,24]. In children, atopic dermatitis is more dominant in boys, while it is more common in adult females as it is influenced by sex hormone that increases Th1 activity [25]. Sex hormone in the male is testosterone with immunosuppressive nature, while the female has estrogen hormone with immunoenhancing nature. The adult female has menstrual cycles that affect the composition of estrogen, making it vulnerable to trigger an allergy response [26].

This study found no correlation between family history of AD and recurrence of AD symptoms. This finding is not consistent with a previous study mentioning that children with parental history of AD have a risk of 25–50%, in which if one parent has AD, so the children would have 25% risk, and if both parents have AD, so the risk would be 50% [4]. A study reported that parental history of AD has a significant correlation with pediatric AD across continents of Asia, America, Europe, and Australia [27]. Filaggrin gene mutation in AD patients has been proven significantly to impair the skin barrier [27,28].

This study found no significant correlation between childbirth history and recurrence of AD symptoms. Some literature explained that during C-sections, lack of vaginal exposure and perianal bacteria lead to the predisposition of AD development. Perturbation of gut microbiota plays a key role in dysregulation of immune response and further development of allergy. Those conditions have been proven by a study reporting that babies born vaginally have microbial colonization similar to the microbiota in the mother's vagina, while babies born through C-section get bacteria from the hospital environment, not from the mother. This lack of colonization with beneficial bacteria predisposes to allergy manifestations later in life [21,29].

In addition, the C-section affects the maturation of the immune system by changing the level of stress at birth. During the process of vaginal delivery, uterine contractions and fetal hypoxia trigger a strong level of stress characterized by the release of cortisol in the fetal circulation, thereby promoting the maturation of various organs. Babies born by C-section do not have this beneficial effect, thus affecting the adaptation system and immune system maturation in the long term [21]. A study supported this claim, reporting that babies born by C-section are at high risk for atopic diseases such as eczema, asthma, and atopic sensitization [30].

The association of exclusive breastfeeding on the recurrence of AD symptoms was significant. The results of several previous studies stated that giving exclusive breastfeeding for 6 months reduced the risk of developing AD symptoms in children [11,12]. A study reported that exclusive breastfeeding protects the risk of eczema in children aged 2 years in developing countries [31]. Another study supported the claim that the provision of exclusive breastfeeding for 6 months reduces the risk of eczema by 33%, but when there is a prolonging of exclusive breastfeeding, the opposite effect will be obtained [32]. Based on a recent study, exclusive breastfeeding cannot be associated with AD because cases of AD in children whose mothers have a history of AD are more dominantly associated with inherited filaggrin gene mutations [33].

The limitations of this research include the limited number of participants, lack of grouping the children according to their age, and process of data collection during the COVID-19 pandemic that becomes a challenge in itself. Difficulties in data collection include finding a suitable time for children and parents/caregivers during a pandemic that requires extra effort.

Table 2
Determinant factor on recurrence of atopic dermatitis in Indonesian children.

Variables	Recurrent of Atopic Dermatitis Symptoms		OR	*p*
	Yes	No		
Sex			1.664	0.349
Male	14 (56.0)	11 (44.0)		
Female	13 (43.3)	17 (56.7)		
Family history of atopy			–	0.131
1 person	12 (38.7)	19 (61.3)		
2 persons	10 (71.4)	4 (28.6)		
3 persons	5 (50.0)	5 (50.0)		
History of Childbirth			1.500	0.467
Surgery	9 (42.9)	12 (57.1)		
Spartaneous	18 (52.9)	16 (47.1)		
Exclusive breastfeeding			4.444	0.032*
Yes	24 (57.1)	18 (42.9)		
No	3 (23.1)	10 (76.9)		

Note: *significant $p < 0.05$.

5. Conclusion

The recurrence of AD symptoms in children is influenced by several factors, including gender, family history of atopic disease, childbirth history, and exclusive breastfeeding. Gender affects the recurrence of AD by sex hormones, while family history of atopic disease through passed down filaggrin gene mutation. C-section affects AD through non-prevaginal delivery and lack of bacterial colonization during labor. Meanwhile, exclusive breastfeeding has been shown to prevent AD symptoms if consumed for 6 months. This study finds that only exclusive breastfeeding significantly affects the recurrence of AD symptoms, whereas gender, family history of atopic disease, and childbirth history do not show a significant correlation.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Abbreviation

AD = Atopic dermatitis
C-section = cesarean section
SCORAD = scoring atopic dermatitis
PO-SCORAD = patient-oriented scoring atopic dermatitis
EASI = eczema area and severity index

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Trial registry number

Name of the registry: Health research ethics committee in the Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Unique identifying number of registration ID: 0118/KEPK/I/2021.

Hyperlink to your specific registration (must be publicly accessible and will be checked): -.

Consent

Written informed consent was obtained from the patient.

Author contributions

All authors contributed toward data analysis, drafting and revising the paper, gave final approval of the version to be published and agree to be accountable for all aspects of the work.

Ethical approval

We have conducted an ethical approval base on the Declaration of Helsinki with registration research at the Health Research Ethics Committee in the hospital.

Guarantor

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