

Cover Page



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Chapter 5

Point and period prevalences of eczema in rural and urban schoolchildren in Ghana, Gabon and Rwanda

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Abstract

Background

Eczema is a growing problem in Africa, particularly amongst children.

Objective

To investigate the point-prevalences of eczema by physical examination in school-children living in rural and urban areas and with different socioeconomic backgrounds in Ghana, Gabon and Rwanda. In Ghana period-prevalences were also estimated by questionnaire and compared with the point-prevalences.

Methods

In total, 4839 schoolchildren in Ghana, Gabon and Rwanda were seen by at least one dermatologist. The point-prevalences of eczema were estimated on the basis of physical examination. Period-prevalences were measured in Ghana with questionnaire based-interviews adapted from the International Study of Asthma and Allergies in Childhood (ISAAC).

Results

The point-prevalences were 1.5% and 1.6% in the two Ghanaian studies; 4% in Gabon and 0.8% in Rwanda. The period-prevalences were 2.6% and 4.4% in the two Ghanaian studies. The prevalences of eczema were not significantly different when comparing the urban and rural groups as well as the different socio economic levels. The sensitivity and positive predictive value to identify eczema cases based on the questionnaires compared to the diagnoses by physical examination were only 33% and 22% in the first Ghanaian study and 10% and 4% in the second Ghanaian study, respectively.

Conclusions

The point-prevalences of eczema in the three African countries studied were low compared with industrialized countries. Physical examination by a dermatologist still is the gold standard to identify eczema cases because the sensitivity and the positive predictive value to identify eczema cases with questionnaires were low in the two Ghanaian studies.

Conflict of interest

The authors state no conflict of interest.

Introduction

Eczema, also called atopic eczema, flexural eczema, atopic dermatitis, neurodermitis or atopiform dermatitis, is a chronic relapsing inflammatory skin disorder which is becoming increasingly common worldwide.¹⁻³ Because nearly 60 percent of patients do have clinical features without IgE-mediated sensitivity to allergens the term eczema instead of atopic eczema is preferred.⁴⁻⁷

Physical examination by a dermatologist or a team of dermatologists is still the gold standard to diagnose eczema.^{4,5} The diagnosis of eczema is based on a constellation of clinical findings. The most frequently used clinical criteria for the diagnosis of eczema are those of Hanifin and Rajka.⁸ These criteria are based on clinical experience and were published in 1980 after a consensus conference. They have since then been widely used in genetic, biological, immunological and epidemiological studies. The U.K. Working Party has tried to refine the criteria of Hanifin and Rajka by developing a minimal set of five diagnostic criteria especially suitable for epidemiological purposes.⁹ In addition the Millennium Criteria were developed in which the presence of allergen-specific IgE in a patient is required for making the diagnosis of atopic eczema. In the Millennium Criteria the term atopiform dermatitis is reserved for the patients with the clinical phenotype but without detectable allergen-specific IgE.^{2,7,9}

Questionnaires are often used in epidemiological studies to identify persons with eczema. The main advantages of questionnaire-based prevalence studies are that questionnaires are relatively cheap to distribute and administer to children and their parents and / or caretakers. In addition, questionnaires can be used to measure disease prevalences in large populations. A major shortcoming of questionnaires however, is the fact that eczema is difficult to define because of its variable morphology, distribution and its intermittent nature.^{2,3,10,11} Many itchy, scaly and erythematous skin diseases are judged by non dermatologists as being eczema which may lead to an overestimation of eczema.

Physical examination measures a point-prevalence while a questionnaire can also measure a period-prevalence. Because eczema is a chronic relapsing disorder a period-prevalence may be the best method to determine its frequency. When one measures a point-prevalence there is always a chance of underestimation.^{5-7,12}

The main purpose of our study was to estimate the point -prevalences of eczema as diagnosed by a dermatologist in schoolchildren living in rural and urban areas and with different socioeconomic backgrounds in Ghana, Gabon and Rwanda. In Ghana we also estimated the period prevalences by questionnaire and compared these with the point prevalences by physical examination. A selection of articles reporting prevalence data amongst sub-Saharan African schoolchildren is supplied to provide a framework for the prevalence data of our study.

Materials and Methods

To provide information about the prevalence of eczema in West and Central Africa, cross sectional studies with 4839 schoolchildren were conducted between 2004 and 2007 in Ghana (2 studies), Gabon and Rwanda. Details of the studies are presented in Table 1.

Point-prevalences of eczema were determined in all four studies by physical examination of all children by at least one dermatologist or a team of dermatologists (Table 1). Period-prevalences were measured by questionnaires adapted from the International Study of Asthma and Allergies in Childhood (ISAAC) in Ghana by trained staff with one of the caretakers of each child. The three most important questions are detailed in Figure 1. Figures 2-4 show clinical pictures of the children with eczema.

Independent persons with advanced levels of English language and mother tongue of Twi, Dangme, Ga or Ewe translated the questionnaire into these languages. In Ghana the rural and urban areas were selected according to the guidelines of the Ghana Statistical Service. This service defines an urban area as a settlement with a population greater than 5000 individuals. Our target urban area was the Accra Metropolitan Area with an estimated population of 1 801 606 in 2002. Our rural target areas were all settlements some distance from the Accra Metropolitan Area with low population densities. Other defining criteria for our rural areas included; settlements where the main income generating activities revolved around agriculture (fishing or farming), areas with limited access to amenities such as water, electricity, health, education, transportation and communication.

In Rwanda and Gabon rural schools were situated in villages, remote from the main road with lower population density than the urban areas. The urban schools were located in the middle of the capital city or one of the major towns of the country, close to the main roads.

Schools were selected for recruitment based on a broad social economic classification. This broad social economic classification reflects the average socioeconomic level (SEL), respectively low, middle and high. Urban high SEL schools were private fee-paying schools while urban low schools were public, government-run schools where no school fees were paid.

Categorical data were analyzed for statistical differences by chi-square test. Point prevalences and period prevalences were estimated by calculating the proportions of children with eczema compared to the total groups of children with 95% confidence intervals. Sensitivity, specificity and predictive values were calculated according to standard methods. For the statistical analyses, we used SPSS for Windows version 16.0 (SPSS Inc, Chicago, IL, USA) and software which is freely available on the internet (http://www.dimensionresearch.com/resources/calculators/conf_prop.html).

Table 1 Characteristics of the studies.

	GHANA (1)	GHANA (2)	GABON	RWANDA
Region	Greater Accra Region: Accra Metropolitan Area and Ga West District	Greater Accra Region: Accra Metropolitan Area , Dangme East District and Ga East District	Albert Schweitzer Hospital which is located about 6 km from the city center of Lambaréné	Muhanga (Gitarama and Saki), Bugesera (Gicaca) and Kicuciro (Gicondo, Kigali)
Number of schools	2	6	1	3
- Rural public (low SEL*)	1	3	1	3
- Urban public (low SEL)	0	1	0	0
- Urban private (middle SEL)	1	1	0	0
- Urban private (high SEL)				
Part of these studies	Association of helminth infection with allergic sensitization and atopic eczema among schoolchildren. In cooperation with the department of Parasitology, Leiden University Medical Center.	EU project GLOFAL "Global view of food allergy: opportunities to study the influence of microbial exposure". In cooperation with the department of Parasitology, Leiden University Medical Center.	Association of helminth infection with allergic sensitization and atopic eczema among schoolchildren. In cooperation with the department of Parasitology, Leiden University Medical Center.	Prevalence of Vernal Keratoconjunctivitis in Rwandan schoolchildren and its association with atopy and parasitic infestation. In cooperation with the department of ophthalmology, Medical University Gent.

*SEL: socioeconomic level.

Figure 1

Three most important questions for a history of symptoms of eczema (period-prevalence) translated from English in Twi, Dangme, Ga, and Ewe (Ghana).

(Q1) Has your child ever had an itchy rash which was coming and going for at least six months?

If Q1 was answered with yes:

(Q2) Has your child had this itchy rash at any time in the past 12 months?

(Q3) Has this itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears or eyes?

The child was considered to have a history of symptoms of eczema if the last two questions were answered confirmative (¹²).

Figure 2 Danny Morgan folds, hyper-pigmentation in the face and anterior neck folds.

An overview of the recent literature is provided after searching Pubmed for the words 'atopic dermatitis' and 'Africa'. The relevant articles were selected and the references in these articles were checked for additional studies. The prevalence data for schoolchildren were extracted and summarized. Non-English articles and hospital-based prevalence data were excluded. The aim of this literature search was not to perform a systematic review of the prevalence of eczema in sub-Saharan Africa but to provide a framework of other recent studies in which we could place and compare the prevalence data of our own study.

Figure 3 Knee folds with typical localization of hyperpigmentation and lichenification.**Figure 4** Prurigo and scratch marks with dry skin and hyperpigmentation.

Results

The baseline characteristics of the children are presented in Table 2. Most children were between 4 and 16 years old and boys and girls were equally distributed (Table 2).

Table 2 Baseline characteristics of the children in the different countries.

	GHANA (1) N (%)	GHANA (2) N (%)	GABON N (%)	RWANDA N (%)
Number of children	463	1394	454	2528
Age distribution				
4-8	128 (27.6)	299 (21.4)	197 (43.4)	327 (12.9)*
9-12	275 (59.4)	804 (57.7)	188 (41.4)	1494 (59.1)
13-16	36 (7.8)	282 (20.2)	68 (15.0)	707 (28.0)
17-20	0	9 (0.6)	1 (0.2)	0
unknown	24 (5.2)	0	0	0
Sex				
Girls	201 (43.3)	734 (52.7)	227 (50.0)	1296 (51.3)
Boys	262 (56.6)	660 (47.3)	227 (50.0)	1224 (48.4)
Unknown	0	0	0	8 (0.3)
Characteristics of the schools				
Rural public (low SEL**)	226 (48.8)	753 (54.0)	209 (46.0)	1455 (57.6)
Urban public (low SEL)	125 (27.0)	214 (15.4)	245 (54.0)	1073 (42.4)
Urban private (middle SEL)	0	356 (25.5)	0	0
Urban private (high SEL)	112 (24.2)	71 (5.1)	0	0

*In Rwanda the youngest child was 8 years old.

** SEL: socioeconomic level.

The point-prevalences of eczema based on physical examination by a dermatologist are presented in Table 3 and range between 0.8% in Rwanda to 4.0% in Gabon. The point-prevalences were slightly higher in the urban schools compared to the rural schools with a prevalence reaching 4.5% in the urban private school with high socioeconomic level in the first Ghanaian study (5 out of 7 children with eczema were found in the urban private rich school), but statistical significance was not reached (Table 3). In contrast, in Gabon the point-prevalence of eczema was higher in the rural school (5.7 %) compared to the urban school (2.5 %) (Table3).

Questionnaires were available from 345 (74.9%) children of the first Ghanaian study and 1245 (89.3%) of the second Ghanaian study. The period-prevalences based on these questionnaires are also presented in Table 3. The sensitivity, specificity and the positive and negative predictive values of the diagnoses of eczema based on questionnaires in

Table 3 Point-prevalence of atopic dermatitis based on physical examination by a dermatologist and period-prevalence based on the questionnaires in the different countries.

	GHANA (1) n/N % (95% CI)	GHANA (2) n/N % (95% CI)	GABON n/N % (95% CI)	RWANDA n/N % (95% CI)
Point prevalence based on physical examination	7/463 1.5 (0.4;2.6)	22/1394 1.6 (0.9;2.2)	18/454 4.0 (2.2;5.8)	20/2528 0.8 (0.4;1.1)
Point prevalence stratified according to the schools				
Rural (low SEL*)	2/226 0.9 (0;2.1)	10/753 1.3 (0.5;2.2)	12/209 5.7 (2.6;8.0)	10/1455 0.7 (0.3;1.1)
Urban combined	5/237 2.1 (0.3;3.9)	12/641 1.9 (0.8;2.9)	6/245 2.5 (0.5;4.4)	10/1073 0.9 (0.4;1.5)
Urban (low SEL)	0/125 0 (0;2.3)	2/214 0.9 (0;2.2)	6/245 2.5 (0.5;4.4)	10/1073 0.9 (0.4;1.5)
Urban private (middle SEL)	--	8/356 2.3 (0.7;3.8)	--	--
Urban private (high SEL)	5/112 4.5 (0.6;8.3)	2/71 2.8 (0;6.7)	--	--
Period prevalence based on questionnaire (flexural eczema)	9/345 2.6 (0.9;4.3)	55/1245 4.4 (3.3;5.6)	Not measured	Not measured

*SEL: socioeconomic level; CI: confidence interval.

relation to the diagnoses based on physical examination are presented in Table 4. Table 5 shows examples of population-based point- and period-prevalences in sub-Saharan Africa of recent studies in comparison with the current study.

Table 4 Sensitivity and specificity of the diagnoses of eczema based on questionnaires in relation to the diagnoses based on physical examination (reference standard).

	GHANA (1)		GHANA (2)	
	Eczema by physical examination	No eczema by physical examination	Eczema by physical examination	No eczema by physical examination
Eczema by questionnaire	2	7	2	53
No eczema by questionnaire	4	332	18	1172
Total	6	339	20	1225
Sensitivity	2/6 33 (0; 71.1)		2/20 10 (0;23.2)	
Specificity	332/339 98 (96.4; 99.5)		1172/1225 96 (94.5; 96.8)	
Positive predictive value	2/9 22 (0; 49.4)		2/55 4 (0; 8.6)	
Negative predictive value	332/336 99 (97.7 ; 100)		1172/1190 98 (97.8 ; 99.2)	

Table 5 Population-based point- and period-prevalences among schoolchildren in sub-Saharan Africa.

Country	Year	References	Point-prevalence by physical examination		Period-prevalence by questionnaire	
			n/N	% (95% CI)	n/N	% (95% CI)
Cameroon	2007	ISAAC ¹⁶			15/215	7.2% (3.7;10.7)
Congo	2007	ISAAC ¹⁶			26/164	16.2% (10.421.6)
	2007	ISAAC ¹⁶			35/320	10.9% (7.6;14.4)
Guinea	2007	ISAAC ¹⁶			112/587	18.8% (15.8;22.2)
Ivory Coast	2007	ISAAC ¹⁶			109/607	18.2% (14.9;21.1)
Ethiopia	2005	Haileamlak ¹¹	79/7915	1.8% (1.5;2.1)	348/7915	4.4% (4.0;4.9)
	2007	ISAAC ¹⁶			115/606	19.0% (15.9;22.1)
Ghana	2009	ISAAC ¹²	5/1325	0.4% (0;0.7)	40/1325	3.5% (2.1;3.9)

Table 5 Continued.

Country	Year	References	Point-prevalence by physical examination		Period-prevalence by questionnaire	
			n/N	% (95% CI)	n/N	% (95% CI)
Ghana	2004	This study	7/463	1.5% (0.4;2.6)	9/345	2.6% (0.9;4.3)
	2007	This study	22/1394	1.6% (0.9;2.2)	55/1245	4.4% (3.3;5.6)
Gabon	2007	ISAAC ¹⁶			65/454	14.4% (11.1;17.5)
	2005	This study	18/454	4.0% (2.2;5.8)		
Kenya	2007	ISAAC ¹⁶			81/509	15.5% (12.8;19.2)
	2007	ISAAC ¹⁶			66/449	14.9% (11.4;18.0)
Mozambique	2007	Mavale-Manuel ²²			466/5013	9.3% (8.5;10.1)
Nigeria	2005	Ogunbiyi ²⁶	0/1066	0% (0;0.3)		
	2007	ISAAC ¹⁶			19/241	7.9% (4.3;11.1)
Rwanda	2007	This study	20/2528	0.8% (0.4;1.1)		
South Africa	1995	Zar ¹⁸			611/5178	11.8% (10.9;12.7)
	2002	Zar ¹⁸			9775037	19.4% (18.3;20.5)
	2007	Chalmer ³¹	31/3067	1.0% (0.6;1.4)	55/ 3067	1.8% (1.3 ;2.2)
	2007	ISAAC ¹⁶			58/520	11.2% (8.4;13.9)
	2007	ISAAC ¹⁶			89/670	13.3% (10.7;15.9)
	2007	ISAAC ¹⁶			401/2996	13.4% (12.2;14.6)
Sudan	2007	ISAAC ¹⁶			6/137	4.7% (1.2;8.2)
Togo	2007	ISAAC ¹⁶			36/332	10.7% (7.5;14.2)

Discussion

The prevalence of eczema in the industrialized world has increased rapidly in the last few decades.^{2,13-15} Surveys conducted worldwide revealed period-prevalences between 15% and 30% in different age groups of children. Most of these data were obtained by questionnaire.^{2,13} Generally, high prevalences were found in the developed countries such as Northern Europe, North America, Japan and Australasia and low prevalences in countries such as China, Iran and Ethiopia.^{2,6,11,13,16,17} Although the prevalence rates of eczema in the developing world are much lower, recent studies show a sharp increase due to rapid urbanization, changes in lifestyle and socioeconomic status as well as frequent washing.^{2,13,18-20} In West Africa, the prevalence of eczema has been considered

to be less than 5%,^{21–23} though recent studies in this region as well as other parts of Africa have shown an increase, particularly amongst infants.^{24–26} Most of the latter studies, however, were hospital-based and therefore are less reliable when estimating the prevalence of eczema on a national scale.^{21,23,25,27–29}

The point-prevalences in our study of eczema amongst schoolchildren as measured by physical examination by a dermatologist in Ghana (1.5% and 1.6%), Gabon (4.0%) and Rwanda (0.8%) were comparable with other studies in sub-Saharan Africa (Table 5). It was notable that the point prevalence of eczema was significantly higher in the rural area of Gabon, for which we do not have a clear explanation. The point-prevalences in our study did not differ significantly between rural and urban areas, which is in agreement with a recent overview about differences between point-and period-prevalences of eczema in rural and urban areas in developing countries.¹³ This may be explained by the fact that rural and urban areas in sub-Saharan Africa are much more comparable than in Western countries.

The questionnaire based period-prevalences in Ghana were about twofold higher than the point-prevalences as measured by physical examination, which can be explained by the chronic relapsing character of eczema.^{5–7,12} The sensitivity and the positive predictive values of the questionnaires, however, were low (33% and 22% in the first and 10% and 4% in the second Ghanaian study respectively).

The questionnaire-based period-prevalences in other sub-Saharan African countries were generally more than 10% (Table 5). Flohr et al. recently showed a poor correlation between the ISAAC questionnaires and the presence of permanent flexural eczema in non-English speaking and developing countries, although there was a good correlation between these two measurements amongst Anglophone children.¹² Most probably these discrepancies are caused by factors related to translation of the questionnaires from the English language as well as cultural and educational differences in developing countries.^{12,30–32} It could be queried whether the questionnaire-based period-prevalences in the other sub-Saharan African countries are real or may be an overestimation due to difficulties in the definition of eczema.

The strength of our study is that we included thousands of schoolchildren in three different countries, that all children were seen by a dermatologist or a team of dermatologists and that the definition of rural and urban schools within the countries was the same. A potential limitation of our study is that we only evaluated the period prevalence by questionnaire in Ghana.

Our data indicate that in African countries the use of questionnaires one such as the ISAAC is a less reliable method to identify children with eczema.^{11,12,31} Probably physical examination is a better method to measure the prevalence of eczema amongst children in these countries. It must be realized, however, that physical examination only measures the point-prevalence and may give an underestimation of the real prevalence of a disease that ‘comes and goes’ over time, such as eczema. Therefore, the gold standard

to identify children with eczema remains, physical examination by a dermatologist or team of dermatologists, especially when the aim of the study is to find cases to analyse risk factors for eczema or to do genetic research.^{10–12}

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