



Cross-sectional Study

Correlation between nutritional status and children's activity with food allergy: A cross-sectional study

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ABSTRACT

Background: Food allergy in children affects nutritional status that limits their daily activities to prevent eating various foods to avoid allergic reactions.

Objective: Analyzing the relationship between nutritional status and daily activities in children with food allergies.

Methods: This study used a cross-sectional design that was carried out on children diagnosed with food allergies who underwent outpatient management of food allergies. The data were collected from January to May 2021 that included participant characteristics, nutritional status, and daily activities. Data analysis used Chi-Square and spearman rho test with $p < 0.05$.

Results: There was a significant relationship between age and FAIS (CI 1.83–4.24; $p = 0.025$). In addition, there was no significant relationship between the affected organs and FAIS (OR = 0.174; $p = 0.052$). Meanwhile, the relationship between nutritional status and FAIS was significant (OR = 0.161; $p = 0.007$). There was no significant relationship between parental education and FAIS (OR = 0.817; $p = 0.776$) as well as sex of the child and FAIS (OR = 0.982; $p = 0.977$).

Conclusion: Daily activities of children with food allergies are influenced by the nutritional status of children and children's age in choosing food.

1. Introduction

Food allergy is a major cause of early manifestations of the atopic disease that can lead to various other allergic manifestations [1]. The incidence of allergies in the world, especially food allergies, continues to increase, particularly in children [2]. In 2016, it was reported that 2–10% of patients had food allergies, 5.9% of patients reported having food allergies in Europe. Meanwhile, food allergies in children were reported as much as 7.1% in Canada [3]. In Indonesia, there is still no detailed data on the prevalence of food allergy patients in all age groups [4], but data on children with food allergies in Indonesia are reported as 3–60% of all reported allergy cases [5]. The prevalence of food allergies also continues to increase every year in children around 4–8% [6].

A common problem in children with food allergies is nutritional status, as many studies report that children with food allergies have poor growth [7,8]. The assessment of nutritional status is by the

recommendations of the Indonesian Pediatrician Association using the World Health Organization (WHO) growth standard chart and the Centers for Disease Control and Prevention (CDC) growth chart [4]. Nutritional status has a significant correlation with daily activities, especially in fracture patients [9], pneumonia [10], heart failure [11], and others. Meanwhile, there is little literature reporting a correlation between nutritional status and children's activities with food allergies [12].

The main referral hospital in East Java, Indonesia, reported that the number of Indonesian children with food allergies increases each year, which was 127 patients and 143 patients in 2017 and 2018, respectively [13] and 145 patients in 2019. The results of a preliminary study on caregivers of children with food allergies found that 80% of children had limitations in carrying out daily activities and they felt disturbed by this condition. Based on the description above, it is necessary to conduct a study to examine the correlation between nutritional status and

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children’s activities with food allergies.

2. Methods

2.1. Participants

The participants in this study were Indonesian children who were diagnosed with food allergies. Participant inclusion criteria were children aged 1 month to <18 years and diagnosed with food allergy [13, 14] with skin prick test showing positive result with provocation. These food allergies include allergy to cow milk [4,15], chicken egg [4,16], seafood (fish and shellfish) [17], chicken [18], and peanut [19]. Participant exclusion criteria were premature birth, thyroid disease, the dependence of enteral or parenteral nutrition, and other illnesses or procedures affecting nutrient metabolism or iodine status.

2.2. Study design

The study used a cross-sectional design that was carried out on children with a history of food allergy who underwent outpatient treatment. The data collection process was carried out from January to May 2021 with a total of 43 participants. The data taken included participant’s characteristics, nutritional status, and daily activities. This research report is by the Strengthening the Reporting of Cohort Studies in Surgery (STROCSS) 2019 guideline [20]. In the COVID-19 pandemic, the data collection procedure in this study followed the COVID-19 protocol that was applied in the hospital [21].

2.3. Ethical approval

Parents/legal guardians first received an explanation regarding the research objectives. They were required to fill out and sign the consent form should they agreed to participate in the study. This research was also registered for eligibility under the Declaration of Helsinki at the Health Research Ethics Committee in the hospital (0365/105/XI/2020).

2.4. Nutritional status score

Participants’ nutritional status was assessed using the growth chart from the Indonesian Pediatrician Association which adopted the growth chart from the World Health Organization (WHO) [22] and the Centers for Disease Control and Prevention (CDC) [23,24]. The Z-score based on WHO is used to assess the growth of participants aged 1–59 months. Fenton & Kim’s study stated that the WHO Z-score is the WHO growth standard tool used to assess the growth of newborn, infant, and toddler age [25]. Meanwhile, the CDC growth chart is used to assess participants aged 5–18 years. Based on a study conducted by Li et al. it was declared valid and reliable to calculate child growth [26].

2.5. Daily activities

The food allergy impact scale (FAIS) is a questionnaire used to evaluate parents’ perceptions of the impact of food allergies on eight aspects of daily family activities, with higher scores indicating a greater impact. The scale consists of 32 questionnaire items comprising of 8 aspects of activities, namely meal preparation (six items), family social activities (five items), caregiver-supervised child social activities (two items), family relations (three items), caregiver stress, and free time (three items), school or structured activities (six items), autonomous child social activities (three items), and employment and finances (three items). The FAIS reliability results obtained Cronbach’s alpha value 0.70, with subscale meal preparation ($\alpha = 0.96$), family social activities ($\alpha = 0.88$), caregiver-supervised child social activities ($\alpha = 0.73$), family relations ($\alpha = 0.79$), caregiver stress and free time ($\alpha = 0.80$), school or structured activities ($\alpha = 0.86$), autonomous child social activities ($\alpha = 0.55$), and employment and finances ($\alpha = 0.60$) [27]. The Indonesian

version of FAIS is declared valid and reliable based on previous studies [13].

2.6. Statistical analysis

The measurement data were analyzed by univariate and bivariate analysis, in which univariate data was displayed in the form of a frequency distribution or mean \pm standard deviation (SD). Meanwhile, the bivariate analysis in this study used the Chi-Square and Spearman rho test. Statistical tests were 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

The mean age of participants was 88.16 ± 42.48 months, with a median age of 84.00 (60.00–120.00) months. The youngest participant’s age was 9 months and the oldest participant’s age was 180.00 months. Most participants were 84-month-old as many as 6 participants (14.00%). Most participants were male (55.80%). Most participants were diagnosed with allergic rhinitis as many as 19 participants (44.20%) and followed by asthma allergy as many as 16 participants (37.20%). Most participants had a history of atopy from the father as many as 24 participants (55.8%). The nutritional status of most participants was sufficient as many as 20 participants (46.5%). The education level of parents was mostly high school (53.5%), and most of them had non-graduate education as many as 30 participants (69.8%). Most participants experienced food allergies in the respiratory tract as many as 35 participants (81.4%; Table 1).

3.2. Analysis of Children’s nutritional status with Children’s activities

Most of the children’s FAIS scores were insignificant as many as 25 participants (58.1). Most participants also had abnormal nutritional status as many as 23 participants (53.5%; Table 1). There was a

Table 1
Characteristics of participants.

Variables	n (%)
Sex	24 (55.8)
Male	19 (44.2)
Female	
Types of Allergy	19 (44.2)
Rhinitis allergy	16 (37.2)
Asthma allergy	2 (4.7)
Urticarial	6 (14.0)
Eksim	
History of Atopy	24 (55.8)
Father	14 (32.6)
Mother	4 (9.3)
Father and Mother	1 (2.3)
Father, Mother and Siblings	
Nutritional Status	7 (16.3)
More	20 (46.5)
Enough	10 (23.3)
Less Bad	2 (4.7)
Obesed	4 (9.3)
Parents’ Education Level	3 (7.0)
Primary school	4 (9.3)
Middle school	23 (53.5)
High school	13 (30.2)
Bachelor	
FAIS	18 (41.9)
Significant	25 (58.1)
Non-significant	
Affected Organs	13 (30.2)
Respiratory tract	30 (69.8)
Skin	

significant relationship between age and FAIS score (CI 1.83–4.24; $p = 0.025$). In addition, there was no significant relationship between the affected organs and FAIS (OR = 0.174; $p = 0.052$). Meanwhile, the relationship between nutritional status and FAIS was significant (OR = 0.161; $p = 0.007$). There was no significant relationship between education and FAIS (OR = 0.817; $p = 0.776$) as well as sex and FAIS (OR = 0.982; $p = 0.977$; Table 2).

4. Discussion

Therapeutic elimination diets have been shown to produce symptomatic emission and are the primary treatment for food allergies [13, 28], however, several studies have stated the effect of decreasing children’s nutritional status [29,30]. So the management of the elimination diet requires knowledge through proper and careful education in its implementation [31], and periodic evaluation of the nutritional status of children with food allergies is required [30,31]. Poor nutritional status affects daily family activities, as in the findings of this study, for various reasons, for example having to provide safe and nutritious food for allergic children with dietary limitations is very difficult [12], consultation with a nutritionist for meal replacements, expensive special allergy formula [12,30], spend more time both in supervision and consultation with health workers so that it interferes with work [12,13].

Due to the strict authority of parents and caregivers on children in carrying out daily activities, it causes resistance to the rules from parents/caregivers with increasing age even though they used to be very obedient to parents/caregivers. Moreover, children did not hesitate to show their rebellion directly in front of their parents. This can also affect daily family activities in children with food allergies, as in our study, where the age of the child affects daily family activities, especially due to increasing age, such as teenagers with food allergies. They have a lower and narrower risk perception, and they seem to care less about their condition that one day can cause an allergic reaction due to the consumption of food freely [32,33]. The desire to be independent causes teenagers to take risks even though they realize the consequences and they are annoyed with parents who often worry and control their lives [33,34]. Meanwhile, another study stated that from the parents’ point of view, the younger the child is with food allergies, the more negative the impact of food allergies on daily family activities. This may be because older children have outgrown some food allergens or have adapted/have positive coping over time [35].

The sex of the child and the education of the parents do not affect the daily activities of the family. There was no effect of sex on the daily activities of children with food allergies, as previous studies reported no sex differences in the quality of life of children with food allergies [36, 37]. Another study reported that the sex of children with food allergies does not affect the burden of parenting. This indicates that sex does not

Table 2
Correlation between Children’s nutritional status and Children’s activities.

Variables	FAIS		OR	p
	Significant	Non-Significant		
Age of choosing food	4	0	–	0.025
≤3 year	14	25		
>3 year				
Affected organs	12	23	0.172	0.052
Respiratory tract	6	2		
Skin				
Nutritional status	4	16	0.161	0.008
Normal	14	9		
Abnormal				
Parents’ educational level	5	8	0.817	0.766
Bachelor	13	17		
Non-bachelor				
Sex	10	14	0.982	0.977
Male	8	11		
Female				

affect parenting either anxiety, productivity, work, and quality of life of caregivers of children with food allergies [38].

The level of education of caregivers also has no effect on the daily family activities of children with food allergies. Caregivers with high general knowledge of food allergies are indeed better to accurately identify foods that their child with a food allergy should avoid, but this is regardless of their general level of education or duration of the child’s food allergy. These findings suggest that relatively educated caregivers who have had time to adapt to their child’s food allergy diagnosis still need food allergy avoidance training to make safe food choices for their children [39].

The limitations of the study include the participants’ age range which is too far away, food allergies that are not specific, and the small number of participants. The challenge in this implementation is that participant data collection which was carried out during the COVID-19 pandemic caused the number of participants to decrease. In addition, data collection requires the additional use of level 3 personal protective equipment by the COVID-19 protocol in the hospital [21].

Future study is expected to be more specific in reviewing the relationship between nutritional status and children’s activities with specific food allergies (cow milk allergy, chicken eggs allergy, etc.) or adapted to the age group of children. The results of this study are expected to be a concern for medical personnel in treating children with food allergies.

5. Conclusion

There is a significant relationship between nutritional status and daily activities in children with food allergies. In addition, there is a significant relationship between children’s age in choosing food and daily activities in children with food allergies. Based on this study, daily activities in children with food allergies do not have a significant correlation with organs affected by food allergies, parental education, and gender.

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Consent

Written informed consent was obtained from the patient.

Ethical approval

We have conducted an ethical approval base on the Declaration of Helsinki at Ethical Committee in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Author contribution

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.

Research registration

Not applicable.

Guarantor

Azwin Mengindra Putera is the person in charge for the publication of our manuscript.

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.102652>.

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