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Epidemiology of atopic dermatitis among children in Jazan Region, Saudi Arabia

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Abstract
Little information is available about the prevalence of these diseases in Jazan Region, Saudi Arabia, especially among the children. This study cross-sectional study was designed to identify the prevalence of AD symptoms among children in Jazan Region Saudi Arabia using the International Study of Asthma and Allergies in Children questionnaire phase I. The total study population was 1032, most of them were Saudi 911 (88.35%) and male students were 591 (57.3%). The mean age of participant 13.2± 1.5 years. According to the residency 578 (56.0%) students were lived in urban. Most of the students lived in plain area 718 (69.6%). Intermediate school students account 62.3% of total students; about 56.5% of them were male. The prevalence of AD-related symptoms was 118 (11.4%), in which male account 55.9% of them. Only 7.4% of participants had PMH of AD with clear statistical significance difference in prevalence according to the gender (p-value = 0.005), nationality (p-value = 0.001), and level of education (p-value = 0.034). AD was confirmed by doctor in 8.9% of participants with clear statistical significance difference in prevalence according to the gender (p-value = 0.000), nationality (p-value = 0.000), residence (p-value = 0.002), and geographical distribution (p-value = 0.034) this most likely due to environmental factors that shared between participants.

Keywords: atopic dermatitis, children, epidemiology, prevalence, jazan region, saudi arabia

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 AD is part of a progression that may lead to subsequent allergic disease at other epithelial barrier surfaces [1, 2]. AD may be associated with other atopic (immunoglobulin E [IgE]–associated) diseases (eg, acute allergic reaction to foods, asthma, urticaria, and allergic rhinitis) [3]. AD has enormous morbidity, and the incidence and prevalence appear to be increasing. Further, AD is the first disease to present in a series of allergic diseases such as food allergy, asthma, and allergic rhinitis (in order), provoking 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].

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 [4]. 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 [5]. One third of patients develop allergic rhinitis. One third of patients develop asthma. In a longitudinal study of 7157 children and adolescents with AD from the Pediatric Eczema Elective Registry, researchers found that symptoms of mild to moderate AD are likely to persist into the teen years or beyond [6-8].

The vast majority of AD has an onset before age five years, and prevalence data in children show a slight female to male preponderance (1.3-1) [9]. The diagnosis of AD is predominantly clinical; there are no objective diagnostic tests [10]. Clinically most patients have manifestations of atopic dermatitis by age five to seven years. In children, acute skin lesions that appear as intensely pruritic erythematous patches with papules and some scaling can be seen on the face, scalp, extremities, or trunk; diaper areas are usually spared. The skin lesions in older individuals with more chronic disease are characterized by thickened skin, increased skin markings (lichenification), and excoriated and fibrotic papules. In adults, the flexural areas (neck, antecubital fossae, and popliteal fossae) are most commonly involved; other common sites include the face, wrists, and forearms. In severe cases, any area of the body can be involved, although it is uncommon to see lesions in the axillary, gluteal, or groin area; lesions in these locations should prompt consideration of other diagnoses such as psoriasis. The presence of pustules within areas of dermatitis suggests secondary infection with Staphylococcus aureus.

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 [11].

In Saudi Arabia, a reasonable number of studies were conducted to investigate certain aspects of this disease, including prevalence of this health problem among children. The objective of this study was to determine the epidemiology of AD among school age children at Jazan Region (JR), SA.

Method

Study Area

This study conducted in Jazan (also called Gizan) region (JR) 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 affect the prevalence of AD.

Study Design

This was a cross-sectional study using the ISAAC questionnaire phase I conducted among school children within JR, 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 estimate the prevalence of AD among school age children in Jazan region, SA. For this purpose, multistage cluster random sampling utilized. JR geographically is classified into three geographical distinct zones, the mountain, hills and the coastal zones. Following Cochrain (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 JR we took 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:

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

Since the sample proportion to the total population is less than 0.05 of the total number of school students in JR, 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 JR, so that the minimum sample size required is 1152. We added 10% as non responder for that the total sample size was 1267. The sample size distributed between areas, educational 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 300, 750 and 217 respectively.

Data collection and analysis

Data collected using structured questionnaire that developed by ISAAC phase I. 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 less than 0.05 will be considered statistically significant.

Ethical Considerations

Ethical clearance first approved by Faculty of Medicine, Jazan University. Field work was approved by Directors of selected schools. A written consent attached to the questionnaire was taken from parents, which filled before the child enrolled in the study. The data had been kept confidentially and used for the target purpose of this study.

Result

A total of 1267 questionnaires were distributed to the students in both level elementary and intermediate schools all over JR, 1032 questionnaires were collected with response rate of 81.5%, and most of them were Saudi 911 (88.35%). Male students were 591 (57.3%), and female were 441 (42.7%). The age of participants range from 10 to 15 years with mean age of 13.2± 1.5 years and a median of 13 years. According to the residency 578 (56.0%) students were lived in urban, where 454 (44.0%) lived in rural area. Most of the students lived in plain area 718 (69.6%), and only 211 (20.4%) and 103 (10.0%) of them lived in costal and mountain areas respectively. Intermediate school students account 62.3% of total students; about 56.5% of them were male as shown in table 1.

Table 1: The background characteristics of the study population

Demographic Characteristics		Gender – Frequency (%)		Total (%)
		Male	Female	
		591 (57.3%)	**441 (42.7%)**	**1032 (100%)**
Age	10 Years Old	20 (1.9%)	18 (1.7%)	38 (3.6%)
	11 Years Old	67 (6.5%)	50 (4.8%)	117 (11.3%)
	12 Years Old	121 (11.7%)	67 (6.5%)	188 (18.2%)

	13 Years Old	139 (13.5%)	99 (9.6%)	238 (23.1%)
	14 Years Old	95 (9.2%)	96 (9.3%)	191 (18.5%)
	15 Years Old	149 (14.5%)	111 (10.8%)	260 (25.3%)
Nationality	Saudi	506 (49.0%)	405 (39.3%)	911 (88.3%)
	Non-Saudi	85 (8.3%)	36 (3.4%)	121 (11.7%)
Residency	Urban	307 (29.8%)	271 (26.2%)	578 (56.0%)
	Rural	284 (27.5%)	170 (16.5%)	454 (44.0%)
Geographical Distribution	Coastal	149 (14.4%)	62 (6.0%)	211 (20.4%)
	Plain	383 (37.1%)	335 (32.5%)	718 (69.6%)
	Mountain	59 (5.8%)	44 (4.2%)	103 (10.0%)
Level Of Education	Elementary	228 (22.1%)	161 (15.6%)	389 (37.7%)
	Intermediate	363 (35.2%)	280 (27.1%)	643 (62.3%)

The prevalence of AD-related symptoms is shown in Table 2, which revealed the symptoms suggestive of AD were affecting 118 (11.4%) of all students. Male account 55.9% of those with AD symptoms, with no clear statistical significance difference in prevalence according to the gender (p-value = 0.768). The prevalence of AD symptoms during last 12 months was 88 (8.5%), where male account 57.9% of them, with no clear statistical significance difference in prevalence according to the gender (p-value = 0.283). Those with past medical history (PMH) of AD were 76 (7.4%), where female account 60.5% of them with clear statistical significance difference in prevalence according to the gender (p-value = 0.005). AD was confirmed by doctor in 92 (8.9%) of participants, in which female account 68.5% of them with clear statistical significance difference in prevalence according to the gender (p-value = 0.000) as shown in table 2. The prevalence of AD was more common among saudi rather than non-saudi (114 (11.0%) and 4 (0.4%) respectively) with clear statistical significance difference (p-value = 0.001) as shown in table 3. Saudi participants had PMH of eczema than non-saudi 76 (7.4%) vs 0 (0.0%) respectively (p-value = 0.005) and only 29 (2.8%) of them had confirmed by doctor (p-value = 0.000) as shown in table 3. Symptoms of AD were more prevalent among intermediate school students 79 (7.6%) than elementary school 39 (3.8%) with no clear statistical significance difference (p-value = 0.313) as shown in table 4.

Table 2: AD related symptoms

AD related symptoms	Frequency (%)			P value
	Male	Female	Total	
Itchy rash which was coming and going for at least six months	66 (6.4)	52 (5.0)	118 (11.4)	0.768
Have you had this itchy rash at any time in the last 12 months?	51 (4.9)	37 (3.6)	88 (8.5)	0.283
Complete disappearance of rash during the last 12 months	46 (4.5)	31 (3.0)	77 (7.5%)	0.492
Past medical history of eczema	30 (2.9)	46 (4.5)	76 (7.4)	0.005
Eczema confirmed by doctor	29 (2.8)	63 (6.1)	92 (8.9)	0.000

Table 3: AD related symptoms according to the nationality

AD related symptoms	Frequency (%)			P value
	Saudi	Non-Saudi	Total	
Itchy rash which was coming and going for at least six months	114 (11.0)	4 (0.4)	118 (11.4%)	0.001
Have you had this itchy rash at any time in the last 12 months?	85 (8.2)	3 (0.3)	88 (8.5%)	0.573
Complete disappearance of rash during the last 12 months	74 (7.2)	3 (0.3)	77 (7.5%)	1.000
Past medical history of eczema	76 (7.4)	0 (0.0)	76 (7.4%)	0.001
Eczema confirmed by doctor	91 (.8.8)	1 (0.1)	92 (8.9%)	0.000

Table 4: AD related symptoms according to the level of education

AD related symptoms	Frequency (%)			P value
	Elementary School	Intermediate school	Total	
Itchy rash which was coming and going for at least six months	39 (3.8)	79 (7.6)	118 (11.4%)	0.313
Have you had this itchy rash at any time in the last 12 months?	30 (2.9)	58 (5.6)	88 (8.5%)	0.649
Complete disappearance of rash during the last 12 months	22 (2.1)	55 (5.4)	77 (7.5%)	0.462
Past medical history of eczema	21 (2.0)	55 (5.4)	76 (7.4%)	0.034
Eczema confirmed by doctor	42 (4.1)	50 (4.8)	92 (8.9%)	0.113

According to students residence there is a clear statistical significance difference in prevalence of AD symptoms (p-value = 0.030 for itchy rash which come and disappear within last 6 months and p-value of 0.033 for symptoms in the last 12 months) as shown in table 5. Most of the students with positive AD symptoms lived in plain area 83 (8.0), which account 70.3% of those with positive symptoms without statistical significance difference (p-value = 0.643) as shown in table 6. The common site for AD symptoms was the fold of elbow joint 36 (3.5%) as shown in figure 1.

Table 5: AD related symptoms according to the residence

AD related symptoms	Frequency (%)			P value
	Urban	Rural	Total	
Itchy rash which was coming and going for at least six months	55 (5.3)	63 (6.1)	118 (11.4%)	0.030
Have you had this itchy rash at any time in the last 12 months?	37 (3.6)	51 (4.9)	88 (8.5%)	0.033
Complete disappearance of rash during the last 12 months	39 (3.8)	38 (3.7)	77 (7.5%)	0.179
Past medical history of eczema	45 (4.4)	31 (3.0)	76 (7.4%)	0.636
Eczema confirmed by doctor	65 (6.3)	27 (2.6)	92 (8.9%)	0.002

Table 6: AD related symptoms according to the geographical distribution

AD related symptoms	Frequency (%)				P value
	Costal	Plain	Mountain	Total	
Itchy rash which was coming and going for at least six months	21 (2.0)	83 (8.0)	14 (1.4)	118 (11.4%)	0.643
Have you had this itchy rash at any time in the last 12 months?	15 (1.5)	63 (6.1)	10 (0.9)	88 (8.5%)	0.937
Complete disappearance of rash during the last 12 months	15 (1.5)	55 (5.3)	7 (0.7)	77 (7.5%)	0.097
Past medical history of eczema	17 (1.7)	56 (5.4)	3 (0.3)	76 (7.4%)	0.203
Eczema confirmed by doctor	16 (1.6)	73 (7.0)	3 (0.3)	92 (8.9%)	0.034

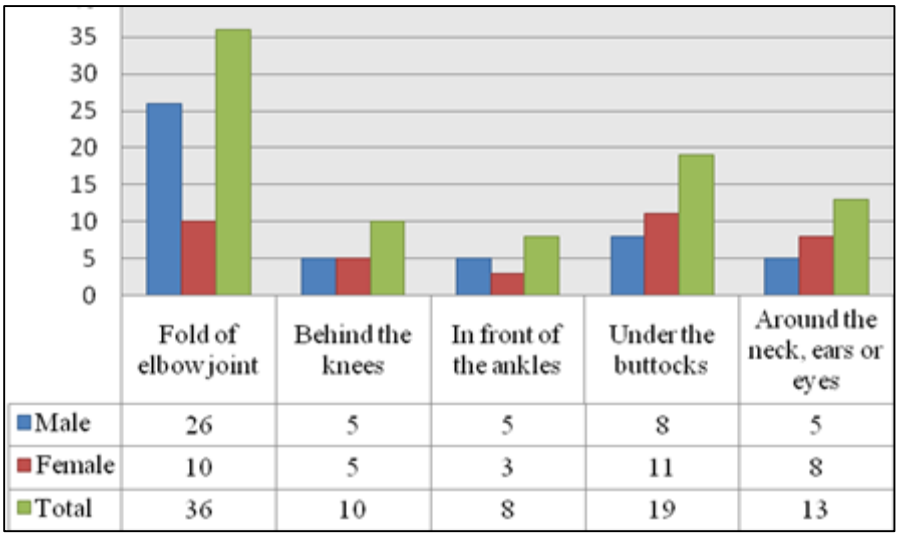

Fig 1: Sites of AD symptoms

Discussion

This study was conducted to assess the epidemiology of AD among children in JR, SA using ISAAC protocol. Phase I of ISAAC was a unique initiative involving genuinely worldwide involvement in research into the patterns and causes of allergic diseases [12]. The ISAAC phase I methodology was simple, the protocol was rigorously applied, and a number of validation studies had indicated that the ISAAC core questions had acceptable sensitivity [13].

A total of 1032 students were screened used ISAAC phase I questionnaire written in Arabic with mean age of 13.2± 1.5 years and median of 13 years old, which is differ from the study conducted in Jeddah, where 936 children had been enrolled with mean age for male was 5 and for female was 9 years [14]. Male students were 591 (57.3%), and female were 441 (42.7%), which is differing from the previous study where 73.5% of study population was female [14].

The prevalence of AD-related symptoms was 118 (11.4%), in which male account 55.9% of them. This is similar to national survey conducted between 1986-1995 which revealed no change in AD prevalence (12-13%) [15] This is differ from reported figures from other local reports in Jeddah (21.6%) [14], and in Madinah city the study revealed 41.7% of children had symptoms suggestive of at least one allergic disorder [16]. Regional studies also showed different result as the study in Egypt and Turkey where the prevalence was 19.8% [17] and 17.1% [18] respectively.

The current study revealed that only 7.4% of participants had PMH of AD with clear statistical significance difference in prevalence according to the gender (p-value = 0.005), nationality (p-value = 0.001), and level of education (p-value = 0.034). AD was confirmed by doctor in 8.9% of participants with clear statistical significance difference in prevalence according to the gender (p-value = 0.000), nationality (p-value = 0.000), residence (p-value = 0.002), and geographical distribution (p-value = 0.034) this most likely due to environmental factors that shared between participants.

Conclusion

The screening methodology adopted in this study resulted in a fairly simple and noninvasive approach for identifying children with AD in school setting using standard ISAAC questionnaire. In conclusion prevalence of AD among children in JR showed considerable difference than those reported from local and regional reports. Students lived in plain are area were more susceptible to AD than other areas. Although more studies are needed to investigate the role of environmental factors, which may lead to changes in prevalence of AD and

other associated allergic diseases as asthma and allergic rhinitis.

Limitations of the study

Although the present study is the first to consider use of ISAAC protocol to measure the prevalence of AD symptoms among children in JR, SA, it has some significant limitations. First the study was based on sample size, so the frequency of these factor results should be interpreted carefully. Second, our participants were school age students and the questionnaire filled by their parents, whom may gave an over/under estimated answers. Third, this study depend of participant experience to report symptoms, which can be miss interpreted inform of over/under estimated these symptoms, which may affect the result of this study. Finally correlation of prevalence of AD-related symptoms should be confirmed by further investigation as laboratory tests, and physician diagnosis.

Competing of interests

The authors have no conflict of interest to declare.

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