Prevalence, severity, and risk factors of eczema among young children and adolescents in Saudi Arabia: A national cross-sectional study, 2019

Sawsan Al Nahas, MBBS, DFE, ABHS,[a] Noura Abouammoh, MBBS, MPH, PhD,[b] Wael Althagafi, MD,[c] Shaker A. Alomary, MD,[d] Abdulaziz S. Almutairi, BDS, DFE,[e] Abdullah M. Assiri, MD,[f] Abdulrahman Alqahtani, BSc, MPH,[d] and Eman Elsayed Abd-Ellatif, MBBS, MPH, PhD[g]

Dubai, United Arab Emirates, Riyadh, Saudi Arabia, and Mansoura, Egypt

Background: Eczema is a common inflammatory skin disease with a significant global health burden. Eczema has a significant impact on quality of life.

Objective: We aimed to estimate the prevalence, severity, and risk factors associated with eczema among schoolchildren in Saudi Arabia.

Methods: The standardized Global Asthma Network questionnaires and methodology were used to conduct a nationwide cross-sectional study across 20 regions in Saudi Arabia between March and April 2019. Data were collected from 137 primary schools and 140 intermediate schools by using a multistage stratified cluster sampling method.

Results: The study included 3614 young children aged 6 to 7 years and 4068 adolescents aged 13 to 14 years. Current eczema was prevalent among 4.5% of the children and 5.1% of the adolescents. Severe eczema was reported in 0.8% and 0.9% of the young children and adolescents, respectively. Several factors showed significant association with eczema. Among the children, eczema was linked positively to having a history of chest infections and wheezing in early life, as well as to ever attending day care and current exposure to cats. Among the adolescents, the main potential risk factors included paracetamol use in the previous year, adherence to a lifestyle of vigorous physical activity, and current exposure to cats. Conversely, high consumption of nuts was found to be negatively associated with eczema.

Conclusion: The prevalence of eczema in schoolchildren in Saudi Arabia is lower than the global average but within the average range for the Eastern Mediterranean region. Further studies in Saudi Arabia should be conducted to identify variation among different regions. (J Allergy Clin Immunol Global 2024;3:100299.)

Key words: *Eczema, atopic dermatitis, children, adolescents, schoolchildren, Saudi Arabia, ISAAC, GAN*

Eczema, also known as atopic dermatitis, is a chronic, noncontagious inflammatory skin disease with a typical dry and severe pruritic rash.[1] Typically, it begins in early childhood and persists throughout a person's life.[2] It is a common condition, affecting approximately 15% to 30% of children and 2% to 10% of adults worldwide.[1] According to the Global Burden of Disease Study 2019, eczema had the highest global burden of any skin condition. It affected more than 171 million people worldwide and resulted in 748 million disability-adjusted life years lost in 2019.[3] Moreover, eczema negatively affects a child's physical, psychological, and social well-being, including by leading to sleep disturbance, low self-esteem, bullying, school absenteeism, and poor academic performance.[1,4-6] On the basis of its burden and significant impact on quality of life, eczema is considered a global public health issue.[1]

Studies assessing eczema prevalence in the Kingdom of Saudi Arabia (KSA) are limited.[7] In a study conducted in Madinah among schoolchildren aged 6 to 9 years, 10.4% reported ever having eczema, and 8.8% reported having current eczema symptoms.[8] In another study, in Najran, among schoolchildren aged 7 to 19 years, the overall prevalences of lifetime eczema, current eczema, and physician-diagnosed eczema were 12.9%, 10.5%, and 12.5%, respectively.[9] Moreover, a study conducted among schoolchildren in Jazan revealed prevalences of 11.4% for lifetime eczema, 8.4% for current eczema, and 8.9% for eczema diagnosed by a physician.[10]

Over the past few decades, eczema incidence has risen 2- to 3-fold in industrialized countries.[1] Although the exact cause of this increase is not well understood, it is believed to be due to a combination of genetic, environmental, nutritional, and lifestyle factors.[11] Additionally, there is a strong correlation between eczema and other atopic diseases, such as asthma and allergic rhinitis. Childhood eczema clearly preceded, and was associated with, incident asthma in each later life stage, supporting a possible causal relationship. According to epidemiologic studies, eczema is strongly associated with childhood asthma,[12,13] and its

From [a]the Department of Public Health Protection, Dubai Health Authority, Dubai; [b]the Department of Family and Community Medicine, College of Medicine, King Saud University, Riyadh; [c]the General Directorate of Health Programs and Chronic Diseases, Asthma Control Program, Ministry of Health, Riyadh; [d]the General Directorate of Health Programs and Chronic Diseases, Ministry of Health, Riyadh; [e]the Field Epidemiology Training Program, Ministry of Health, Riyadh; [f]the Assistant Agency for the Preventive Health, Ministry of Health, Riyadh; and [g]the Department of Public Health and Community Medicine, Faculty of Medicine, Mansoura University, Mansoura.

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Corresponding author: Abdulrahman Alqahtani, BSc, MPH, General Directorate of Health Programs and Chronic Diseases, Saudi Arabia Ministry of Health, Saudi Arabia, Riyadh, 12382. E-mail: qahtaniad@moh.gov.sa.

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Abbreviations used
aOR: Adjusted odds ratio
EMR: Eastern Mediterranean region
GAN: Global Asthma Network
ISAAC: International Study of Asthma and Allergies in Childhood
KSA: Kingdom of Saudi Arabia
OR: Odds ratio

occurrence in early childhood significantly (2- to 3-fold) increases a child's risk of developing asthma by age 5 years.[14]

For more than a decade, the relationship between atopic diseases has been referred to as "the atopic march" in terms of eczema immunopathology. The atopic march is based on the theory that all allergic diseases share a common ground and should be managed accordingly. Although several studies of the atopic march have been conducted, this theory is not universally accepted; some studies suggest a distinct phenotype rather than progressive development. More recently, it has been recognized that T_H2 cells play an important role in all atopic diseases. The body responds to antigens (such as house dust mites, animal dander, plant or tree pollen, and food products) with a complex immune response. The response begins with the activation and differentiation of specific T_H2 cells. These cells later regulate IgE production against allergens, IgE-dependent mast cell activation, and eosinophil recruitment by producing cytokines such as IL-4, IL-5, and IL-13. Following repeat exposure to these allergens, cross-linking of IgE on mast cells causes the release of hypersensitivity mediators such as histamine, which can cause immediate symptoms. T_H2 cells and their cytokine products are important targets, given their critical role.[6,12,13]

The International Study of Asthma and Allergies in Childhood (ISAAC) and subsequent Global Asthma Network (GAN) studies have significantly contributed to understanding of the global burden of atopic diseases. ISAAC and the GAN studies used standardized methodologies and protocols to collect data on eczema prevalence, severity, and determinants from different regions and countries worldwide. Additionally, they provided a better understanding of the key environmental and lifestyle risk factors that can be targeted or modified to develop public health policies and interventions to reduce disease burden.[15-21] Our study aimed to estimate the prevalence, severity, and factors associated with eczema in the KSA and establish baseline measures to assess future trends.

METHODS

Study design, settings, and population

This analytic, cross-sectional study used secondary data obtained from the National Asthma Control Program of the General Directorate of Health Programs and Chronic Diseases, a department of the Saudi Arabian Ministry of Health.[22] The study, which was carried out in 2019, surveyed schoolchildren across the KSA (4669 children aged 6 to 7 years and 4666 adolescents aged 13 to 14 years) as part of GAN phase I, which was intended to use standardized methods to monitor the global prevalence, severity, and risk factors of asthma and other atopic diseases.[23] A detailed account of the methods and sampling technique used has been published previously.[22]

The questionnaire

The study used validated Arabic translations of the standardized GAN questionnaires for children in both of the aforementioned age groups. The prevalence and severity of eczema symptoms were assessed by using several questions.[23,24] To determine whether individuals had ever experienced eczema, they were asked whether they had an itchy rash that appeared and disappeared for at least 6 months. Current eczema symptoms were evaluated with 2 questions, one of which asked whether the individual had experienced an itchy rash in the past 12 months and the other asking whether the rash had affected specific areas of the body (the elbow folds; area behind the knees; area in front of the ankles; area under the buttocks; or area around the neck, ears, or eyes). Severe eczema was determined by combining those respondents with current eczema with those who reported sleep disturbances due to their itchy rash (waking up ≥1 night per week). Finally, respondents were asked whether a doctor had confirmed their eczema.

Data analysis

Data were entered and coded following the GAN manual.[23,24] The analysis excluded observations with missing values in all variables or the main symptoms. Initially, the data were entered into Microsoft Excel 2019 (Microsoft Corporation, Redmond, Wash) and then exported to IBM SPSS Statistics, version 23 (IBM, Armonk, NY) for analysis. The descriptive analysis was performed by representing continuous data as means and SDs and categoric data as percentages and numbers. The overall prevalence of eczema was determined for each age group and further categorized on the basis of sex. Prevalence was calculated by dividing the number of participants who reported a specific eczema symptom by the total number of respondents.

Moreover, subsequent analysis was carried out to examine the risk factors for each age group separately, with current eczema as the outcome variable.[23] The association between current eczema and demographic, dietary, and environmental factors was assessed by using the chi-square and Fisher exact tests, as well as univariate and multivariable logistic regression. To build the multivariable logistic regression model, univariate logistic regression was carried out to estimate crude odds ratio (OR). All variables with a P value of .10 or less were included in the model to identify the independent factors associated with current eczema after adjustment for confounders. Results were represented by adjusted OR (aOR) with a 95% CI. A P value less than .05 was considered statistically significant.

Ethical considerations

The data were obtained from the Saudi Arabian Ministry of Health after receiving approval from the data management office and the Ministry's central institutional review board (approval reference no. 22-47 M). The obtained data were completely anonymous; therefore, there was no personal contact with the participants, and their information remained confidential during the study. Prior permissions from the Ministry of Education and school administrations were granted to the primary researcher before the start of the study. Then, children in the appropriate age group who were studying in those schools were invited to participate in this study. Informed consent was obtained from

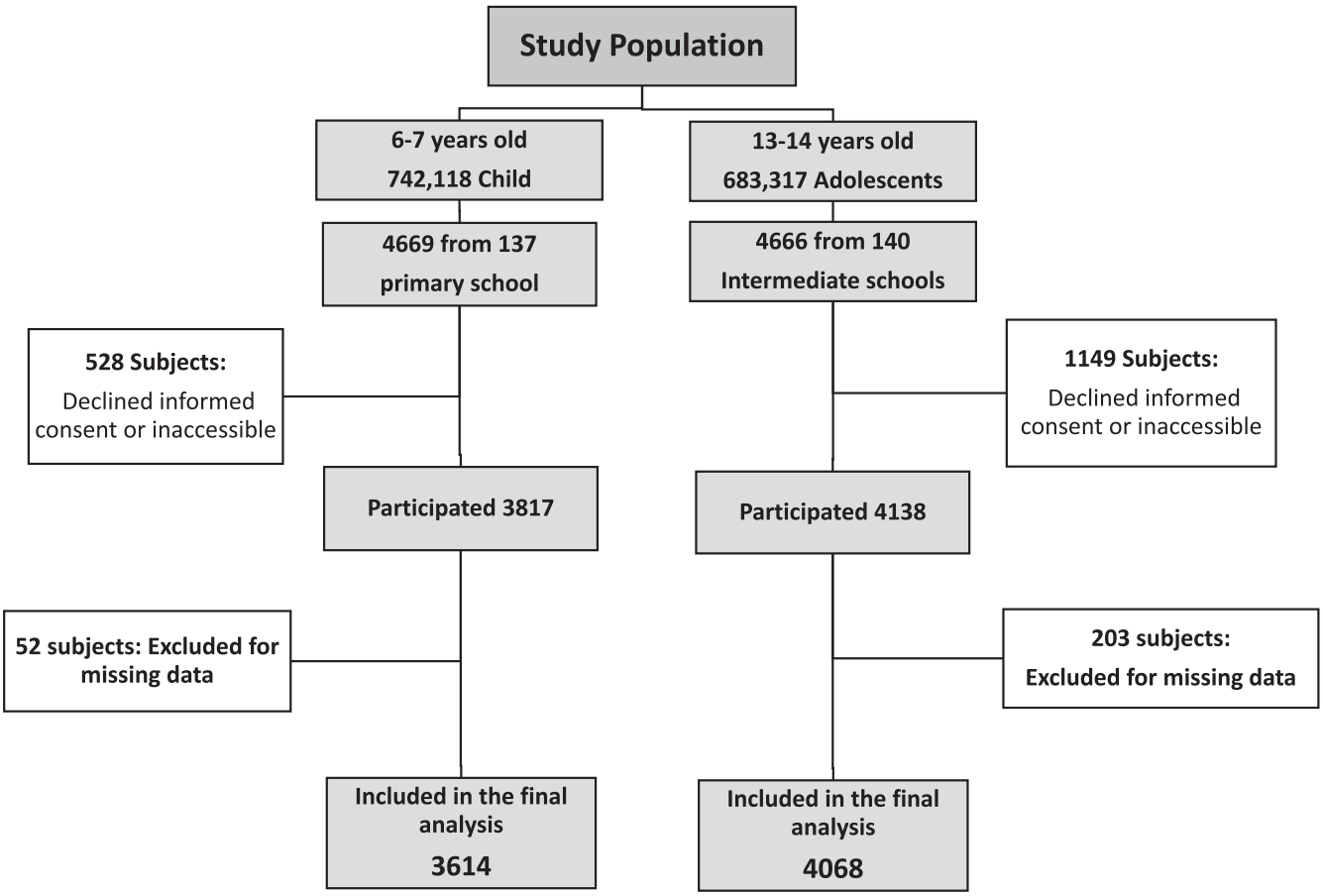

FIG 1. Study flow diagram. Adopted from Alomary et al[22] and reused with permission from Elsevier.

those students aged 13 to 14 years and from the parents or guardians of those students aged 6 to 7 years who agreed to participate in the study.

RESULTS

Description of the study participants

The questionnaires were distributed to 4669 parents of children aged 6 to 7 years and 4666 adolescents aged 13 to 14 years. The overall response rates were 81.8% and 88.7%, respectively. After exclusion of the questionnaires containing incomplete or missing data, the analysis included 3614 questionnaires from young children and 4068 questionnaires from adolescents (Fig 1).

Table I lists the baseline characteristics of the study participants. There were slightly more girls than boys in both age groups, and the majority were born in the KSA.

Prevalence and severity of eczema symptoms

Table II presents the prevalence and severity of eczema symptoms among young children and adolescents. In children, the prevalences of ever having any eczema symptom and having any eczema symptoms over the past 12 months were 11.5% and 4.6%, respectively. On the other hand, adolescents had a slightly higher prevalence of eczema symptoms: 12% reported ever having eczema symptoms, and 5.1% reported having current eczema symptoms.

The proportion of young children reporting a physician diagnosis of eczema (9.2% [95% CI = 8.2%-10.2%]) was greater than the proportion of adolescents reporting such a diagnosis (6.9% [95% CI = 6.1%-7.7%]) ($P < .001$). Moreover, there was no statistically significant sex-related difference between the prevalence of eczema symptoms in either age group, except for physician-diagnosed eczema among adolescents who had ever experienced eczema symptoms. The percentage of boys diagnosed with eczema was significantly higher than the percentage of girls (62.8% vs 53.5%).

Furthermore, less than 1.0% of all participants in both age groups reported severe eczema, defined as eczema symptoms that interfered with sleep at least once per week. However, among children and adolescents with current eczema symptoms, 16.7% and 18.2%, respectively, had severe eczema.

Eczema and associated factors

We identified several factors that were significantly associated with current asthma symptoms among young children (Table III) and adolescents (Table IV). Multivariable logistic regression analysis revealed that the odds of current eczema were significantly higher in children with a history of chest infection in early life (aOR = 1.96 [95% CI = 1.23-3.13]), children who had

TABLE I. Background characteristics of the participating young children and adolescents

Characteristic	Children aged 6 to 7 years (n = 3614)	Adolescents aged 13 to 14 years (n = 4086)
Age (y), mean ± SD	6.86 ± 0.5	13.4 ± 0.6
Sex, no. (%)		
Male	1673 (48.7%)	1973 (49.5%)
Female	1764 (51.3%)	2015 (50.5%)
Birth weight (kg), mean ± SD	3.3 ± 0.4	NA
Weight (kg), mean ± SD	21.7 ± 4.4	48.7 ± 11.7
Height (cm), mean ± SD	119.2 ± 6.4	154.8 ± 8.4
No. of siblings, no. (%)		
None	86 (2.7%)	71 (1.8%)
1-2	1268 (39.1%)	3063 (79.9%)
≥3	1889 (58.2%)	701 (18.3%)
Twins, no. (%)		
Yes	96 (2.8%)	114 (2.9%)
No	3329 (97.2%)	3839 (97.1%)
Born in the KSA, no. (%)		
Yes	3203 (92.7%)	3730 (92.9%)
No	252 (7.3%)	284 (7.1%)
Time lived in the KSA (y), no. (%)		
1-5	128 (3.6%)	79 (2.3%)
6-10	3421 (96.4%)	207 (6.1%)
11-15	—	3104 (91.6%)

NA, Not available for this age group.

TABLE II. Overall and sex-stratified prevalence and severity of eczema symptoms among young children and adolescents

	Age group							
	Age 6 to 7 years				Age 13 to 14 years			
Symptom	Overall	Male (n = 1673)	Female (n = 1764)	*P* value	Overall	Male (n = 1973)	Female (n = 2015)	*P* value
Eczema symptoms ever*								
No.	417	184	211		489	231	243	
Percentage of all participants	(11.5%)	(11.0%)	(12.0%)	.674	(12.0%)	(11.7%)	(12.1%)	.053
Current eczema symptoms†								
No.	168	72	91		209	88	113	
Percentage of all participants	(4.6%)	(4.3%)	(5.2%)	.238	(5.1%)	(4.5%)	(5.6%)	.098
Severe eczema symptoms‡								
No.	28	11	17		38	15	22	
Percentage of all participants	(0.8%)	(0.7%)	(1.0%)	.318	(0.9%)	(0.8%)	(1.1%)	.275
Percentage of those with current eczema	(16.7%)	(15.3%)	(18.7%)	.567	(18.2%)	(17.0%)	(19.5%)	.660
Eczema confirmed by a doctor§								
No.	331	153	161		280	145	130	
Percentage of all participants	(9.2%)	(9.1%)	(9.1%)	.985	(6.9%)	(7.3%)	(6.5%)	.263
Percentage of those with eczema ever	(79.4%)	(83.2%)	(76.3%)	.093	(57.3%)	(62.8%)	(53.5%)	.041*

P values were derived by using the chi-square test to compare categoric variables between boys and girls.
*Participants who ever had an itchy rash for at least 6 months.
†Participants with eczema symptoms in the past 12 months.
‡Participants with eczema in the past 12 months who had awoken at night for 1 or more nights per week because of an itchy rash.
§Significance values at the 5% level.

wheezing episodes in infancy (aOR = 1.71 [95% CI = 1.03-2.82]), and children who had attended day care in the past (aOR = 1.59 [95% CI = 1.04-2.40]). Furthermore, children exposed to a cat at home in the past 12 months were 3 times more likely to have current eczema symptoms than those not exposed (aOR = 3.00 [95% CI = 1.50-6.02]).

Among adolescents, the results showed that current eczema symptoms were negatively associated with high nut consumption (aOR = 0.50 [95% CI = 0.27-0.92]). However, practicing vigorous physical activity 3 or more times per week (aOR = 2.20 [95% CI = 1.21-3.99]), using paracetamol at least once per month (aOR = 2.43 [95% CI = 1.31-4.50]), and having a cat living at home in the past 12 months (aOR = 1.54 [95% CI = 1.02-2.32]) were significantly associated with a higher prevalence of current eczema symptoms.

DISCUSSION

The present study, which represents the first national assessment of eczema prevalence, severity, and determinants,

TABLE III. Logistic regression analysis of factors associated with current eczema symptoms among young children aged 6 to 7 years

Current eczema symptoms among 6- to 7-year-old children (n = 3614)					
		Univariate model		Multivariable model	
Associated factors	**No. (%)**	**Crude OR (95% CI)**	***P* value**	**aOR (95% CI)**	***P* value**
Daily computer time					
<1 hour	62 (4.2%)	Reference		Reference	
1 to <3 hours	35 (4.5%)	1.10 (0.72-1.67)	.674	1.22 (0.74-2.02)	.432
≥3 hours	52 (6.2%)	1.64 (1.12-3.39)	.011*	1.55 (0.97- 2.48)	.065
Paracetamol use in the past 12 months					
Never	10 (1.9%)	Reference		Reference	
At least once per year	61 (4.5%)	2.46 (1.25-4.84)	.009*	1.42 (0.58 -3.4)	.441
At least once per month	84 (5.9%)	3.27 (1.68-6.34)	.000*	1.59 (0.65-3.89)	.306
Ever diagnosed with pneumonia					
No	128 (4.0%)	Reference		Reference	
Yes	32 (13.6%)	3.76 (2.49-5.68)	.000*	0.98 (0.53-1.83)	.952
Had a cat at home in the past 12 months					
No	135 (4.2%)	Reference		Reference	
Yes	19 (11.2%)	2.84 (1.71-4.71)	.000*	3.00 (1.50 – 6.02)	.002*
Had a dog at home in the past 12 months					
No	150 (4.5%)	Reference		Reference	
Yes	3 (15.0%)	3.73 (1.08-12.88)	.037*	1.42 (0.27-7.39)	.675
Mother used paracetamol during pregnancy					
Never	44 (3.5%)	Reference		Reference	
At least once in pregnancy	31 (4.8%)	1.39 (0.87-2.23)	.167	0.83 (0.47-1.46)	.517
At least once per month	22 (5.1%)	1.48 (0.88-2.49)	.144	0.63 (0.32-1.25)	.185
More often	31 (8.2%)	2.48 (1.55-3.99)	.000*	1.15 (0.62-2.14)	.663
Does not know	35 (5.0%)	1.44 (0.92-2.27)	.112	1.15 (0.65-2.04)	.640
Child born prematurely					
No	144 (4.5%)	Reference		Reference	
Yes	19 (9.1%)	2.12 (1.28-3.49)	.003*	1.44 (0.75-2.79)	.275
Paracetamol used during first year of life					
No	18 (2.3%)	Reference		Reference	
Yes	143 (5.4%)	2.38 (1.45-3.92)	.001*	1.36 (0.68-2.75)	.388
History of chest infection during the first year of life					
No	71 (3.0%)	Reference			
Yes	90 (8.5%)	2.976 (2.16-4.10)	.000*	1.96 (1.23 – 3.13)	.005*
Antibiotics used in the first year of life					
No	70 (3.4%)	Reference		Reference	
Yes	90 (6.6%)	2.03 (1.48-2.80)	.000*	1.42 (0.93-2.17)	.109
Wheezing or whistling in the chest during the first year of life					
No	107 (3.6%)	Reference		Reference	
Yes	54 (11.3%)	3.38 (2.40-4.76)	.000*	1.71 (1.03 – 2.82)	.037*
Had a cat at home in the first year of life					
No	149 (4.5%)	Reference		Reference	
Yes	12 (10.7%)	2.57 (1.38-4.77)	.003*	1.41 (0.60 - 3.33)	.436
Regular contact with farm animals during the first year of life					
No	143 (94.4%)	Reference		Reference	
Yes	20 (11.2%)	2.76 (1.68-4.52)	.000*	1.68 (0.81-3.49)	.167
Ever attended day care					
No	53 (3.5%)	Reference			
Yes	99 (5.9%)	1.74 (1.24-2.44)	.002*	1.59 (1.04 – 2.40)	.033*

*Significant.

found that of schoolchildren in the KSA, 4.6% of the children aged 6 to 7 years and 5.1% of the adolescents aged 13 to 14 years had current eczema. In contrast to previous studies conducted locally, these prevalence rates are lower than those observed in Madina, Najran, and Jazan, with prevalence rates of 8.8%, 10.5%, and 8.4%, respectively.[8-10] This may be due to the environmental and climatic conditions of these regions, which could contribute to the development of eczema. However, this nationwide study represents the entire country, which has a diverse climate and geographic expanse. Considering this diversity, the study is expected to show a lower overall prevalence of eczema, as it averages out the disparities between regions with higher and lower eczema rates.

Our prevalence rates for current eczema also align closely with the reported average rate of 4.8% in the Eastern Mediterranean Region (EMR) for children aged 6 to 7 years. Similar environmental and genetic factors may influence eczema in young children throughout the EMR. Conversely, we found that the prevalence of eczema among adolescents aged 13 to 14 years was lower than the regional average of 6.3% reported in

TABLE IV. Logistic regression analysis of factors associated with current eczema symptoms among adolescents aged 13 to 14 years

Current eczema symptoms among 13- to 14-year-old adolescents (n = 4086)					
		Univariate model		Multivariable model	
Associated factor	No. (%)	Crude OR (95% CI)	*P* value	Adjusted OR (95% CI)	*P* value
Raw vegetable consumption					
Never or only occasionally	84 (4.6%)	Reference		Reference	
Once or twice per week	76 (7.3%)	1.66 (1.21-2.29)	.002*	1.48 (0.99 – 2.22)	.057
Most or all days	33 (4.7%)	1.04 (0.69-1.58)	.838	1.07 (0.64 – 1.78)	.809
Nut consumption					
Never or only occasionally	69 (5.5%)	Reference		Reference	
Once or twice per week	98 (5.8%)	1.04 (0.76-1.43)	.805	1.14 (0.76-1.71)	.533
Most or all days	25 (3.4%)	0.59 (0.37-0.95)	.028*	0.50 (0.27-0.92)	.026*
Weekly vigorous physical activity					
Never or occasionally	127 (4.5%)	Reference		Reference	
Once or twice per week	50 (7.4%)	1.70 (1.21-2.38)	.002*	1.52 (0.99 – 2.35)	.058
Three or more times per week	24 (9.4%)	2.21 (1.40-3.49)	.001*	2.20 (1.21 – 3.99)	.009*
Paracetamol use in the past 12 months					
Never	21 (2.6%)	Reference		Reference	
At least once per year	71 (4.5%)	1.75 (1.07-2.87)	.026*	1.76 (0.94-3.30)	.076
At least once per month	103 (7.1%)	2.85 (1.77-4.60)	.000*	2.43 (1.31 – 4.49)	.005*
Had a cat at home in past 12 months					
No	148 (4.6%)	Reference		Reference	
Yes	55 (7.1%)	1.56 (1.14-2.15)	.006*	1.54 (1.02-2.32)	.042*
Trucks pass near home					
Never	25 (3.8%)	Reference		Reference	
Seldom	108 (4.6%)	1.21 (0.77-1.88)	.406	1.11 (0.61 – 2.00)	.740
Frequently or almost throughout the whole day	69 (7.3%)	1.97 (1.23-3.15)	.005*	1.54 (0.82-2.90)	.179

*Significant

the EMR for the same age group, including specific figures from Gulf countries such as Kuwait (6.1%) and Oman (7.1%).[25] This observed difference could be attributed to environmental exposure risks, socioeconomic disparities, and adolescent behaviors that influence health care–seeking habits.

Expanding on our earlier findings, we also found lower prevalence rates of current eczema among young children and adolescents than reported in international studies conducted across several countries.[25-28] Globally, according to the GAN phase I study, 5.9% of young children and 6.4% of adolescents experience current eczema symptoms.[29] Moreover, the ISAAC phase III study showed global prevalence rates of 7.9% among young children aged 6 to 7 years. and 7.3% among adolescents aged 13 to 14 years.[30] Notably, the Indian subcontinent exhibits the lowest prevalence rates, namely, 2.5% (range 2.3%-2.7%) among children aged 6 to 7 years and 3.5% (range 3.27%-3.71%) among adolescents aged 13 to 14 years.[31] These variations in eczema prevalence across different regions may be influenced by differences in behavioral habits, climatic conditions, and environmental factors.

Our study revealed that the percentage of adolescents aged 13 to 14 years who reported ever experiencing eczema symptoms was marginally higher than the corresponding percentage of children aged 6 to 7 years (12.0% vs 11.5%). Despite this, a significant proportion of younger children had their eczema diagnosed by a physician (9.2% vs 6.9% for adolescents [$P <$ .01]). Even so, adolescents have a higher prevalence of severe eczema than children do (18.2% vs 16.7%). Our results suggest that adolescents may ignore their symptoms and refrain from seeking medical attention because the illness is not fatal.

Concerning the severity of eczema symptoms, the prevalence of severe eczema was 0.8% in children and 0.9% in adolescents. Our finding was consistent with that of the global GAN phase I study, which found severe eczema symptoms reported by 1.0% of adolescents and 0.7% of children.[29] However, the prevalence was lower than that reported in some international studies, in which it ranged from 0.0% (in Hong Kong; Davangere, India; and Kharkiv, Ukraine) to 4.9% (in La Habana, Cuba) for children aged 6 to 7 years and from 0.0% (in Ho Chi Minh City, Vietnam; Borivali; and India) to 5.8% (in Marrakech, Morocco) for children aged 13 to 14 years.[25] Moreover, the findings were lower than those reported in the ISAAC phase III study conducted in Latin America, which found that the prevalence of current severe eczema symptoms among schoolchildren was 1.5%, ranging from 0.3% in Ciudad Victoria, Toluca, and Cuernavaca (Mexico) to 4.9% in La Habana (Cuba). The mean prevalence for adolescents was 1.4%, with variations ranging from 0.1% in Mexicali Valley (Mexico) to 4.2% in Santa Cruz (Bolivia).[27] Furthermore, the findings were lower than those reported in Bangkok, with the prevalences of severe eczema in children aged 6 to 7 years and 13 to 14 years being 5.6% and 3.8%, respectively. Overall, 4.7% of children had severe eczema.[32]

Each age group was investigated for various risk factors associated with current eczema symptoms. According to our study, children aged 6 to 7 years were more likely to have current eczema due to factors related to early life. We found that children with a history of chest infections or wheezing in the first year of life were more likely to develop eczema later in childhood. According to previous studies, it is unclear whether exposure to early infections in day care poses a risk or provides protection against future allergic disease or asthma (both allergic and

nonallergic). Viral infections in the respiratory tract, particularly rhinovirus infections, are the leading cause of asthma exacerbations in school-age individuals. Lower respiratory symptoms in infants and young children are commonly caused by respiratory syncytial virus. In the Tucson Children's Respiratory Study, early respiratory syncytial virus infection was linked to asthmatic symptoms in children up to age 11 years.[33] Attendance at day care centers was also identified as a potential risk factor for eczema in children. The effect of day care attendance on the development of atopy has been examined in numerous studies. However, the results remain conflicting, with some studies showing a protective effect from day care attendance[33,34] and others showing a positive association[35,36] or no association.[37,38]

We observed that owning a cat in the past 12 months was associated with a higher risk of current eczema symptoms. Several studies have also investigated the relationship between exposure to a cat and atopic diseases.[31,39-42] However, the results were conflicting. Some studies found that owning a cat increases the likelihood of developing eczema.[31,39-41] However, Kurosaka et al found that exposure to a cat may protect against eczema.[42]

In our study, eczema was significantly more prevalent among adolescents who engaged in vigorous physical activity, which was consistent with the findings of other studies.[43,44] An increase in sweating following vigorous exercise could possibly contribute to the aggravated symptoms of eczema. The Greek study, however, found an inverse relationship between an active lifestyle and eczema.[45]

Our study found that paracetamol consumption was associated with current eczema symptoms in adolescents, consistent with the findings of other published studies.[31,40,46] Paracetamol inhibits an antioxidant enzyme essential to the prevention of oxidative stress, which is a factor that contributes to the pathogenesis of atopic diseases.[46] Conversely, nuts are rich in antioxidants, such as vitamin E and zinc,[47,48] which protect against oxidative stress.[47] Therefore, our study suggests that consumption of nuts may have a protective effect against eczema among adolescents.

This study has several key strengths, including its large and representative sample drawn from all regions of the KSA. In addition, the standardized methods utilized to estimate eczema prevalence allow comparisons between countries and extend the generalizability of the results. There are, however, certain limitations that should be acknowledged. The study used a questionnaire-based cross-sectional approach, which can be subject to self-reporting and recall bias, as well as the inability to establish causal relationships. Further, the lack of clinical or laboratory assessment may limit the validity of the diagnosis.

Conclusion and recommendations

The prevalence of eczema among schoolchildren in the KSA is below the global norm but within the average range for the EMR region. According to the results, various factors have been linked to eczema, suggesting that environmental factors could play a crucial role in the development of eczema during childhood and adolescence.

This study provides baseline epidemiologic data on the prevalence, severity, and contributing factors for eczema among schoolchildren in the KSA, which will create the foundation for future research and enable local, national, and international comparisons.

This study sheds light on the situation of eczema among the Saudi Arabian population; however, more extensive studies are required to determine variation across different regions of the country. Additionally, tracking trends over time can provide insight into changes in the prevalence of eczema and the effectiveness of intervention strategies. Investigating risk factors contributing to eczema in the KSA, such as genetic predisposition and environmental and lifestyle factors, is essential. Understanding these factors can help in the identification of high-risk groups and the development of effective prevention and treatment strategies to reduce the burden of disease and improve patients' quality of life.

DISCLOSURE STATEMENT

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Data availability statement: The data set used in the current study is managed and maintained by the Asthma Control Program at the General Directorate of Health Programs and Chronic Diseases, Ministry of Health, Saudi Arabia. On reasonable request and with permission from the data owners, interested individuals may obtain the data sets used in this study from the corresponding author.

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Key messages

- **The prevalence of eczema in schoolchildren in Saudi Arabia is lower than the global average.**
- **Current eczema was prevalent among 4.5% of Saudi children and 5.1% of Saudi adolescents; severe eczema was reported in 0.8% and 0.9% of children and adolescents, respectively.**
- **Several factors showed significant association with eczema. Among children, eczema was linked positively to having a history of chest infections and wheezing in early life, as well as to ever attending day care and current exposure to cats. Among adolescents, the main potential risk factors included paracetamol use in the previous year, adherence to a lifestyle of vigorous physical activity, and current exposure to cats.**

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