Research Article

THE ASSOCIATION OF ALLERGIC DISEASE WITH EPILEPSY

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ABSTRACT:

Background. Small studies have shown an increased risk of allergic disease in children with epilepsy and many studies still showing a conflicting result. The mechanism of the relationship between allergic disease and seizures remain undetermined. Many hypotheses the release of inflammatory cytokines during the process of immune system response alter the blood-brain-barrier integrity and lead to neuronal inflammation which could constitute on epileptogenic focus.

Objective. This study was commenced to investigate whether the allergic disease is associated with epilepsy.

Methods. We used data from the medical record in 2016-2019 in children aged 6 months-18 years old with epilepsy who were still in neither treatment nor already completing the treatment, along with the allergic history of food allergy, atopic dermatitis, insect bites reaction, drugs allergy, and asthma. A cross-sectional study with chi-square was used to analyze the relationship between allergic disease and epilepsy.

Results. From, 106 children with epilepsy, there were 21 children with allergic disease, with 4 of them are with a food allergy, 6 with allergic rhinitis, 7 with asthma, 1 with insect bite reaction and 3 with atopic dermatitis. The chi-square analysis shows a strong association between allergic disease and epilepsy ($p = 0.002$). From the bivariate model analysis, there was an association between epilepsy with food allergy (OR 4.219), allergic rhinitis (OR 2.344), asthma (OR 2.813), insect bite (OR 8.438) and atopic dermatitis (OR 1.875) even though it was not significant statistically.

Conclusion. There was an association between allergic diseases with epilepsy.

INTRODUCTION

Allergic diseases, most commonly atopic dermatitis (AD) and asthma are associated with multiple neuropsychiatric and mental health disorders in children and adults, including depression, anxiety, attention deficit hyperactivity disorder, and autism. Even with all of the growing evidence between allergy and neuropsychiatric condition. The relationship between allergic disease and other neurologic disorder, including epilepsy.[1]

The previous study in adults show an association between epilepsy and asthma in adults have found a conflicting results. Although the mechanism for this interaction is not known for sure, there have been some hypothesis according to this condition, where inflammatory process and certain cytokines in the pathogenesis of epilepsy. Inflammation occurring in allergic disease might also contribute toward the development of epilepsy. Indeed, small studies have shown increased risk of allergic disease in children.[2-3]

Moreover, little is known about the relationship between epilepsy and allergic disease in childhood. Taken together with previous clinical and epidemiological studies, we hypothesized that childhood epilepsy is associated with allergic disease, where in this study, we examined the association between childhood allergic disease and seizures.

METHODS

This study is a retrospective study using a medical record from the previous medical record from 2016 until 2019, who aged 6 months – 18 years old who was diagnosed with epilepsy, or currently on epilepsy treatment or already on finished the treatment of epilepsy. The allergic disease was determined by parentral response to our question regarding allergic disease, or through the medical history of the patient. The allergic disease then was divided into four sub-group of food allergy, allergic rhinitis, asthma, insect bites, and atopic dermatitis.

The exclusion criteria for this study was a central nervous system disorder or infection, or any organic disease within the brain that affect the epilepsy. Patient who are Immunocompromised, or patient who are on steroids.

The data processing and statistical data of this study was performed in SPSS. The chi-square analysis was performed to analysis the association between allergic disease and epilepsy. While multivariate logistic regression were used to analyze each of the allergic type in epilepsy condition, with p-value < 0.05 was significant in analysis.

RESULTS

From our subject characteristic study, we collected a total of 106 children, there was 66 children with epilepsy, and 40 children without epilepsy. Within the epilepsy group, there were 21 children who have allergies, and only 10 children from non-epilepsy group have allergies. The detailed of subject characteristics can be seen in table 1.

Variable	Allergic	Non-Allergic
Sex		
Male	21	32
Female	10	43
Epliepsy		
Yes	21	45
No	10	30
Allergic Type within Epilepsy Children		
Food Allergy	4	
Rhinitis Allergy	6	
Asthma	7	
Insect Bite	1	
Atopic Dermatitis	3	

Table 1. Subject Characteristic of the Sample

The association between prevalence of allergic disease and epilepsy was analyzed, with the results of the patients with allergic disease had a higher odds of epilepsy compared with non-allergic children (OR 1.4, p-value 0.002). The odds of each allergic type analysis there was an association between epilepsy with food allergy (OR 4.219), allergic rhinitis (OR 2.344), asthma (OR 2.813), insect bite (OR 8.438) and atopic dermatitis (OR 1.875) even though it was not significant statistically.

Variable	Positive Allergy	Negative Allergy	OR	P Value
Epilepsy	21	45	1,4	0.002
Non-Epilepsy	10	30		ref

Table 2. Association between epilepsy and allergic disease

Allergy Type	Total	OR	P-Value
Food Allergy	4	4.219	0.060
Allergic Rhinitis	6	2.344	0.279
Asthma	7	2.813	0.058
Insect Bite	1	8.483	0.072
Atopic Dermatitis	3	1.875	0.608

Table 3. Type of Allergy and Association with Epilepsy

DISCUSSION

In this cross-sectional study, we showed the result of children with allergic disease, including asthma, atopic dermatitis, food allergic and insect bite, have a higher lifetime and point prevalence of healthcare-provider-diagnosed epilepsy. These results are consistent with previous study between epilepsy and asthma in children and adults.[5-7]

A questionnaire-based single-center study of 406 children found that asthma was associated with more neurological problems, including epilepsy, hearing impairment and developmental delay.[8] A previous study of data from the 2002 National Health Interview Survey found that adults with seizures ha a two-fold higher odds of asthma, as well as cancer, arthritis, heart disease, stroke, severe headaches, lower back, and neck pain.[5] There was lot of studies that show association between adults and neurological disorder, the first study in 1998, from 24 children diagnosed with asthma and 24 age- and sex- matched healthy controls found that asthmatics were more likely to exhibit epileptiform activity on electroencephalogram (EEG).[9]

The allergic disease and epilepsy have been regarded as chronic inflammatory disease. The neuroinflammation and related cytokines in epilepsy and eplieptogenesis have been garnered clinical and scientific attention in recent years.[10-11] The study in transgenic mice overexpressing tumor necrosis factor (TNF)-α or IL-6 in the brain were susceptible to the occurrence of seizures and neuronal cell loss, where the overexpression of TNF- αand IL-6 in mice, was associated with the occurrence of neurodegenerative changes and sporadic spontaneous seizures.[12-13]

Another evidence has suggested the important roles of microglia and mast cells, which happens in allergic condition in neuroinflammation and related cytokine production, and reported that the synergic effect of microglia and mast cells may contribute to chronic neurodegenerative disease and accelerate disease progression.[14-15]Mast cells functions as effector cells for allergic diseases, including atopic dermatitis, asthma and allergic rhinitis. Mast cells derived a cascade of proinflammatory agents and chemokines are released sequentially.[16]

The over secretion of proinflammatory cytokines during atopic reactions would penetrate the blood-brain barrier and activate neuroimmunologic mechanism involving some specific neural circuits which causing a neuroinflammation and injure neuron cells. The chronic neuroinflammation and neuronal damage would further increase the susceptibility to epileptogenesis process.[17]

Silverberg et al. study shown that children with allergic disease had more epilepsy in their lifetime compared to non-allergic children, where our study also showed that children with allergic disease had an increased risk of developing epilepsy. The possible explanation may be that the majority of adults with epilepsy experience a childhood onset, and the incidence of the adulthood-onset epilepsy was much lower than the incidence of childhood-onset epilepsy.[5&18]

In conclusion, our results showed the elevated risk of developing epilepsy patient with allergic disease, especially in children. Further studies would be required to investigate the underlying pathophysiology between allergic disease and epilepsy, our study also showed an influence of each allergy type but it's not statistically significant, bigger sample size were needed to examine the detailed association between each allergic type and epilepsy.

CONCLUSION

There was a strong association between allergic diseases with epilepsy.

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DISCLOSURE

The authors stated that they had no interests which might be perceived as posing a conflict or bias.

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