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Research Article

**ATOPIC DERMATITIS AMONG CHILDREN, JAZAN REGION
SAUDI ARABIA: ROLE OF ENVIRONMENTAL FACTORS**

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Abstract:

Background: Atopic dermatitis (AD) is considered to be one of the most popular chronic diseases. Little information is available regarding the prevalence of AD in Jazan Region, Saudi Arabia, especially among the adult group.

Objective: This study was conducted to assess the relation between environmental factors and the AD-related symptoms in children in JR Saudi Arabia (SA).

Methods: This was a cross-sectional study using the ISAAC questionnaire conducted among school children within Jazan region, SA over a period of 3 months started on November 2015 to fulfill the proposed objectives.

Results: The overall response rate was 93.3% for that the final total sample size was 1400 students and most of them were Saudi 1193 (85.2%). Male students completed 763 (54.5%) questionnaires, and female completed 637 (45.5%). The background characteristics of the study population are shown in Table I. Most of study population was lived in rural area 871 (62.2%). Most of the students lived in lowlander area 836 (59.7%), and 461 (32.9%) and only 103 (7.4%) of them lived in costal and mountain areas respectively. Most of study population had intermediate level of education 1011 (72.2%).

Conclusions: The current study revealed the prevalence rates of AD symptoms during last 12 months was 9.2%. The prevalence of AD among females was higher than in males. The prevalence of AD symptoms within last 6 months lived in rural area was higher than those in urban area. Our results reported that 19.2% of children who had AD symptoms are second hand smokers but we didn't report significant correlation regarding to smoking.

Keywords: Atopic Dermatitis, Environmental Factor, Jazan Region, Saudi Arabia.

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INTRODUCTION:

Atopic dermatitis (AD) is a chronic, pruritic inflammatory skin disease of unknown origin that usually starts in early infancy, but also affects a substantial number of adults. AD is commonly associated with elevated levels of immunoglobulin E (IgE). That it is the first disease to present in a series of allergic diseases—including food allergy, asthma, and allergic rhinitis, in order—has given rise to the “atopic march” theory, which suggests that early or severe AD and cutaneous sensitization to environmental allergens may lead to subsequent allergic disease at other epithelial barrier surfaces (eg, gastrointestinal or respiratory tract). This hypothesis is supported by cross-sectional and longitudinal studies [1, 2]

AD has three phases; infantile (0 to 2 years), childhood (2 to 12 years), and adolescent/adult (12 to 18 years). AD usually begins in infancy and childhood, and its clinical features are age specific [3].

The diagnosis is based on clinical presentation, as no unique laboratory test has been specified to diagnose the disease. Different criteria have been suggested for diagnosing AD and the most important are Hanifin and Rajka and the United Kingdom Working Party’s diagnostic criteria [4]. Moreover, the profiles of AD including aggravating factors and clinical features vary greatly in different studies [5, 6].

The prevalence rate of AD is rising, and AD affects 15-30% of children and 2-10% of adults. This figure estimates the prevalence in developed countries. In China and Iran, the prevalence rate is approximately 2-3%. The frequency is increased in patients who immigrate to developed countries from underdeveloped countries [8]. In 85% of cases, AD occurs in the first year of life; in 95% of cases, it occurs before age 5 years. The incidence of AD is highest in early infancy and childhood. The disease may have periods of complete remission, particularly in adolescence, and may then recur in early adult life. Most patients improve; this can occur at any age. While the frequency of atopic dermatitis (AD) is as high as 20% in childhood, it is 0.9% in adults [8].

In Saudi Arabia (SA), there are limited data on the epidemiology of allergic disorders. In a recent study carried out among schoolchildren in Madinah city, parents reported symptoms suggestive of a history of eczema in 10.3%, rhinitis in 24.2% and asthma in 23.6% of children. Overall, 41.7% of children had symptoms suggestive of at least one allergic disorder [9].

Risk factors demonstrated to be associated with AD include: personal factors (e.g., smoking habits, age, gender, nutritional status, number of siblings, lifestyle, allergy status, family history and occupation) [10] and indoor/outdoor environmental factors (e.g., house dust mite, animal dander, moulds, cockroach infestation, occupational exposure, environmental tobacco smoke (ETS), air pollution, aeroallergens and climate) [11].

The International Study of Asthma and Allergy in Children (ISAAC) phase I protocol was designed to identify the symptoms of asthma, AR and eczema. The data generated from these surveys can estimate the prevalence of these health problems, which based on the symptomatology and participants perception.

The current study was conducted to explore the relation between environmental factors and the AD-related symptoms in children in JR Saudi Arabia (SA).

METHODS:**Study Area:**

This study conducted in Jazan (also called Gizan) region is one of the thirteen regions of the SA. It is located on the tropical Red Sea coast in southwestern SA. Jazan covers an area of 11,671 square kilometers, including some 5,000 villages and towns with a total population of 1.5 million. Geographically Jazan Region divides into three zones (costal, plain and mountain), which intersected with perennial streams, these geographical factors may be as risk factors for AD.

Study Design:

This was a cross-sectional study using the ISAAC questionnaire conducted among school children within Jazan region, SA over a period of 3 months started on November 2015 to fulfill the proposed objectives.

Sample Design and Size:

The ultimate objective of the study was to correlate the environmental factors with presence of AD-related symptoms among school children in Jazan region, SA. For this purpose, multistage cluster random sampling utilized. Jazan Region geographically is classified into three geographical distinct zones, the mountain, hills and the coastal zones. Following Cochran (1977), the suitable sample size determined on the bases of the standard formula given by:

$$n = \frac{Z^2 \pi (1 - \pi)}{d^2}$$

Where:

n: the sample size.

π : is an anticipated proportion here, the prevalence of AD.

Z: the standardized variable that corresponds to 95% level of confidence.

d: the desired marginal error.

Since there is no prior knowledge about the prevalence of AD in Jazan region we will set the values $\pi = 0.5$ to provide the maximum sample size, d the desired marginal error = 0.05 and $z=1.96$, the study sample size, denoted (n), is given by:

$$n = \frac{(1.96)^2 \times (0.5) \times (0.5)}{(0.05)^2} = 384$$

Since the sample proportion to the total population is less than 0.05 of the total number of school students in Jazan region, we don't need to use the finite population correction factor to adjust the sample size. However, in order to increase precision, which might be lost as a result of adopting multi-stage cluster sampling method, we multiply the sample size (n) by the design effect factor, which is the ratio of the variance of estimates for a particular sample design to the variance of estimates for a simple random sample of the same size. The design effect is equal to the number of geographical zones in Jazan region, so that the minimum sample size required is 1152. The sample size distributed between areas, school level (elementary or intermediate schools) and both sexes according to the sex ratio in the schools. The schools as well students in the different clusters selected using simple random technique. For that the

calculated sample were distributed according to the three geographical areas costal, plain and mountain as 250, 750 and 200 respectively. When distributing questionnaires we added 30 % for each for non-responders for that the total sample approximately was 1500 students.

DATA COLLECTION AND ANALYSIS:

Data collected using modified structured questionnaire that developed by ISAAC. The questionnaire written in Arabic and were mainly address to target group and filled by their parents. These data had been entered and analyzed using Statistical Package for Social Sciences (SPSS) software version 20.0. A p-value < 0.05 was considered to be statistically significant.

RESULTS:

A total of 1500 questionnaires were distributed to the students in both level elementary and intermediate schools all over JR, 100 questionnaires were removed due to incomplete data. The overall response rate was 93.3% for that the final total sample size was 1400 students and most of them were Saudi 1193 (85.2%). Male students completed 763 (54.5%) questionnaires, and female completed 637 (45.5%). The background characteristics of the study population are shown in Table I. Most of study population was lived in rural area 871 (62.2%). Most of the students lived in lowlander area 836 (59.7%), and 461 (32.9%) and only 103 (7.4%) of them lived in costal and mountain areas respectively. Most of study population had intermediate level of education 1011 (72.2%).

Table I: The background characteristics of the study population

Demographic characteristics		Gender – Frequency (%)		Total (%)
		Boys	Girls	
		763 (54.5)	637 (45.5)	1400 (100)
Nationality	Saudi	607 (43.4)	586 (41.9)	1193 (85.2)
	Non-Saudi	156 (11.1)	51 (3.6)	207 (14.8)
Residency	Urban	479 (34.2)	392 (28.0)	871 (62.2)
	Rural	284 (20.3)	245 (17.5)	529 (37.8)
Geographical Distribution	Coastal	267 (19.1)	194 (13.9)	461 (32.9)
	Lowlander	437 (31.2)	399 (28.5)	836 (59.7)
	Mountain	59 (4.2)	44 (3.1)	103 (7.4)
Level of education	Elementary	228 (16.3)	161 (11.5)	389 (27.8)
	Intermediate	535 (38.2)	476 (34.0)	1011 (72.2)

Out of the 1400 participants 129 (9.2%) had AD symptoms within last 6 months. Table II illustrate the prevalence of AD symptoms in relation to environmental factors according to the gender. Regarding to gender 75 (5.3%) of total 129 of the students with itchy rash which come and disappear

within last 6 months were females and the remaining 54 (3.9%) were males (Figure I).

Most of the students with positive AD symptoms within last 6 months lived in rural area 72 (5.1%), which account 55.8% of those with positive

symptoms without statistical significance difference (p-value = 0.081).

According to students Geographical distribution there is a clear statistical significance difference in prevalence of AD symptoms within last 6 months (P-value = 0.003) where most of the students with positive AD symptoms lived in lowlander area 68 (4.68% %), which account 52.7% of those with positive symptoms.

The prevalence of AD symptoms within last 6 months was more common among students who lived in traditional houses 64 (4.6%) rather than in apartment and villa 34 (2.4%) and 31 (2.2%) respectively with non-statistical- significance difference (P-value = 0.327).

Regarding to air cooling system, all of students with positive AD symptoms within last 6 months lived in air conditioning window /split unit with non-statistical- significance difference (P-value = 0.681).

Most of the students with positive AD symptoms within last 6 months used gaseous cooking fuel 123 (95.3%) with non-statistical- significance difference (P-value = 0.657).

Regarding to flooring, most students with positive AD symptoms within last 6 months lived in buildings with hard flooring (Ceramic) 92 (71.3%) with non-statistical- significance difference (P-value = 0.529). Regarding to curtain, animals at home, types of animal contacts, smoking, second hand smoking and Khat chewing of the students with positive AD symptoms within last 6 months there was no significance difference (P-value= 0.978, 0.858, 1.000, 0.753, 0.896 and 0.835 respectively).

Regarding to type of food, sea foods, nuts, eggs and dairy product are considered the most common foods caused positive AD symptoms within last 6 months among students with the prevalence of 74 (57.3%), 77 (59.7%), 81 (62.8%), 96 (74.4%) non-statistical- significance difference (P-value= 0.835, 990, 0.895 and 0.952 respectively).

Fig I: Prevalence of itch rash during the past 12 months:

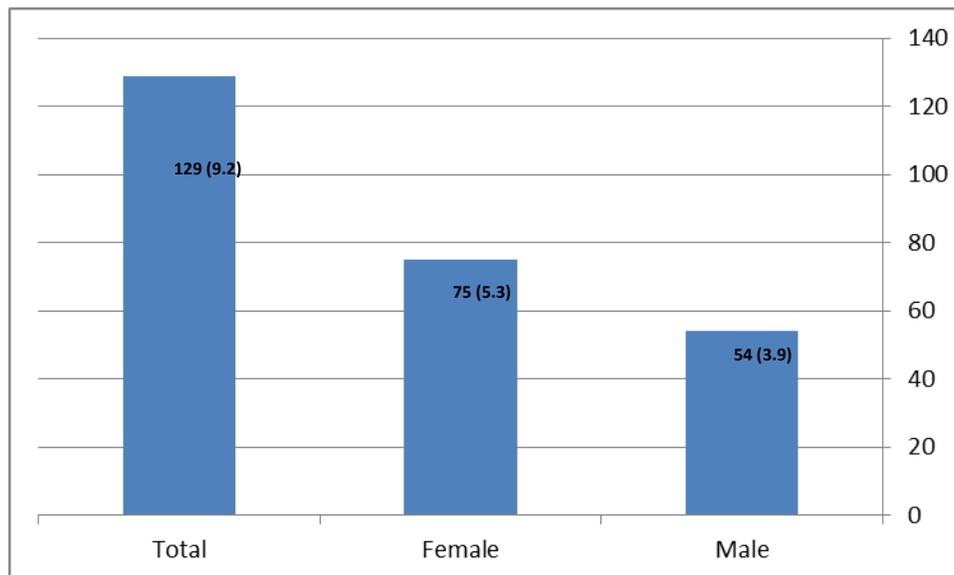


Table II: Prevalence of AD symptoms in relation to environmental factors according to the gender

#	Environmental factors		Prevalence of AD symptoms			χ^2	p value
			Frequency				
			Male 54 (3.9)	Female 75 (5.3)	Total 129 (9.2)		
1	Residency	Urban	19	37	57	3.051	0.081
		Rural	35	37	72		
2	Geographical Distribution	Costal	12	39	51	11.824	0.003
		Lowlander	36	32	68		
		Mountain	6	4	10		
3	Type of house	Apartment	14	17	31	3.455	0.327
		Villa	14	20	34		
		Traditional house	26	38	64		
4	Air cooling system	Air conditioning window /spilt unit	54	75	129	0.769	0.681
		evaporative cooler	0	0	0		
5	Cooking fuel	Electrical	2	1	3	1.133	0.657
		Gaseous	50	73	123		
		Wood	2	1	3		
6	Flooring	Earthy	3	3	6	0.397	0.529
		Carpeting	6	9	15		
		Hard flooring (Ceramic)	40	52	92		
		Resilient flooring (linoleum)	5	11	16		
7	Curtain		35	37	72	0.001	0.978
8	Animal at home		28	21	49	0.032	0.858
9	Types of Animal contacts	Cat	12	5	17	0.000	1.000
		Dog	1	1	2		
		Bird	7	4	11		
		Sheep	7	6	13		
		Cow	1	6	7		
10	Smoking		8	1	9	0.244	0.621
11	Second hand smoking		18	19	37	0.099	0.753
12	Khat chewing		15	1	16	0.027	0.896
13	Types of Food	Sea food	37	37	74	0.043	0.835
		Nuts	33	44	77	0.000	0.990
		Egg	40	41	81	0.017	0.895
		Dairy products	43	53	96	0.004	0.952

DISCUSSION:

The ISAAC questionnaire has been used for many years all over the world and has proven it-self useful for assessing the prevalence and morbidity of asthma and allergic diseases. It is an easy-to-apply questionnaire that can be completed quickly without interfering with activities [12]. This first study carried out in the faculty of medicine, Jazan University to establish the effect of environmental factors on AD-related symptoms among children in Jazan Region, Saudi Arabia.

The current study revealed the prevalence rates of AD symptoms during last 12 months was 9.2%. Mahnashi et al., [13] conducted similar study in JR which concerned with the prevalence of AD among

adults; they reported that the prevalence of AD symptoms during last 12 months was 16.3%.

In our study regarding to gender 75 (5.3%) of total 129 of the students with itchy rash within last 6 months were females and the remaining 54 (3.9%) were males, this indicated that the prevalence of AD among females was higher than in males this matched with the majority of published epidemiological studies atopic dermatitis was more commonly diagnosed in girls than in boys [14].

We reported that the prevalence of AD symptoms within last 6 months lived in rural area was higher than those in urban area this results mismatched with Kupryś-Lipińska et al., [15], who reported that An

interesting finding was the equalisation of the prevalence of atopic dermatitis in children inhabiting urban and rural areas. Similar findings have been reported by Taylor et al. in Ireland [16]. They studied children between 4 and 19 years of age and found that pollenosis was more common in children from urban than in those inhabiting rural areas, while no such difference was found in the case of atopic dermatitis. Atopic dermatitis develops as the first illness of the triad of allergic diseases. If we were to look for the reasons, we should take into consideration changes in living conditions, including the rural areas, changes in the natural environment caused by the introduction of chemical pesticides in agriculture, changes in eating habits and hygiene and the increasing car traffic [15].

This study reported that according to students Geographical distribution there is a clear statistical significance difference in prevalence of AD symptoms within last 6 months (P-value = 0.003) where most of the students with positive AD symptoms lived in lowlander area 68 (4.68%) %, which account 52.7% of those with positive symptoms, while Mahnashi et al., [13] reported that And AD-related symptoms according to geographical distribution of study population showed that the ever eczema in costal, plain and mountain was 22 (1.8%), 21 (1.7%) and 10 (0.8%) respectively.

Tobacco smoke has a number of harmful effects on the immune system, [17] eg, on humoral and cellular immunity. The putative direct effect of tobacco smoke on the skin is unclear, [18] but smoke might directly impair skin-barrier function via the effects of reactive oxygen species on keratinocytes [19, 20]. Numerous studies explored the relationship between tobacco smoke and various atopic diseases including asthma, allergic rhinitis, allergic conjunctivitis, and AD. In particular, epidemiologic studies demonstrated a strong link between environmental tobacco smoke and asthma in the pediatric population, with an increased incidence of asthma and wheeze by at least 20% [21]. Our results reported that 19.2% of children who had AD symptoms are second hand smokers but we didn't report significant correlation regarding to smoking and AD symptoms this may be due to our study concerned with children and the smoking wasn't common between children.

Clinical studies have documented the prevalence of food allergy in AD from 20% to 80% [22]. Common food allergens triggering AD are milk and milk products, peanuts, eggs, soy, wheat, seafood, and shellfish [23]. Many studies have documented that

food allergy plays an important role in exacerbating severe form of AD and diet elimination will decrease the severity. An open pilot study conducted by Dhar and Banerjee on the effects of dietary elimination in AD in 100 Indian children showed statistically significant decrease in the severity score after dietary elimination alone. A group of 100 children without systemic disease and not on systemic steroids were assessed for severity of AD by SCORAD index. They were advised to strictly avoid diet containing milk and milk products, nuts, nut containing foods, egg, sea fish and prawns, brinjal, and soybean, for 3 weeks. To maintain proper nutrition, they were asked to take lots of dal, rohu fish, chicken, and fruits. After 3 weeks, the severity of AD was measured and showed significant improvement [24]. Our study reported that regarding to type of food, sea foods, nuts, eggs and dairy product are considered the most common foods caused positive AD symptoms within last 6 months among students with the prevalence of 74 (57.3%), 77 (59.7%), 81 (62.8%), 96 (74.4%) non-statistical- significance difference (P-value= 0.835, 990, 0.895 and 0.952 respectively).

CONCLUSION:

The current study revealed the prevalence rates of AD symptoms during last 12 months was 9.2%. Risk factors demonstrated to be associated with AD include: personal factors (e.g., smoking habits, age, gender, nutritional status, number of siblings, lifestyle, allergy status, family history and occupation) [10] and indoor/outdoor environmental factors (e.g., house dust mite, animal dander, moulds, cockroach infestation, occupational exposure, environmental tobacco smoke (ETS), air pollution, aeroallergens and climate) [11]. Our study reported that the prevalence of AD among females was higher than in males. We reported that the prevalence of AD symptoms within last 6 months lived in rural area was higher than those in urban area. Our results reported that 19.2% of children who had AD symptoms are second hand smokers but we didn't report significant correlation regarding to smoking.

LIMITATIONS OF THE STUDY:

Although the present study is the first to consider prevalence of AR symptoms regarding to the environmental factors among Jazan school children, it has some significant limitations. First the study was based on sample size, so the AR prevalence results should be interpreted carefully. Second, our participants were general school children.

Competing of interests

The authors have no conflict of interest to declare.

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