Article

Factors Associated with Atopic Dermatitis among Children Aged 6 To 14 Years in Alimosho Local Government, Lagos, Nigeria

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Abstract: There has been a rise in the prevalence of atopic dermatitis (AD) globally especially in low-and middle-income countries such as Nigeria. The condition has been linked to genetic predisposes, living conditions and environmental factors. Environmental factors are considered an significant contributor to AD in low- and middle-income countries. This study determined the prevalence of AD in south-western Nigeria and identified risk factors in home and school environments that children aged 6 to 14 years are exposed to. A cross-sectional study was adopted, and the total sample size was 349. Four randomly selected health facilities were used for the study. A questionnaire was used to determine the risk factors in the population. Data analysis was done using the latest version of Statistical Package for Social Science (SPSS).The prevalence of atopic dermatitis in this study is 25%. Atopic dermatitis was found to be common in females (27%). Children who lived where trucks pass on the street almost daily had the highest cases of atopic dermatitis (28%). Children with rug in their houses and those whose houses are surrounded by bushes also had higher cases of atopic dermatitis at 26% and 26% respectively. Children who played on school grass, attended creche with rubber toys, attended school where wooden chairs, chalkboard were used had higher number of AD cases at 26%, 26%, 28%, 27% respectively. This study identified home and school exposure that predisposes children to AD. It is envisaged that the study will serve as a basis for possible research on evidence-based treatment options.

Keywords: Atopic dermatitis; children; allergic; skin conditions; environmental factors

1. Introduction

Atopic dermatitis (AD) is a prevalent, most common chronic skin condition in children. It is a chronic inflammatory skin condition characterised by pruritus and common in pediatric dermatology clinics [1–4]. AD has a significant impact on the quality of life amongst children while indirectly affecting their families [5,6]. The physical impact of this condition on children includes irritability, excessive crying, and sleep disturbances while its social impact include stigma due to visible skin condition [7]. This worldwide skin condition burden is treatable and preventable. Preventing the occurrence of this disease would help reduce its physical, social and economic impact [8]. Scientific evidence further shows that a combination of genetic and environmental factors are contributory factors towards the development of AD [9].

Several cross-sectional studies have identified the association between environmental factors and AD but only few factors like air pollution and keeping of pets were discovered [10,11]. A study carried out in Abuja; Nigeria also noted that AD was associated with dry season [12]. With respect to the burden of AD, there are more environmental factors yet to be identified. A study in 2019 also identified this gap and noted that further studies are required to identify other environmental factors [13]. One of the identified gaps is that

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guardians and parents have little knowledge on the causes of atopic dermatitis [14]. However, it is reported that some are aware of the hereditary component of this skin disease but believe that other factors are the main triggers not all the children from the same family bloodline develop the disease [15]. Thomsen and colleagues noted that there is a sevenfold increased risk of AD in affected twin of identical twins unlike a threefold risk in second twin of fraternal twins [16]. Children whose parents have allergies are more likely to develop atopic dermatitis than children of parents without allergic conditions [17,18]. Despite this clear genetic predisposition for AD, evidence suggests that environmental factors contribute significantly in the development of the disease [19].

Identification of the factors triggering this disease, in the home and school environments as well as educating parents and guardians on these will help them take caution while caring for their children during infancy and childhood [20]. Direct medical costs, direct family care costs and indirect costs associated with loss of productivity of parents may also be reduced [21].

The diagnosis of atopic dermatitis is made using the Hanifin and Rajka criteria. This requires that the individual presents with a pruritic rash and three or more of the following features: history of rash in the skin creases (fold of the elbow, behind the knees, front of the ankles and around the neck), a personal or family history of asthma and hay fever, history of generalized dry skin (xerosis), onset before the age of 2 years and visible flexural dermatitis [22]. In 2004 Nnoruka, noted that the symptoms these children present with varies according to ethnicity [23]. However, the internationally acceptable criteria remain the Hanifin and Rajka criteria and will be used in making a diagnosis of AD in this study.

Atopic dermatitis has proven to be a dermatological disease of public health importance due to its rising prevalence over the years. The literature review showed that despite genetic factors being associated with atopic dermatitis, there seems to be environmental factors that triggers the onset of the disease. To our knowledge, there are limited studies have been done in Nigeria especially in the southwestern part to identify these factors, hence the need for this study which determined the prevalence, identified home related and school related risk factors of atopic dermatitis. It also determined the association between these factors and atopic dermatitis. The aim of the study was to determine environmental factors associated with atopic dermatitis amongst children aged 6 to 14 years in Alimosho Local Government, Lagos, Nigeria. While the specific objectives of the study were to:

i) to determine the prevalence of AD among children aged 6 to 14 years;
ii.) to determine household risk factors of AD amongst study participants;
iii.) to determine school-related risk factors of AD amongst study participants; and
iv.) to establish the association between AD and risk factors in the study population.

2. Materials and Methods

2.1. Study Design

An observational cross sectional study design was adopted for this research project. The study was conducted over a period of 3 months.

2.2. Study Population

This study was conducted at four private health facilities in Alimosho Local Government of Lagos State, Nigeria. Alimosho is a Local Government Area in the Ikeja Division of Lagos State, Nigeria. It is the largest local government in Lagos, with over two million inhabitants. The study population consisted of children aged 6 to 14 years who attended the health facilities chosen for the study. The ISAAC phase three study on atopic dermatitis was within the same age group. Any child less than 6years or greater than 14years was excluded from this study. The study only included children aged 6 to 14years diagnosed with atopic dermatitis and other dermatological conditions, whose parents gave consent and children whose parents did not give consent was excluded.

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2.3. Sampling Approach

There were 12 private health facilities in Alimosho local government targeted as a study site. However, the researcher allocated numbers from one to twelve. Thereafter three facilities were drawn by choosing every third facility on the list. While the participants were purposively selected, once they were diagnosed. The practicing physician gave information about the study to the caregiver of any child aged 6 to 14 diagnosed with AD and other dermatological conditions during the period of the study. The physician also identified those with atopic dermatitis by giving them a paper as 'A' while those who was managed for other dermatological conditions other than atopic dermatitis as 'B'. They approached us for participation in the study after being referred by their physician. The participants selection process was repeated until the desired sample size was reached. The sample size was determined using EPI INFO 7.2 (Centre for Disease Control and Prevention). The following parameters were used when calculating the sample; the confidence level as 95%, power as 95%, prevalence in general population (unexposed) as 8.5%, prevalence in exposed as 30.4% [23]. Therefore, the total sample size calculated is 290. To compensate for non-respondent and invalid forms, the calculated sample size was increased by 20% to get the final sample size for the study which is 349

2.5. Data Analysis

The variables analysed include sociodemographic factors, factors in the home and factors in the school environment. Cross tabulations were used to determine the prevalence and identify risk factors in home and school environments. This data was analysed using SPSS version 28. Specific data analysis by objectives were conducted as follows:

Objective i: frequency distribution was used to quantify the prevalence of atopic dermatitis among children aged 6 to 14 years in Alimosho Local Government, Lagos, Nigeria. Tables and graphs were used to summarize the data.

Objective ii: frequency distributions, cross tabulations, binary and multivariate logistic regressions models were used to explore the relationship between atopic dermatitis among children aged 6 to 14 years in Alimosho Local Government, Lagos Nigeria, and socio-demographic factors. P-values (0.05) was used to test if the relationship is statistically significant.

Objective iii: frequency distributions, cross tabulations, binary and multivariate logistic regressions models were used to explore the relationship between atopic dermatitis among children aged 6 to 14 years in Alimosho Local Government, Lagos Nigeria, and risk factors in home environment. P-values (0.05) was used to test if the relationship is statistically significant.

Objective iv: frequency distributions, cross tabulations, binary and multivariate logistic regressions models were used to explore the relationship between atopic dermatitis among children aged 6 to 14 years in Alimosho Local Government, Lagos Nigeria, and risk factors in school environment. P-values (0.05) as used to test if the relationship is statistically significant.

3. Results

These results are presented according to the objectives of the study, and these include: to determine the prevalence, household risk factors and school-related risk factors of AD among children aged 6 to 14 years in Alimosho Local Government, Lagos, Nigeria. Lastly, it presents the association between AD and risk factors in the study population. There were 86 (25%) participants that had AD, while there were 263 (75%) of participants without AD. Therefore, the prevalence of AD in this study was 25% as shown in figure 1.

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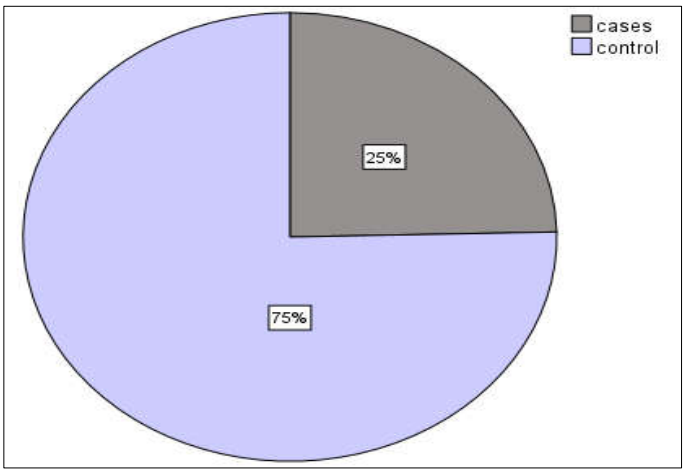

Figure 1. Shows the percentage of cases and control in the study

3.1. Participants' characteristics

As presented in the table 1 below, the age group 9-11years had the highest cases of atopic dermatitis which is 27% (n=31). More cases [28% (n=44)] of AD occurred in females unlike in males with 22% (n=42) of cases. The statistical comparison between the characteristics of study participants was not significant, however; the income of mothers representing cases was significantly different to the referent group (p< .048).

Table 1. Characteristics of study participants.

Variable	Total N(%)	Cases N(%)	Control N(%)	p-value
Age				
6-8 Years	131 (38%)	32 (24%)	99 (76%)	
9-11 Years	116 (33%)	31 (27%)	85 (73%)	0.773
12-14 Years	102 (29%)	23 (23%)	79 (77%)	
Gender				
Male	189 (54%)	42 (22%)	147 (78%)	0.254
Female	160 (46%)	44 (28%)	116 (72%)	
Maternal educational status				
No education	57 (16%)	14 (25%)	43 (75%)	
Primary level	77 (22%)	19 (25%)	58 (75%)	
Secondary	78 (22%)	13 (17%)	65 (83%)	0.172
Tertiary	66 (19%)	23 (35%)	43 (65%)	
Post-Tertiary	71 (20%)	17 (24%)	54 (76%)	
Paternal educational status				
No education	56 (16%)	15 (27%)	41 (73%)	
Primary level	63 (18%)	9 (14%)	54 (86%)	
Secondary	83 (24%)	18 (22%)	65 (78%)	0.169
Tertiary	72 (21%)	21 (29%)	51 (71%)	
Post-Tertiary	75 (22%)	23 (31%)	52 (69%)	
Maternal employment status				
Employed	115 (33%)	31 (27%)	84 (73%)	
Self-employed	123 (35%)	37 (30%)	86 (70%)	0.235
Not employed	111 (32%)	18 (16%)	93 (84%)	
Paternal employment status				
Employed	122 (35%)	32 (26%)	90 (74%)	0.235
Self-employed	104 (30%)	30 (29%)	74 (71%)	

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Not employed	123 (35%)	24 (19%)	99 (81%)	
Mother's monthly income				
<10,000	90 (26%)	28 (31%)	62 (69%)	0.048*
10,000-50,000	84 (24%)	25 (30%)	59 (70%)	
>50,000-100,000	93 (27%)	14 (15%)	79 (85%)	
>100,000	82 (24%)	19 (23%)	63 (77%)	
Father's monthly income				
<10,000	88 (25%)	17 (19%)	71 (81%)	0.485
10,000-50,000	83 (24%)	23 (28%)	60 (72%)	
>50,000-100,000	77 (22%)	22 (29%)	55 (71%)	
>100,000	101 (29%)	24 (24%)	77 (76%)	
Position of child in the family				
First	101 (29%)	27 (27%)	74 (73%)	0.837
Intermediate	124 (36%)	30 (24%)	94 (76%)	
Last	124 (36%)	29 (23%)	95 (77%)	

* Statically significance at 0.050

3.2. Household Related Risk Factors

Children whose parents have no specific fuel for cooking have the highest number of cases at 27% (n=27). Also, children who live where trucks pass on their street almost every day showed the highest number of cases at 28% (n=26). Those children who do not have cats and dogs in their home have the highest number of cases at 27% (n=44) and 26% (n=42) respectively. Those whose mothers/female guardian do not smoke have the highest number of cases at 29% (n=51) while there was no difference in percentage between children of fathers/male guardian who smokes [25% (n=45)]. Children who live in houses with bushes around have higher percentage at 26% (n=44). Children who do not use cleaning agents like JIK in their homes have higher percentage at 25% (n=42). Children who did not have rubber toys in their house have higher number of AD cases at 25% (n=43). Children who use rug in their house have higher number of AD cases at 26% (n=48). Children who took seafood and nuts about 4-6 times in a week have the highest percentage at 33% (n=30) and 27% (n=22) respectively. Children who ate meat, vegetables, butter and egg more than 6times in a week have the highest percentage at 29% (n=25), 26% (n=27), 25% (n=22) and 28% (n=26) respectively. Children who took cereal and milk about 1-3 times in a week also have the highest percentage of AD cases at 34% (n=29) and 29% (n=28). Children who did not take fruits pasta, rice, butter, margarine and potatoes have the highest percentage at 33% (n=32), 28% (n=26), 28% (n=26), 25% (24), 30% (27), and 34% (n=32) respectively.

3.3. School Related Risk Factors

From the table 2 below, it can be deduced that children who played on school grass, attended creche with rubber toys, attended school where wooden chairs, chalkboard were used have higher number of AD cases at 26% (n=40), 26% (n=51), 28% (n=52), 28% (n=48) respectively. On the other hand, children who did not attend school surrounded by bushes and who did not attend school surrounded by stagnant water also have higher percentage of AD cases at 26% (n=45) and 28% (n=51) respectively.

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Table 2. School Related Risk Factors

Variable	Total N(%)	Cases N(%)	Control N(%)	p-value
School grass				
Yes	152 (44%)	40 (26%)	112 (74%)	0.524
No	197 (56%)	46 (23%)	151 (77%)	
Surrounding bushes				
Yes	175 (50%)	41 (23%)	134 (77%)	0.598
No	174 (50%)	45 (26%)	129 (74%)	
Stagnant water				
Yes	166 (48%)	35 (21%)	131 (79%)	0.142
No	183 (52%)	51 (28%)	132 (72%)	
Rubber toys				
Yes	194 (56%)	51 (26%)	143 (74%)	0.424
No	155 (44%)	35 (23%)	120 (77%)	
Wooden chairs				
Yes	188 (54%)	52 (28%)	136 (72%)	0.157
No	161 (46%)	34 (21%)	127 (79%)	
Chalkboard				
Yes	180 (52%)	48 (27%)	132 (73%)	0.365
No	169 (48%)	38 (23%)	131 (77%)	

3.4. Association Between Atopic Dermatitis And Risk Factors

From table 3 below, it can be inferred that the odds of having atopic dermatitis was 2.6 more higher among children who took fruits 4-6 times in a week than those who did not take fruits at all [AOR (2.60), 95%CI (1.14, 5.91)]. Also, children who ate potatoes 4-6times a week were 4.5 times likely to report atopic dermatitis than those who did not eat potatoes at all [AOR (4.49), 95% CI (1.88, 10.70)].

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Table 3. Multivariate logistics analysis between atopic dermatitis and risk factors.

Risk Factor	Crude Odds Ratios	P-Value	95% Confidence Intervals		Adjusted Odds Ratios	P-Value	95% Confidence Intervals	
			Lower	Higher			Lower	Higher
Weekly fruit consumption								
Less than 1					Reference			
1-3	1.71	0.11	0.88	3.32	1.64	0.22	0.74	3.66
4-6	1.92	0.06	0.98	3.75	**2.60**	**0.02***	**1.14**	**5.91**
>6	1.91	0.06	0.97	3.78	2.05	0.07	0.94	4.48
Weekly cereal consumption								
Less than 1					Reference			
1-3	0.53	0.06	2.73	1.03	**0.45**	**0.04***	**0.20**	**0.99**
4-6	0.78	0.51	0.38	1.62	0.77	0.56	0.31	1.88
>6	1.14	0.72	0.56	2.30	1.26	0.58	0.55	2.88
Weekly potatoes consumption								
Less than 1					Reference			
1-3	1.27	0.45	0.68	2.38	1.23	0.59	0.58	2.59
4-6	**3.62**	**<0.001**	**1.69**	**7.78**	**4.49**	**<0.001***	**1.88**	**10.73**
>6	1.94	0.06	0.98	3.86	1.96	0.11	0.86	4.46

* Statistically significant (0.005)

4. Discussion

The study's objectives were to determine the prevalence of atopic dermatitis and identify home. School related risk factors that predispose children in Alimosho Local Government, Lagos, Nigeria to atopic dermatitis and the association of these risk factors to the disease under study. A total of 349 participants were included in the study, 86 participants had atopic dermatitis while 263 participants did not have atopic dermatitis. The prevalence of atopic dermatitis in this study was 25%. The finding is higher than other studies conducted in Nigeria, which reported a prevalence of 13% and 9%, in Northern and Southern Nigeria, respectively [49]. However, it was lower than in a South African study that reported 60.1% prevalence [34]. This study was conducted during the dry season and might have brought about the increased prevalence noted in this study. A study in Abuja, Nigeria noted that there is an increased risk of developing AD during dry season [12].

The study shows that atopic dermatitis was common amongst females (27.5%) compared to males (22.2%) with ratio of 0.8 (male) to 1 (female). The study findings were similar to a local study conducted elsewhere in Nigeria among children aged 0-16 years that showed a preponderance ratio to females [24]. While another local study conducted in northern Nigeria showed that AD was common in males compared to females [25]. This might be due to the culture difference that permits male to move freely unlike females in the Northern part of the country, therefore males could report in hospital more than females.

Children who live where trucks pass almost every day on the street had higher number of AD cases 28% (n=26). Previous studies have linked frequent truck movement to air pollution in untarred roads in residential areas [26]. Consequently, air pollution is a known risk factor AD [27]. He also argued that air pollutants appear to be one of the risk factors for developing AD. Furthermore, air pollutants exposure can lead to imbalance between oxidants and antioxidants thereby culminating in oxidative stress on the skin that presents as features of AD [28]. Children who live in houses surrounded by bushes also had a higher percentage of AD 26% (n=44). Elsewhere, Montealegre and colleagues

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noted that patients with AD showed positive skin reactions to animal, plant and fungal allergens [29]. The exposure to these allergens due to environmental surroundings could contribute to triggering allergic reactions that results in exacerbate AD [29].

Children who played on school grass, attended creche with rubber toys, attended school where wooden chairs, chalkboard had higher prevalence at 26.3%, 26.3%, 27.7%, 26.7% respectively. Werner and colleagues argued that grass pollen is one of the factors that predisposes an individual to developing AD as his study revealed worsening of AD when participants were exposed to grass pollen [30]. also noted that rubber materials such as rubber toys contain latex [31]. A Bolivian case study reported that wood is capable of causing allergies as it contains allergen such as quinones, stilbenes, phenols, and terpenes [32]. He reported that the allergens found in the wood led to the case developing chronic dermatitis [32]. Lastly, metals in blackboard chalk are likely to trigger AD due to allergic reaction [33].

Mother's employment status ($p=0.038$ was found to be associated with AD. In addition, mother's monthly income [AOR=3.66, 95%CI (1.67, 7.80] was associated with AD as children of mothers who are paid between 50,000naira and 100,000naira are 3.66times at risk of developing AD. This shows that AD is associated with higher maternal socio-economic status [30]. Similar to the findings from a study conducted in the city of Tehran among children aged 6 to 14 years old, socioeconomic was a risk factor to AD [34]. It might be that people with high socioeconomic status are able to purchase more materials and food that exposes the child to several allergens.

5. Strength and limitations

This study was conducted at four private health facilities in Alimosho Local Government, Lagos state and focuses on children attending the health facilities and it also concentrated on one state out of the thirty-six states in Nigeria, therefore generalizing the results to other states and countries might bring doubts. If this study was conducted in public hospitals and in rural areas, more predisposing factors might have been identified. Children spend most of their times at home and in school, hence this study identified risk factors in the home and school environment that predisposes children to developing atopic dermatitis. It would help policy makers make policies that would reduce exposure of children to these factors. Parents would be enlightened on these risk factors and would be advised to reduce or prevent exposure of their children to them. School owners would be educated and enlightened on how some factors in the school environment can predispose a child to this chronic skin disease and its possible physical, social, and mental impacts on such children. Policy makers would be advised to make policies on what the school environment should look like. Clinicians would benefit by having a focused treatment plan on atopic dermatitis.

6. Conclusions

The study has drawn attention to the factors around the home environment like trucks passing in the street and bushes around the house as they are more likely to lead to atopic dermatitis compared to those within the home environment. It also drawn attention to some food like meat, vegetables, butter and egg which showed high prevalence in these children. Factors in the school environment like grass, wooden chairs, chalkboard and rubber toys in creche were also identified as risk factors for atopic dermatitis. There is a need to address the general public to look outward and pay attention to the surroundings where they live in other to reduce the incidence of atopic dermatitis. Schools also need advancement in their technology by using markets, plastic chairs and tables and ensuring a tidy environment. Further studies need to be carried out at a larger scale and that will include several local governments in the state.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study can be made available on request from the corresponding author.

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