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Eating Habits and Their Impact on Atopic Dermatitis: A Single-Center Cross-Sectional Study of 342 Cases

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Abstract

Background: The correlation between atopic dermatitis and food allergies is well-documented within the scientific community. However, the precise influence of various food allergens on the worsening of atopic dermatitis symptoms remains a subject of considerable debate and ongoing research. This study aims to explore in depth the potential link between dietary habits and the severity of atopic dermatitis in a pediatric population living in Goma. **Methods:** As part of an analytical approach, a cross-sectional study was conducted in the dermatology department of the North Kivu Provincial Hospital, involving a sample of 342 patients examined between January and June 2025. The collected data were digitized and analyzed using SPSS software, version 26. **Results:** The study revealed that 35.7% of patients suffered from a severe form of atopic dermatitis. Univariate analysis showed a statistically significant association between the severity of atopic dermatitis and several factors, including urban residence (p = 0.002), the dry season (p < 0.001), delayed introduction of solid foods (p = 0.004), consumption of more than three meals per day (p = 0.001), and being overweight (p = 0.003). Multivariate analysis demonstrated that frequent consumption of junk food, specifically candies, pastries, chocolate, fried potatoes, potato chips, and sweets (OR = 1.185, 95% CI = 1.113 - 2.345, p = 0.000) and dairy products (OR = 1.902, 95% CI = 1.160 - 3.111, p = 0.011) significantly increased the risk of developing a severe form of atopic dermatitis. Conversely, frequent consumption of fruits and vegetables was found to be significantly associated with a less severe form of atopic dermatitis

(OR = 1.250, 95% CI = 1.048 - 1.491, p = 0.013). **Conclusion:** The hypothesis that eliminating or selectively introducing certain foods may be a relevant therapeutic strategy to reduce the risk of severity associated with atopic dermatitis in children deserves consideration.

Keywords

Dietary Habits, Atopic Dermatitis, North Kivu Provincial Hospital

1. Introduction

Atopic Dermatitis (AD) is a widespread chronic inflammatory skin condition, primarily characterized by intense itching and the formation of characteristic eczematous plaques. Epidemiological studies indicate that the prevalence of AD in children ranges from 10% to 20% globally. Notably, in approximately 10% of cases, the condition may persist beyond childhood, extending into adolescence or even adulthood [1] [2]. AD exhibits considerable heterogeneity in terms of severity, clinical presentation, and disease progression. Its underlying pathophysiology is complex [3], involving the interplay of various factors such as a dysfunctional skin barrier, immune system dysregulation, genetic predisposition, and mutations in the gene encoding filaggrin. In addition, environmental factors—including exposure to ultraviolet radiation, air pollution, household hygiene practices, and climatic variations—significantly contribute to the multifaceted nature of this dermatological condition [4].

Experimental studies using animal models suggest that environmental allergens, such as food-derived proteins, may interact with the immune system through antigen-presenting cells located in the superficial epidermal layer. This interaction may trigger immune sensitization, potentially exacerbating the clinical manifestations of atopic dermatitis [5].

For over two decades, the role of diet in the onset and persistence of atopic dermatitis has been the subject of ongoing debate among dermatologists and allergists. Although AD and Food Allergies (FA) are frequently observed together, the precise nature of their relationship remains a major point of contention within the scientific community. This issue continues to be relevant, as reflected in recent publications from 2023 and 2024 [6] [7].

The present study aims to explore the potential link between dietary habits and the severity of atopic dermatitis in a pediatric population receiving care at the dermatology department of the North Kivu Provincial Hospital in the Democratic Republic of Congo.

2. Methods

2.1. Study Type and Design

Between January and June 2025, we conducted a cross-sectional analytical study

to examine the relationship between dietary habits and the severity of atopic dermatitis in children recruited at the Dermatology Department of the North Kivu Provincial Hospital (NKPH). Due to the lack of a complete data base and the difficulties in accessing patients, a non-random sampling method was used for subject selection.

2.2. Data Collection and Instrumentation

To gather data on the sociodemographic profile and dietary habits of children with atopic dermatitis, a self-administered questionnaire was distributed to the parents. In addition, a physical examination was conducted for each child to thoroughly assess the characteristic signs of AD. The diagnosis of atopic dermatitis was confirmed in accordance with the diagnostic criteria established by Hanifin and Rajka [8].

The severity of Atopic Dermatitis (AD) was rigorously evaluated using the SCORAD index, a standardized and widely recognized tool in clinical practice and research [9]. This index incorporates an analysis of the topographical characteristics of the disease, including the affected skin surface, the intensity of observed skin lesions, and subjective parameters reported directly by the patients, thus enabling a holistic evaluation approach. To determine the extent of AD, the "rule of nines" was systematically applied to all participants. The total affected body surface area was quantified on a continuous scale ranging from 0 to 100, allowing for precise measurement. The SCORAD index was calculated using the formula: $A/5 + 7B/2 + C$, where A represents the extent of the disease (scored from 0 to 100), B represents the intensity of lesions (scored from 0 to 18), and C includes the patient's subjective symptoms (scored from 0 to 20). Based on the SCORAD score obtained, the severity of atopic dermatitis was categorized as follows: mild (under 25 points), moderate (between 25 and 50 points), or severe (over 50 points).

To estimate the patients' weight status, the Body Mass Index (BMI) was calculated as the ratio of weight (in kilograms) to height squared (in meters). The resulting values were classified into four categories: underweight (BMI < 18.5), normal weight (BMI between 18.5 and 24.9), overweight (BMI between 25 and 29.9), and obesity (BMI ≥ 30) [10].

Additionally, the income variable was dichotomized to classify households into two categories: low-income households defined as those living on less than USD 1.25 per person per day and acceptable-income households those with a stable income equal to or greater than USD 1.25 per person per day. It is worth noting that the USD 1.25 threshold has been a benchmark published by the UNDP since December 2010 [11].

2.3. Inclusion Criteria

The study included all children diagnosed with atopic dermatitis, aged between 6 months and 14 years. Informed and voluntary consent was obtained from the parents or legal guardians of each participant prior to their inclusion in the study.

Moreover, all collected data were kept confidential in accordance with ethical standards.

2.4. Exclusion Criteria

Children with atopic dermatitis who also presented with systemic comorbidities were excluded from the study. Additionally, children whose parents did not provide formal consent were also excluded.

2.5. Data Analysis

After data collection, the information was thoroughly recorded and processed using the Statistical Package for Social Sciences (SPSS), version 26. For data organization and presentation in structured tables, EXCEL and WORD 2007 were used. Qualitative variables were expressed in frequencies (n) and percentages (%), while quantitative variables were described by their means and extreme values. To compare severe and non-severe forms of atopic dermatitis, a univariate analysis was initially performed, followed by a multivariate logistic regression analysis. Odds Ratios (OR) with their 95% Confidence Intervals (CI) were presented, and statistical significance was set at a p-value of less than 0.05.

3. Results

3.1. Prevalence of Atopic Dermatitis by Severity

In this study involving 342 individuals, 122 were found to have severe atopic dermatitis. This represents a significant proportion **35.7%** of the studied population. Meanwhile, mild to moderate atopic dermatitis was diagnosed in **220 patients**, accounting for **64.3%** of all examined cases.

3.2. Sociodemographic, Economic, and Clinical Factors Associated with Atopic Dermatitis Severity

The average age of the patients was 4.4 years, ranging from 6 months to 14 years. Univariate analysis revealed a statistically significant correlation between the severity of atopic dermatitis and several factors. These factors included the area of residence ($p = 0.002$), with a higher prevalence in urban areas (78.7%); climate ($p < 0.001$), characterized by increased prevalence during the dry season (76.6%); dietary diversification ($p = 0.004$), where a delayed introduction of foods was associated with a higher rate of atopic dermatitis (64.9%); meal frequency ($p = 0.001$), with a predominance among individuals consuming more than three meals per day (45.7%); and body mass index ($p = 0.003$), where overweight was the most represented category (64.9%). However, statistical analysis did not reveal a significant association between the severity of atopic dermatitis and the following factors: age of the patients ($p = 0.172$), sex of the patients ($p = 0.099$), parents' standard of living ($p = 0.183$), duration of breastfeeding ($p = 0.081$), as well as personal or family history of atopy ($p = 0.114$).

3.3. Dietary Habits and Atopic Dermatitis

A rigorous statistical analysis revealed that frequent consumption (at least three times per week) of junk food (p = 0.000), dairy products (p = 0.001), and fish (p = 0.032) showed a positive and significant correlation with the severity of atopic dermatitis. Conversely, frequent consumption of fruits and vegetables was associated with a less severe form of atopic dermatitis (p = 0.038). Other food groups, such as high-fat foods, eggs, and starchy foods, did not show any significant association with the severity of atopic dermatitis (all p ≥ 0.05) (**Table 1**).

Table 1. Univariate analysis between Atopic Dermatitis (AD) severity and dietary habits.

Frequently Consumed Foods (≥3 times/week)	Severe AD		p-value
	Yes N = 122	No N = 220	
Junk Food			0.000
Yes	106 (86.9)	122 (55.5)	
No	16 (13.1)	98 (44.5)	
Fish			0.032
Yes	71 (58.2)	100 (45.5)	
No	51 (41.8)	120 (54.5)	
Starchy foods			0.650
Yes	71 ((58.2)	122 (55.5)	
No	51 (41.8)	98 (44.5)	
Dairy products			0.001
Yes	65 (53.3)	156 (70.9)	
No	57 (46.7)	64 (29.1)	
Fruits and vegetables			0.038
Yes	40 (32.8)	98 (44.5)	
No	82 (67.2)	122 (55.5)	
High-fat foods			0.245
Yes	81 (66.4)	131 (59.5)	
No	41 (33.6)	89 (40.5)	
White and red meat			0.652
Yes	57 (46.7)	109 (49.5)	
No	65 (53.3)	111 (50.5)	
Other foods			0.113
Yes	104 (85.2)	136 (61.8)	
No	18 (14.8)	84 (38.2)	

Junk food: Candies and pastries, chocolate, fries, chips, sweets. **Other foods:** Tomatoes, eggplants, peppers, paprika, potatoes, sweet potatoes. **AD:** Atopic Dermatitis.

The logistic regression results indicate a significant association between frequent consumption of junk food, specifically candies, pastries, chocolate, fried potatoes, potato chips, and sweets (OR = 1.185, 95% CI = 1.113 - 2.345, p = 0.000) and dairy products (OR = 1.902, 95% CI = 1.160 - 3.111, p = 0.011) significantly increased the risk of developing a severe form of atopic dermatitis. Conversely, frequent consumption of fruits and vegetables was found to be significantly associated with a less severe form of atopic dermatitis (OR = 1.250, 95% CI = 1.048 - 1.491, p = 0.013) (Table 2).

Table 2. Multivariate logistic regression analysis between Atopic Dermatitis (AD) severity and dietary habits.

	Severe AD		ORb	CI 95%	p	ORa	CI 95%	p-value
	Oui (%)	Non (%)						
Junk food								
Yes	86.9	55.5	1.567	[1.366 - 1.797]	0.000	1.185	[1.113 - 2.345]	0.000
No	13.1	44.5	1.00			1.00		*
Fruits and vegetables								
Yes	58.2	45.5	1.280	[1.039 - 1.578]	0.032	1.250	[1.048 - 1.491]	0.013
No	41.8	54.5	1.00			1.00		*
Fish								
Yes	32.8	44.5	1.212	[1.021 - 1.439]	0.038	1.889	[1.147 - 3.111]	0.090
No	67.2	55.5	1.00			1.00		*
Dairy Products								
Yes	53.3	70.9	1.606	[1.214 - 2.125]	0.001	1.902	[1.160 - 3.120]	0.011
No	46.7	29.1	1.00				[0.61 - 1.83]	*

Junk food: Candies and pastries, chocolate, fries, chips, sweets. **AD:** Atopic Dermatitis. **ORb:** Crude Odds Ratio. **ORa:** adjusted Odds Ratio.

4. Argument

4.1. Summary of Main Findings

A cross-sectional study was conducted at the Provincial Hospital of North Kivu (HPNK) with the aim of exploring the potential relationship between dietary habits and the severity of atopic dermatitis in a pediatric population residing in Goma. The results of this study revealed that frequent consumption of junk food and dairy products significantly increased the risk of developing a severe form of atopic dermatitis. Conversely, regular intake of fruits and vegetables was associated with a decreased risk of severity of this skin condition.

4.2. Strengths of the Study

The main strength of this investigation lies in its originality, as it represents the

first analysis of dietary habits in patients with atopic dermatitis in our region. This study helped identify and document foods that may exacerbate the symptoms of atopic dermatitis in children living in Goma. Therefore, it provides valuable insights into potential food-induced allergic reactions.

4.3. Study Limitation

The limitation of the study includes the self-selective nature of the survey, which limits the generalizability of the results. In further research, it would be relevant to consider conducting multicenter studies. Such an approach would significantly increase the number of participants and, consequently, provide a more accurate representation of children in Goma affected by atopic dermatitis. Moreover, a larger sample size would allow for more rigorous statistical analysis, thereby contributing to the consolidation of research results.

4.4. Argument of Key Differences

A detailed analysis of the severity of atopic dermatitis among our patients was conducted using the SCORAD index, a measurement tool whose reliability and practicality are well-established in the scientific literature [9]. The results showed that a significant proportion of our cohort, over one-third (35.7%) of patients, had a severe form of atopic dermatitis. This observation differs significantly from existing literature, which reports severe forms in less than 15% of cases [12] [13]. A plausible explanation for this high prevalence lies in the specific context of our study, which was conducted at HPNK, a referral hospital specializing in the treatment of severe and complicated conditions.

Further analysis revealed a marked association between the severity of atopic dermatitis and the patients' area of residence, with a higher predisposition observed among urban populations. This trend could be attributed, within the context of this research, to multifactorial air pollution, which includes natural components such as volcanic emissions and dust storms [14], as well as human-induced pollutants from motor vehicles, power generation facilities, and industrial sectors. This observation is supported by studies by Costner McKenzie and Jonathan Silverberg in the United States, which identified similar links [14].

A statistically significant correlation was also observed between the dry season and the severity of atopic dermatitis. Drought is closely linked to other extreme weather events, such as wildfires, heatwaves, and the increased frequency and intensity of dust storms. These events, through their contribution to air pollution, can potentially worsen the clinical symptoms of atopic dermatitis [15].

A late introduction of solid foods showed a significant correlation with the severity of atopic dermatitis in our patient cohort. These findings align with existing scientific evidence suggesting that earlier food introduction could offer substantial benefits in both the therapeutic and potentially prophylactic management of this skin condition [16] [17].

The consumption of more than three meals per day was found to be a significant

determinant of atopic dermatitis severity. This observation could be attributed to the potentially increased risk of cross-allergies associated with frequent meals, which may consequently exacerbate atopic dermatitis [18].

The study also highlighted a significant correlation between being overweight and the severity of atopic dermatitis. Various studies converge to show that excess body weight increases susceptibility to allergies [19] [20]. A potential explanation is that overweight or obese individuals exhibit increased transepidermal water loss, indicating impaired skin barrier function, as well as reduced hydration of the stratum corneum compared to individuals of normal weight. These physiological alterations may worsen skin dryness (xerosis) and, consequently, intensify the clinical manifestations of atopic dermatitis [19].

Our data analysis revealed that frequent consumption of junk food and dairy products was associated with a significantly increased likelihood of developing severe atopic dermatitis. These results are consistent with previous research that established a link between junk food consumption and the severity of atopic dermatitis [21]. Similarly, Atherton and his team [22] reported a potential correlation between dairy product intake and the manifestation of atopic dermatitis. On the other hand, frequent consumption of fruits and vegetables was associated with a reduced likelihood of developing severe atopic dermatitis. Fruits and vegetables are rich sources of carotenoids, flavonoids, vitamins, and minerals, which have been shown to inversely correlate with oxidative stress and pro-inflammatory cytokines such as TNF-alpha and C-reactive protein [23]. Moreover, earlier research has suggested that a vegetarian diet can improve atopic dermatitis symptoms by reducing peripheral eosinophil counts and PGE2 synthesis by monocytes [24].

5. Conclusion

Nutrition plays an important role in all chronic inflammatory diseases and should therefore be taken into account in atopic dermatitis. Studies have highlighted a correlation between the consumption of junk food and dairy products and an increased risk of severe clinical presentation of atopic dermatitis. Conversely, the inclusion of fruits and vegetables in the diet appears to have a protective effect. As a result, targeted dietary interventions, involving the strategic elimination or addition of specific foods, could represent a promising adjuvant therapeutic approach to mitigate the progression of atopic dermatitis in predisposed individuals. It is crucial to emphasize the importance of conducting comprehensive research on dietary habits and the severity of atopic dermatitis in children across different geographical regions of the Democratic Republic of Congo. These analyses are essential for establishing nutritional guidelines tailored to patients affected by this dermatological condition.

Authors' Contributions

All listed authors contributed to the writing of this article. All authors also declare

that they have read and approved the final version of the manuscript.

Conflicts of Interest

The authors declare no competing interests.

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