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Assessment of atopic dermatitis using self-report and caregiver report: a multicentre validation study

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Summary

Background—The epidemiology of atopic dermatitis (AD) in the U.S.A. has been described largely via US population-based questionnaire studies. However, the validity of the questions used for self- and caregiver-reported eczema has not been previously demonstrated.

Objectives—To validate the assessment of self- and caregiver-reported eczema.

Methods—We performed a prospective multicentre dermatology-practice-based study (three sites) to determine the validity of caregiver- and self-reported ever having eczema and 1-year history of eczema. Questionnaires were administered to unselected patients prior to their encounter. Patients (n = 782) were then evaluated by expert dermatologists trained in utilizing the Hanifin and Rajka criteria for AD. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value were determined.

Results—Caregiver-reported 1-year history of childhood eczema was found to have a sensitivity (95% confidence interval) of 0·70 (0·59–0·80), specificity of 0·96 (0·93–0·99) and PPV of 0·87 (0·78–0·96) when compared with a physician's diagnosis of AD at that visit. Similarly, self-reported 1-year history of adult eczema was found to have a sensitivity of 0·70 (0·59–0·80), specificity of 0·95 (0·93–0·97) and PPV of 0·76 (0·64–0·85). The specificities and PPVs of a history of ever having caregiver- (0·89, 0·82–0·96 and 0·81, 0·70–0·93) and self-reported eczema (0·97, 0·95–0·99 and 0·91, 0·85–0·97) were high, with a high sensitivity in children (0·83, 0·72–0·95) but not in adults (0·43, 0·37–0·51).

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Conflicts of interest

None declared.

Conclusions—Self- and caregiver-reported diagnosis of eczema ever or in the past year based on a single question demonstrates sufficient validity for the epidemiological study of AD.

Understanding the epidemiology of atopic dermatitis (AD or eczema) is essential for identifying at-risk populations and potentially modifiable risk factors, and ultimately in developing interventions that could prevent eczema in the general population. Much of our knowledge of the epidemiology of eczema in the U.S.A. comes from a number of US population-based studies, which analysed data from the National Survey of Children's Health (NSCH), National Health Interview Survey (NHIS) and National Health and Nutrition Examination Survey (NHANES).[1–12] These studies employed different approaches to identifying eczema, including caregiver- and self-reported diagnosis of eczema ever (NHANES) or in the past year (NSCH and NHIS). While previous studies validated different questionnaires for self- and caregiver-reported eczema,[13,14] the validity of the particular questions employed by NSCH, NHIS and NHANES has not previously been investigated. We sought to determine the performance characteristics and validity of a single question in the diagnosis of eczema.

Materials and methods

Study design

We performed a prospective multicentre dermatology-practice-based study to determine the validity of caregiver-and self-reported history of ever having eczema and 1-year history of eczema. Three sites were included in the study: Oregon Health & Science University, Mount Sinai St Luke's–Roosevelt Hospital Center and Northwestern University Feinberg School of Medicine.

Questionnaires were administered to unselected patients in the waiting area of the respective adult and paediatric dermatology practices prior to their encounter. For adult patients (age ≥ 18 years) questionnaires were completed by the patients themselves. For paediatric patients (age 0–17 years) questionnaires were completed by the patients' caregivers. Patients were then evaluated by expert dermatologists trained in utilizing the Hanifin and Rajka criteria.[15]

A medical history and total-body skin examination were performed for all patients, guided by the Hanifin and Rajka[15] major and minor criteria. The primary end point for validation of 1-year history of eczema was a diagnosis of AD at that visit. The primary end point for validation of a history of ever having eczema was a diagnosis of AD at the present visit or a previous visit as identified by chart review. Surveys were administered between 1 May 2013 and 6 June 2014. The study was approved by the institutional review board of each institution.

History of eczema

One-year history of a self-reported healthcare diagnosis of eczema in adults was determined by an affirmative response to the question, 'During the past 12 months, have you been told by a doctor or other health professional that you had eczema or any kind of skin allergy?' One-year history of a caregiver-reported healthcare diagnosis of eczema in children was determined by, 'During the past 12 months, have you been told by a doctor or other health

professional that your child had eczema or any kind of skin allergy?' A history of ever having self-reported eczema in adults was determined by an affirmative response to, 'Have you ever been told by a doctor or other health professional that you had eczema or any kind of skin allergy?' A history of ever having caregiver-reported eczema in children was determined by, 'Have you ever been told by a doctor or other health professional that your child had eczema or any kind of skin allergy?' One-year history of eczema was assessed at all three sites, whereas a history of ever having eczema was assessed at St Luke's–Roosevelt Hospital Center and the Feinberg School of Medicine.

Data processing and statistical methods

All data analyses and statistical processes were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, U.S.A.). Self-report and caregiver report of 1-year history of eczema were compared with physician diagnosis of AD at that visit. A history of ever having eczema was compared with physician diagnosis of AD at that visit or a previous visit. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value and the respective 95% confidence intervals (CIs) were calculated. Additional analyses were performed to determine whether there were differences of response by age. A sample size of 625 participants was determined to provide adequate precision ($d = 0{\cdot}1$) around the estimates and 95% CIs for the expected sensitivity (0·7) and specificity (0·7) of the individual questions, assuming a 12·97% prevalence of eczema.[10]

Results

Patient characteristics

Surveys were administered to 782 persons at three sites, of which 722 were completed. In total 481 patients (67·0%) were adults age ≥ 18 years and 237 (33·0%) were children or adolescents. The prevalence of physician-diagnosed AD at the present encounters was 29·6% in children and 17·7% in adults, whereas the prevalence of AD at past or present encounters was 34·0% in children and 49·3% in adults. The breakdown of age, survey responses and diagnosis of AD for each site is presented in Table 1.

Validity of 1-year history of healthcare-diagnosed eczema

Caregiver-reported 1-year history of childhood eczema was found to have a sensitivity of 0·70 (95% CI 0·59–0·80), specificity of 0·96 (95% CI 0·93–0·99) and PPV of 0·87 (95% CI 0·78–0·96) when compared with a physician's diagnosis of AD at that visit (Table 2). Similarly, self-reported 1-year history of adult eczema was found to have a sensitivity of 0·70 (95% CI 0·59–0·80), specificity of 0·95 (95% CI 0·93–0·97) and PPV of 0·76 (95% CI 0·64–0·85).

Validity of a history of ever having healthcare-diagnosed eczema

Caregiver-reported history of ever having childhood eczema had a high sensitivity (0·83, 95% CI 0·72–0·95), specificity (0·89, 95% CI 0·82–0·96) and PPV (0·81, 95% CI 0·70–0·93) when compared with a physician's diagnosis of AD at any visit (Table 3). In adults, self-reported history of ever having eczema was less sensitive (0·43, 95% CI 0·37–0·51) than

caregiver report in children, with slightly higher specificity (0·97, 95% CI 0·95–0·99) and PPV (0·91, 95% CI 0·85–0·97).

Discussion

Using a multicentre dermatology-practice-based study, we demonstrated the validity of caregiver- and self-reported 1-year history and history of ever having healthcare-diagnosed eczema. The question for caregiver-reported history of ever having eczema was more sensitive than for 1-year history of eczema in children. However, self-reported history of ever having eczema was less sensitive than 1-year history of eczema in adults. This suggests that many adults with AD may be either undiagnosed or unaware of their diagnosis. Overall, the high specificity and PPV of the questions about 1-year history or history of ever having of eczema make them ideal for the study of comorbidities and patient-reported outcomes in AD, but may result in underestimation of the actual prevalence of disease.

Previous studies found that self-report and parental report of AD and other types of dermatitis have good validity.[13,14] Flohr *et al.* demonstrated good diagnostic precision for the question used in the International Study of Asthma and Allergies in Childhood (ISAAC) about ‘persistent flexural eczema in the past 12 months’.[13] Vissing *et al.* demonstrated almost complete sensitivity of self-reported childhood dermatitis in the Copenhagen Study on Asthma in Childhood (COPSAC) birth cohort.[14] The present study demonstrates that self- and caregiver-reported healthcare-diagnosed eczema also have good diagnostic precision, sensitivity and specificity.

The question for 1-year history of eczema was employed in the NSCH 2003–2004 and 2007–2008 surveys, and in the NHIS in 1997–2013 for children and in 2012 for adults. In the 2003–2004 NSCH, the US prevalence of eczema was 10·7% overall, but as high as 18·05% in District of Columbia.[3] These prevalence estimates are similar to those from other studies.[16,17] More recently, in the 2007–2008 NSCH, the US prevalence of eczema increased to 12·97% overall, but it was as high as 20·1% in District of Columbia.[10] In NHIS, the prevalence of eczema has increased from 7·4% in 1997–1999 to 12·5% in 2009–2011.[18] Together it appears that the prevalence of childhood eczema is increasing in the U.S.A. Previous studies also suggested that the prevalence of eczema is increasing in Africa, eastern Asia, western Europe and parts of northern Europe.[19] In NHIS 2012, the US prevalence of adult eczema using self-reported 1-year diagnosis of eczema was estimated to be 7·2%.[5] The question for a history of ever having eczema was employed in NHANES 2005–2006 in children and adults. The present study demonstrates that the questions employed in these studies are quite specific, although they may slightly underestimate the true prevalence of disease due to lower sensitivity.

This study has several strengths, including using multiple centres from different regions, a large sample size of children and adults, and diagnosis of AD by dermatologists who were expert in the gold-standard Hanifin and Rajka criteria. However, the study has limitations. In particular, the study administered questionnaires to patients in the dermatological setting. Given that these were referral centres for dermatological care, it is expected that the prevalence of AD in this study (19·3–25·2%) is higher than in the general population. It is

well established that the PPV of a test depends on the prevalence of the disease in the test population. Thus, the PPV would likely be lower in the general population based on previous prevalence estimates. Nevertheless, these questions would likely still perform quite well. Moreover, if the prevalence of childhood eczema is increasing in the U.S.A. and other locations worldwide, as mentioned above, it is likely that the PPV will also increase for the questions used to identify eczema.

In conclusion, caregiver- and self-reported 1-year history of healthcare-diagnosed eczema has excellent specificity and PPV and good sensitivity to detect AD using a physician's diagnosis as the gold standard. A history of ever having healthcare-diagnosed eczema also has excellent specificity and PPV, but had good sensitivity only in children. These questions appear to be suitable for studying the 1-year prevalence of AD in children and adults, lifetime prevalence of AD in children, and comorbidities of AD in children and adults, using data from surveys that utilize these questions.

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References

1. Garg N, Silverberg JI. Association between eczema and increased fracture and bone or joint injury in adults: a US population-based study. JAMA Dermatol. 2015; 151:33–41. [PubMed: 25353616]
2. Garg NK, Silverberg JI. Eczema is associated with osteoporosis and fractures in adults: a US population-based study. J Allergy Clin Immunol. 2015; 135:1085–7. e2. [PubMed: 25512080]
3. Shaw TE, Currie GP, Koudelka CW, Simpson EL. Eczema prevalence in the United States: data from the 2003 National Survey of Children's Health. J Invest Dermatol. 2011; 131:67–73. [PubMed: 20739951]
4. Silverberg JI. Healthcare utilization, patient costs, and access to care in US adults with eczema: a population-based study. JAMA Dermatol. 2015; 151:743–52. [PubMed: 25738422]
5. Silverberg JI, Garg NK, Paller AS, et al. Sleep disturbances in adults with eczema are associated with impaired overall health: a US population-based study. J Invest Dermatol. 2015; 135:56–66. [PubMed: 25078665]
6. Silverberg JI, Greenland P. Eczema and cardiovascular risk factors in 2 US adult population studies. J Allergy Clin Immunol. 2015; 135:721–8. e6. [PubMed: 25579484]
7. Silverberg JI, Hanifin J, Simpson EL. Climatic factors are associated with childhood eczema prevalence in the United States. J Invest Dermatol. 2013; 133:1752–9. [PubMed: 23334343]
8. Silverberg JI, Hanifin JM. Adult eczema prevalence and associations with asthma and other health and demographic factors: a US population-based study. J Allergy Clin Immunol. 2013; 132:1132–8. [PubMed: 24094544]
9. Silverberg JI, Lee-Wong M, Silverberg NB. Complementary and alternative medicines and childhood eczema: a US population-based study. Dermatitis. 2014; 25:246–54. [PubMed: 25207686]
10. Silverberg JI, Simpson EL. Association between severe eczema in children and multiple comorbid conditions and increased healthcare utilization. Pediatr Allergy Immunol. 2013; 24:476–86. [PubMed: 23773154]
11. Silverberg JI, Simpson EL. Association between obesity and eczema prevalence, severity and poorer health in US adolescents. Dermatitis. 2014; 25:172–81. [PubMed: 25000233]

12. Silverberg JI, Simpson EL. Associations of childhood eczema severity: a US population-based study. Dermatitis. 2014; 25:107–14. [PubMed: 24819283]
13. Flohr C, Weinmayr G, Weiland SK, et al. How well do questionnaires perform compared with physical examination in detecting flexural eczema? Findings from the International Study of Asthma and Allergies in Childhood (ISAAC) Phase Two. Br J Dermatol. 2009; 161:846–53. [PubMed: 19485999]
14. Vissing NH, Jensen SM, Bisgaard H. Validity of information on atopic disease and other illness in young children reported by parents in a prospective birth cohort study. BMC Med Res Methodol. 2012; 12:160. [PubMed: 23088330]
15. Hanifin J, Rajka G. Diagnostic features of atopic dermatitis. Acta Derm Venereol Suppl (Stockh). 1980; 92:44–7.
16. Hanifin JM, Reed ML. A population-based survey of eczema prevalence in the United States. Dermatitis. 2007; 18:82–91. [PubMed: 17498413]
17. Laughter D, Istvan JA, Tofte SJ, Hanifin JM. The prevalence of atopic dermatitis in Oregon schoolchildren. J Am Acad Dermatol. 2000; 43:649–55. [PubMed: 11004621]
18. Jackson KD, Howie LD, Akinbami LJ. Trends in allergic conditions among children: United States, 1997–2011. NCHS Data Brief. 2013; 121:1–8.
19. Deckers IA, McLean S, Linssen S, et al. Investigating international time trends in the incidence and prevalence of atopic eczema 1990–2010: a systematic review of epidemiological studies. PLoS ONE. 2012; 7:e39803. [PubMed: 22808063]

What's already known about this topic?

- Questions about self-reported eczema have been used in multiple epidemiological studies.

What does this study add?

- A single question about self-report and caregiver report of healthcare-diagnosed eczema is valid to assess for atopic dermatitis.

Table 1

Patient characteristics (n = 722)

Variable	OHSU	SLR	FSM
Age (years)			
Mean ± SD	37·0 ± 42·3	16·1 ± 14·5	44·5 ± 15·2
< 18	125 (57·1)	110 (69·2)	4 (1·0)
≥ 18	94 (42·9)	49 (30·8)	396 (99·0)
Self-reported history of ever having eczema			
No	–	34 (69)	317 (80·9)
Yes	–	15 (31)	75 (19·1)
Self-reported 1-year history of eczema			
No	32 (80)	37 (76)	331 (84·4)
Yes	8 (20)	12 (24)	61 (15·6)
Caregiver-reported history of ever having eczema			
No	–	71 (64·5)	0 (0)
Yes	–	39 (35·5)	4 (100)
Caregiver-reported 1-year history of eczema			
No	96 (77·4)	85 (78·0)	0 (0)
Yes	28 (22·6)	24 (22·0)	4 (100)
Physician diagnosis of AD at that visit in children			
No	85 (71·4)	79 (71·8)	0 (0)
Yes	34 (28·6)	31 (28·2)	4 (100)
Physician diagnosis of AD at that visit in adults			
No	31 (94)	40 (82)	314 (81·3)
Yes	2 (6)	9 (18)	72 (18·7)
Physician diagnosis of AD at a previous visit			
No	–	107 (69·9)	112 (45·9)
Yes	–	46 (30·1)	132 (54·1)

Values are n (%) unless stated otherwise. OHSU, Oregon Health & Science University; SLR, St Luke's–Roosevelt Hospital Center; FSM, Feinberg School of Medicine; AD, atopic dermatitis.

Table 2

Sensitivity, specificity and positive and negative predictive values of caregiver- and self-reported 1-year history of eczema

	Physician diagnosis of AD at that visit	
Caregiver report	**No**	**Yes**
No	160 (88·4)	21 (11·6)
Yes	7 (13)	48 (87)
		Estimate (95% CI)
Sensitivity		0·70 (0·59–0·80)
Specificity		0·96 (0·93–0·99)
Positive predictive value		0·87 (0·78–0·96)
Negative predictive value		0·88 (0·84–0·93)
	Physician diagnosis of AD at that visit	
Self-report in adults	No	Yes
No	367 (93·9)	24 (6·1)
Yes	18 (24)	56 (76)
		Estimate (95% CI)
Sensitivity		0·70 (0·59–0·80)
Specificity		0·95 (0·93–0·97)
Positive predictive value		0·76 (0·64–0·85)
Negative predictive value		0·94 (0·91–0·96)

AD, atopic dermatitis; CI, confidence interval.

Table 3

Sensitivity, specificity and positive and negative predictive values of caregiver- and self-reported history of ever having eczema

	Physician diagnosis of AD at any visit	
Caregiver report	**No**	**Yes**
No	67 (91)	7 (9)
Yes	8 (19)	35 (81)
		Estimate (95% CI)
Sensitivity		0·83 (0·72–0·95)
Specificity		0·89 (0·82–0·96)
Positive predictive value		0·81 (0·70–0·93)
Negative predictive value		0·91 (0·84–0·97)
	Physician diagnosis of AD at any visit	
Self-report in adults	No	Yes
No	245 (69·8)	106 (30·2)
Yes	8 (9)	82 (91)
		Estimate (95% CI)
Sensitivity		0·43 (0·37–0·51)
Specificity		0·97 (0·95–0·99)
Positive predictive value		0·91 (0·85–0·97)
Negative predictive value		0·70 (0·65–0·75)

AD, atopic dermatitis; CI, confidence interval.