

Review article

Epidemiology and management of asthma and atopic dermatitis in Sub-Saharan Africa

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Sub-Saharan Africa (SSA) is currently undergoing a transformation process of unprecedented magnitude owing to economic development and urbanization. This process is paralleled by a dramatic increase in prevalence and incidence of noncommunicable diseases. In this article we analyze the current situation with regard to 1 group of the earliest noncommunicable diseases in a person's life, namely, allergies and asthma. This article provides an update on the epidemiology, availability, and access to management strategies by patients experiencing bronchial asthma or atopic dermatitis in SSA. Despite all of the progress, there is still a tremendous need to support education and training, transfer of resources, and cooperation with pharmaceutical and diagnostic companies to achieve adequate treatment and sustainability in SSA with regard to allergy, asthma, and eczema management. (*J Allergy Clin Immunol* 2021;■■■:■■■-■■■.)

Key words: *Bronchial asthma, atopic dermatitis, Sub-Saharan Africa, epidemiology, treatment*

Abbreviations used

AD: Atopic dermatitis
 FENO: Fractional exhaled nitric oxide
 GINA: Global Initiative for Asthma
 ICS: Inhaled corticosteroid
 ISAAC: International Study on Asthma and Allergy in Childhood
 LABA: Long-acting β -agonist
 NCD: Noncommunicable disease
 SABA: Short-acting β -agonist
 SSA: Sub-Saharan Africa

Sub-Saharan Africa (SSA) is in the spotlight of a transition and transformation process of unprecedented magnitude. This includes economic development and growth together with industrialization and urbanization. Furthermore, the availability and distribution of the Internet provides a new level of access to information and knowledge. Looking at health care indicators, improvements have been achieved over the past 2 decades, yet major shortcomings are evident. They include life expectancy; mortality rate among those younger than 5 years; prevalence of underweight; and prevalence of infectious diseases, including HIV, malaria, and tuberculosis. Together, these are in parallel with a prominent increase in noncommunicable diseases (NCDs).¹⁻⁵ Among the earliest NCDs in a person's life are allergies and asthma. Therefore, it is not surprising that these diseases demonstrate a large increase that parallels the aforementioned transition and transformation process. Here, we analyze the current situation by focusing on atopic dermatitis (AD) and bronchial asthma to provide an update on the current situation in SSA.

EPIDEMIOLOGY OF ASTHMA AND ALLERGY IN SSA

Although allergies are less common in low-income countries, their prevalence appears to be increasing.⁶ A systematic analysis showed that asthma cases in Africa rose from 74 million in 1990 to 120 million in 2010.⁷ More than 30 million people in Africa have allergic rhinitis, and a large proportion suffer from asthma as well.⁸ Data suggest that asthma prevalence among African children is as high as the global average and is increasing.⁹ Importantly, more than 80% of the asthma deaths occur in low-income countries such as Uganda, usually as a result of inappropriate treatment.¹⁰ Interestingly, in a report from 2003, wheezing was more prevalent in urban versus rural children (aged 1-4 years) and less prevalent in those infected with

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Ascaris.¹¹ The latter was thus associated with protection against wheeze in young Ethiopian children but not via attenuation of allergen sensitization.¹¹ The same group reported that intestinal parasite infection was not associated with AD in a similar rural pediatric population in Ethiopia.¹² Furthermore, a number of studies have reported a direct association between frequent acetaminophen or paracetamol use early in life and new-onset wheeze, asthma, and allergy in Ethiopia.¹³⁻¹⁶ In Kenya, urban children showed a strong correlation between asthma and atopy; however, the same correlation was not found in rural children, who did not test positive for allergens by means of skin prick testing.¹⁷ The phase I International Study on Asthma and Allergy in Childhood (ISAAC) reported a prevalence of asthma symptoms between 7.5% and 17% in urban and periurban areas of Cape Town, South Africa.¹⁸ ISAAC III reported a prevalence of 18% to 20% for allergic rhinoconjunctivitis, asthma, and eczema among children aged 13 to 14 years in South Africa.¹⁹ Malan et al²⁰ similarly reported a prevalence of 27% for parent-reported allergy symptoms among rural iron-deficient children aged 6 to 11 years. The rates of symptom-defined asthma prevalence in a study by Mentz et al²¹ were 32% with “any” asthma and 12% with persistent asthma. A national survey in Uganda showed an asthma prevalence of 11.02% among individuals older than 12 years, the majority of whom were undiagnosed and untreated.²² Furthermore, the Uganda Registry for Asthma and Chronic Obstructive Pulmonary Disease reported that 60.3% of Ugandans with asthma experienced more than 3 attacks per year, and it found an all-cause mortality of 27.3 per 1000 person years in a cohort of 449 individuals with asthma.²³ A cross-sectional population-based study in Ethiopia revealed a 27.7% asthma prevalence²⁴ (Fig 1). Nevertheless, this particular study was based on the use of self-report, which may introduce recall and other types of bias.

With migration and increased mobility from traditional rural to urban settings, there are significant changes in socioeconomic lifestyles, including house conditions, dietary habits, social activities and living, family size, and work environment. It is known from other NCDs that this abrupt and dramatic change is accompanied by changes and modifications in the immunometabolic program of these individuals. Although data in this regard are not yet available from the field of allergy and asthma, it can be hypothesized that such changes in the immunometabolic program may also have an impact on the development, severity, and immunophenotype of allergic diseases. However, further intensive, and especially prospective, studies are needed in this field.

A high proportion of African children with asthma have poorly controlled disease.²⁵ With regard to disease control, 2 studies among adults in Uganda and South West Ethiopia have shown poor asthma control levels, with 0% and 3.8% of participants having well-controlled asthma according to the Global Initiative for Asthma (GINA) criteria.²⁶ Monene et al²⁷ reported that according to the GINA criteria, asthma was well controlled in 44.9% of enrolled children. Comparison of findings across African countries is challenging because of methodologic inconsistency in terms of definitions and assessment of asthma and associated severity. In a hospital-based study in Ghana, the prevalence of allergic rhinoconjunctivitis was 9.1%.²⁸ Other community-based studies showed a higher prevalence (17.3% or 39.9%).²⁹

MANAGEMENT OF ASTHMA IN SSA

The diagnosis of asthma is based on clinical presentation of respiratory symptoms such as wheeze, shortness of breath (dyspnea), chest tightness, and/or cough.³⁰ However, the symptoms are nonspecific, and confirmatory tests are essential. It is recommended that testing using peak flow meters or spirometry be included to confirm variability in expiratory airflow limitation.³¹ In addition to spirometry, in developed countries the use of fractional exhaled nitric oxide (FENO) in both diagnosis and monitoring is reported in local studies.³²

In SSA, the practice varies from country to country, with much of it depending on the economy of the country. For example, the South African asthma guideline for the management of asthma recommends the use of spirometry and FENO for adults and children older than 5 years.³³ Similarly, the Nigerian guideline also recommends spirometry for airflow limitation and reversibility for patients older than 5 years.³⁴ Despite this recommendation, the tests are available only in specialized hospitals and for research purposes. In contrast, in countries such as Tanzania the diagnosis is based on history and clinical findings, and the situation is worse in Zimbabwe, where there is no guide on how to diagnose asthma³⁵ (Fig 1). In Senegal, nearly 1 in 10 children had symptoms suggestive of asthma; however, few children had a diagnosis of asthma or used appropriate therapies.³⁶ In Nigeria, despite the fact that 24.4% of those studied had possible asthma, only 2.2% had asthma that had actually been diagnosed.³⁶ Similar findings were obtained from Uganda, with misdiagnosis leading to asthma exacerbations, poor control, and mortality.^{23,37}

The poor practice is linked to several factors, such as poor knowledge of asthma among health care providers and availability of diagnostic tests and medication.³⁸⁻⁴⁰ Medicines and diagnostic tests essential in asthma care are not widely available in most of SSA and remain largely unaffordable. For example, the rates of availability of inhaled short-acting β -agonists (SABAs), oral leukotriene receptor antagonists, inhaled long-acting β -agonist (LABA)-inhaled corticosteroid (ICS) combinations and ICSs alone in health facilities were 75%, 60.8%, 46.9%, and 45.4%, respectively.³⁷ None of the facilities had inhaled long-acting antimuscarinic agents or inhaled LABA-long-acting antimuscarinic agent combinations. Also, spirometry and measurement of peak flow as diagnostic tests were available in 24.4% and 6.7% of the study sites, respectively.^{37,41} With regard to knowledge, providers had poor knowledge about the use of metered dose inhalers and spacer devices. Only 37.3% had ever used a peak flow meter, with only 14.3% using a peak flow meter frequently and 26.7% checking patients' inhaler technique often.⁴²

As for the diagnosis, treatment of asthma varies across the region. The 2021 GINA report Global Strategy for Asthma Management and Prevention focuses on treatment of modifiable risk factors, asthma medications, and education and skills training. Urbanization is also associated with increased asthma prevalence, probably on account of multiple lifestyle factors. Smoking, open fire heating, and physical exercise are highly associated with asthma in SSA.^{22,31} Exposure to a range of environmental allergens and irritants is also thought to increase the risk of asthma, including indoor and outdoor air pollution, house dust mites, molds, and occupational exposure to chemicals, fumes, or dust.³¹ Dietary interventions such as increased fruit, vegetable, and whole-grain intake are known to improve asthma

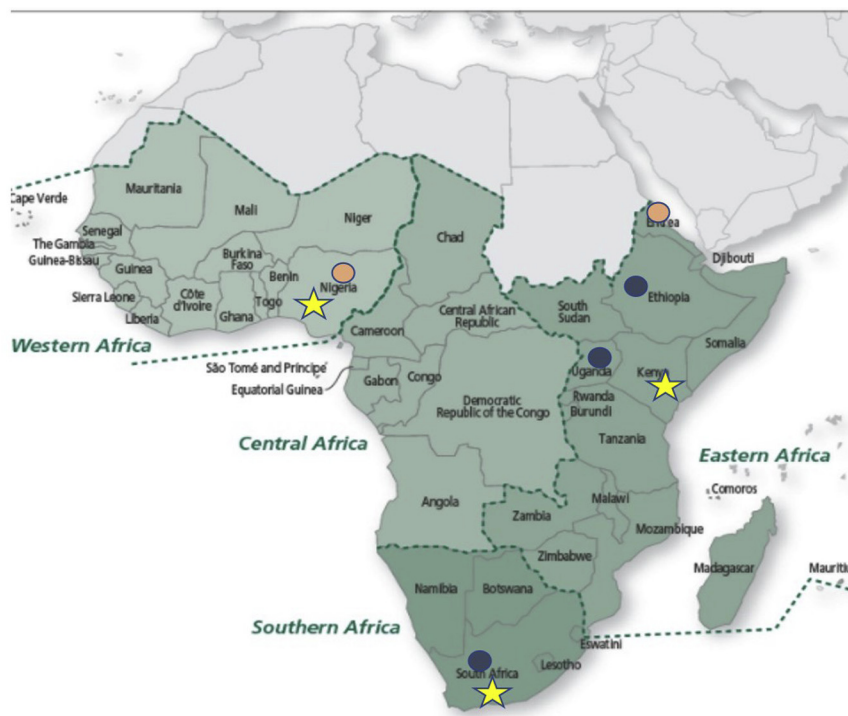


FIG 1. Prevalence of asthma and availability of treatment guidelines. This figure indicates the limited availability of epidemiologic data in SSA together with only a small number of countries developing or adapting treatment guidelines. Dark blue dots indicate countries with reported prevalence higher than 10%. Yellow asterisk indicates a country with its own asthma guideline.

outcomes. Further, regular physical activities and weight loss in obese patients with asthma are known to reduce disease severity.⁴³ Most guidelines in SSA have adopted the GINA guideline on asthma management, thus advocating lifestyle changes in asthma control. As evidenced within this review, the few available guidelines from countries in SSA also recommend lifestyle changes in asthma management. Several other guidelines recommend environmental control, especially avoidance of allergens and air pollutions. Indoor smoking and unclean cooking fuel are discouraged, especially when there is a clear association with asthma symptoms.³³ The Kenyan guideline⁴⁴ for asthma management advocates control of indoor and outdoor triggers, which is similar to the recommendation in the South African asthma management guideline.⁴⁵ Even in countries with no asthma management guidelines, lifestyle modifications and environmental controls for asthma are mentioned in the country disease management guidelines. GINA recommends ICSs, LABAs, as-needed ICS-formoterol, and SABAs.⁴⁶ For safety, GINA no longer recommends treatment of asthma in adolescents and adults with a SABA alone. Instead, to reduce their risk of serious exacerbations, it is recommended that all adults and adolescents with asthma receive either symptom-driven (in mild asthma) or daily ICS-containing treatment.⁴⁷ The Nigerian guideline adapted the GINA-recommended approach of assessment, adjustment, and review with rapid-acting inhaled β_2 -agonists (salbutamol, fenoterol, and terbutaline), systematic glucocorticosteroids (prednisone and prednisolone), anticholinergics (ipratropium bromide), short-acting β_2 -agonists (salbutamol), and theophylline (aminophylline).³⁴ In addition to the relievers, inhaled glucocorticosteroids (beclomethasone, budesonide,

fluticasone, and ciclesonide), leukotriene modifiers (montelukast and zafirlukast), cromones (sodium cromoglycate), a long-acting inhaled anticholinergic (tiotropium), and anti-IgE therapy (omalizumab) are recommended as asthma controllers.³⁴ The same approaches and medications are used in South Africa,⁴⁸ Uganda,³⁷ and Ethiopia.⁴⁹ Although physicians appear to have good knowledge,^{41,42,50} there are areas of gap in the quality of asthma care with regard to the standard guideline.

EPIDEMIOLOGY OF AD IN SSA

AD is one of the most prevalent chronic inflammatory skin diseases globally, affecting up to 20% of children and 10% of adults in high-income countries.⁵¹ As shown in the ISAAC studies⁵² and other surveys from Africa and the Middle East,⁵³ the prevalence of AD is quite similar in SSA, which is in contrast to other atopic diseases. In ISAAC III, a prevalence of 18% to 20% for eczema among children in South Africa is reported.¹⁹ These data have to be interpreted with some caution, as the diagnosis of eczema was based mainly on a questionnaire focusing on “itchy rash,” which could also have other causes. However, other studies also showed AD being the most common skin disease in children, with a prevalence of 15.6 % in Nigeria also.⁵⁴ In addition, a survey performed by the International Society for Atopic Dermatitis in 2019 among 90 dermatologists from 23 countries of SSA did point to AD as one of the most common skin disorders seen in this region.⁵⁵ Two recent studies in South Africa showed that AD is still less common in rural settings than in urban settings.⁵⁶

However, there are still rather few studies focusing on AD in SSA; this might also be due to the fact that dermatologists are

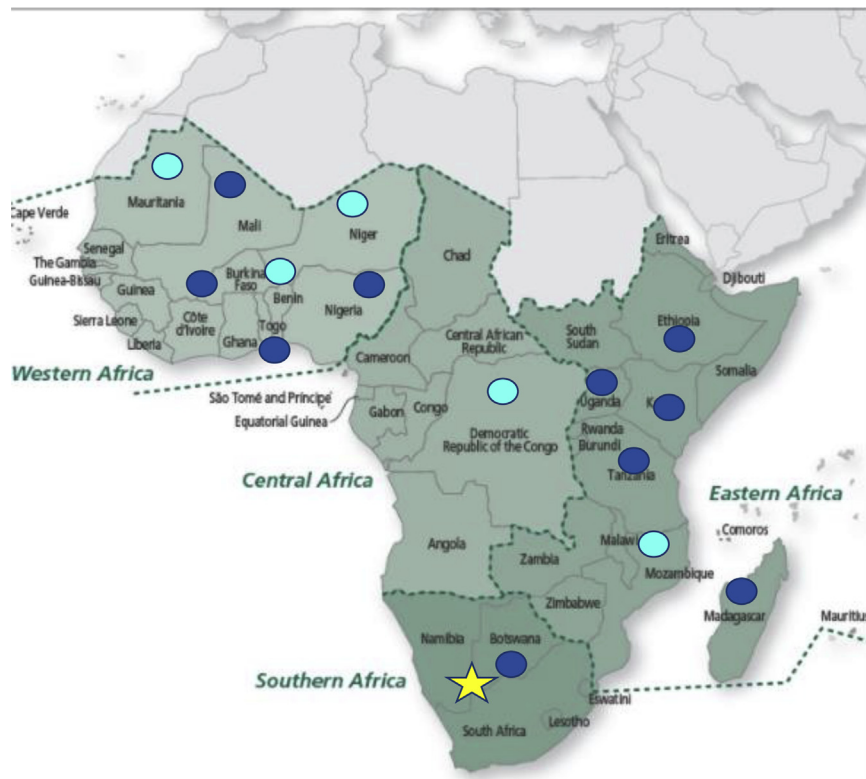


FIG 2. Prevalence of AD and availability of treatment guidelines. This figure indicates the limited availability of epidemiologic data in SSA together with only a small number of countries developing or adapting treatment guidelines. Light blue dots indicate countries with a reported prevalence of 5% to 10%. Dark blue dots indicate countries with a reported prevalence higher than 10%. Yellow asterisk indicates a country with its own AD guideline.

very rare in SSA. In some countries, 1 dermatologist has to serve more than 2.5 million persons on average⁵⁵; in addition, specialists are often concentrated around the capitals, so an enormous lack of professional skin care, especially outside the major cities, exists in most of SSA (Fig 2). Historically, the prevalence of AD in SSA has been lower than in Europe and North America, but recent time trends show an increasing AD prevalence in the SSA region also.⁵³ The ISAAC study also noted an increase in the prevalence between 1996 and 2015 in adolescents in most countries in SSA (eg, Ethiopia, Kenya, South Africa) but a decrease in prevalence in Nigeria over the same period.^{52,57} Urbanization in Africa has also been connected with an increase in the prevalence of AD (eg, in South Africa).⁶ A published study from a dermatology clinic in Ghana reported an 8.4% prevalence of the diagnosis of AD among adults, and 31.7%, 30.0%, and 14.9% among infants, children, and adolescents, respectively.⁵⁸ Previous dermatologists' studies from Ghana reported a prevalence of AD of approximately 15% to 30%.⁵⁹

Clinical features are only partly compatible with the commonly used diagnostic criteria of AD in White or Asian ethnic populations⁶⁰; the most common features are flexural dermatitis, palmar hyperlinearity, pityriasis alba, and papular lesions. Disturbed barrier is an important pathogenic cause of AD in SSA also (Fig 3). Decreased levels of filaggrin breakdown products are more common in South African patients with AD⁶¹; in the Ethiopian population, tight junction genes (in particular, claudin 1) rather than variants in filaggrin may be involved in susceptibility to AD.⁶²

With regard to cytokine imbalance and the microbiome, investigations have been started only recently. A study in South African children demonstrated differences in gut microbiome composition between rural children with AD and their healthy counterparts.⁵⁶ In addition, differences in immunologic signatures and sensitization patterns were recently reported,⁶³ and an immune and barrier characterization of AD skin phenotype in Tanzanian patients was presented, pointing toward an IL-17–dominated immune pattern.⁶⁴ In this study, it was also shown that the skin phenotype of Tanzanian patients with AD is consistent with that of African Americans. These data highlight the unique characteristics of AD in Black individuals, also showing the need to develop unique treatments targeting patients with AD in underrepresented populations.

Data regarding sensitizations in patients with AD are also rare, but they show distinct patterns in the populations of SSA, with a predominance of cockroaches and house dust mites as inhalant allergens and grass pollen⁶⁵ and primarily sensitizations to *Dermatophagoides pteronyssinus* 7 and *Dermatophagoides pteronyssinus* 23 being the major sensitizers.⁶⁶ Sensitization to skin-colonizing yeasts of the genus *Malassezia*, on the other hand, seems to be very rare, as observed in Tanzanian patients with AD.⁶³ Although the hygiene hypothesis is only partially applicable to AD (especially in African countries^{67,68}), urbanization seems to play an important role, influencing immunologic signatures⁵⁶ and house dust composition.⁶⁹ Also, the prevalence of a fiber-rich diet seems much higher in children in South Africa; however, its effect on AD is still partly unclear.⁷⁰



Prevalence:	High, between 8 – 15 % Underdiagnosed in patient care research
Genetics:	No loss of function mutations for <i>filaggrin</i> , <i>claudin-1</i> mutations have greater association
Immunology:	relatively high serum levels of proinflammatory Th1/TH17 cytokines/chemokines
Sensitizations:	Mites (Der p 7; Der p 23) Tropomyosin-containing sources Lacking sensitization to <i>Malassezia</i>
Possible causes:	Urbanization Changes in gut microbiome in relation to high sugar intake
Treatment:	Except South Africa, no national guidelines often limited access to emollients and topic steroids very limited access to systemic treatments except systemic corticosteroids

FIG 3. AD in SSA: some aspects.

TREATMENT STRATEGIES—LIMITED ACCESS TO ESSENTIAL MEDICINES, INCLUDING EMOLLIENTS

Gaining access to specialists in dermatology is difficult in nearly all countries, with an average of 1 dermatologist for 1 to 2 million inhabitants.⁵⁵ Telemedicine could be particularly helpful in the context of SSA, as has been shown (eg, in Mali).⁷¹

The use of emollients is an important first-line, basic, and crucial step in long-term AD control; however, in the setting of SSA, their use is variable. Although access to essential drugs is assured in some areas, in other areas gaining such access is difficult or impossible, especially if imported products from branded cosmetic houses are used. In addition, AD care is hampered by the absence of coverage by health insurance in some countries. A possible solution is local emollient production. In contrast, topical corticosteroid supplies have been reported as being variably available. For severe cases, systemic corticosteroids are used sparsely for short periods of time. Methotrexate is available, but in some countries the supply is sufficient only enough for rheumatology. Cyclosporin is available in some countries, but it is rarely used. Newer drugs to manage AD, such as biologics and small molecules, are currently out of reach of most public medical systems in SSA, and they are variably available to private medical systems. As many of the drug trials evaluating the efficacy and safety of new drugs for AD treatments are not being undertaken in SSA, drug pharmacokinetics in these ethnicities and adverse effects in different skin physiologies are areas yet to be explored.⁷² Guidelines for AD are almost totally lacking in SSA (Table 1⁷³ and Fig 2); in a very recent survey among African dermatologists from 24 countries, only South Africa has its own guidelines; many others countries are referring mostly to the guidelines of the European Task Force on AD⁷⁴ but also to those of the French Society of Dermatology⁷⁵ or the American Academy of Dermatology.⁷⁶ Locally established practical algorithms for the management of mild-to-moderate disease of AD in daily clinical practice will contribute to an improvement of care for patients with AD in this region.⁷⁷

Considering the fact that AD is also one of the most common diseases in SSA, there are still huge gaps in all aspects, such as epidemiology and pathophysiology, and even more so, in the therapeutic options in these regions. Thus, activities, such as those offered by the International Society for AD with meeting and research grants dedicated to AD in SSA (www.isadsociety.org), the World Health Organization in recognition of the importance of AD as an NCD in SSA, and also the International League of

Dermatological Societies⁷⁸ (www.ilds.org), paired with local initiatives by the African Society Dermatology (www.asdvfrica.org) or South African dermatologists and allergists, are of the utmost importance to improving care for patients in SSA who have AD.

CONCLUSION

The prevalence of eczema and asthma in SSA is increasing sharply. Although a mechanistic understanding of this epidemiologic situation is still lacking, some data indicate that urbanization and industrialization, together with changes in lifestyle, dietary habits, and social activities, are closely linked to this phenomenon. This increase in prevalence might be also linked with increased allergen exposure. However, mechanistic studies are urgently needed to understand the cellular and molecular mechanisms in more detail. In particular, this applies to the question of the underlying endotype of the disease in this region of the world. A further open question is the association with parasitic infections. Whether prevention of parasitic diseases is associated with allergy and asthma prevention or, conversely, increases the risk for development of allergic conditions, remains to be elucidated. However, this question is beyond the scope of this article.

A further obstacle is the limited access to medication for AD and asthma. In particular, this applies to the availability of level 1 and level 2 guideline-based therapies such as local and topical corticosteroids, short- and long-lasting β_2 -agonists, and others. This goes hand in hand with the lack of available diagnostic tests, including *in vitro* and *in vivo* allergy testing, lung function measurement, the performance of provocation (in the field of food allergy), and the measurement of FENO. Guidelines need to be adopted to the needs of the various regions of SSA. So far, AD guidelines have been developed only in South Africa, whereas asthma guidelines are already spread among several countries. Of note, local guidelines exist in only 3 of 25 countries (12%).

Awareness of allergy and asthma among physicians and nonphysicians in the medical community needs to be increased. Allergy education and training needs to start in medical schools and clinical centers, and it should reach out to the local community-based health care providers. As long as patients have limited access to health care, poor patients need to pay for health care themselves on account of the lack of health insurance, and diagnostic and therapeutic options are of limited availability,

TABLE I. SSA countries with asthma and AD treatment guidelines

Country	Asthma				Atopic dermatitis			
	Country treatment guideline	Names of the guideline	Last updated	Alternative treatment guideline	Country treatment guideline	Names of the guideline	Last updated	Alternative treatment guideline
Benin	No		NA	International Union Against Tuberculosis and Lung Disease; 2008. Management of Asthma: A Guide to the Essentials of Good Clinical Practice WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No		NA	European Task Force Atopic Dermatitis
Burkina Faso	No		NA	Global Strategy for Asthma Management and Prevention. Revised 2019	No		NA	Société française de dermatologie
Cameroon	No		NA	Global Strategy for Asthma Management and Prevention. Revised 2014	No		NA	No info
Democratic Republic of the Congo	No		NA	WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No		NA	None
Ethiopia	No	NA	NA	WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No		NA	British and US American Guidelines
Gambia	No		NA	No info	No		NA	No info
Ghana	No		NA	WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No		NA	No info
Ivory Coast	No		NA	No info	No		NA	European Task Force Atopic Dermatitis
Kenya	Yes	Guidelines for Asthma Management in Kenya	2011	WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No		NA	South African AD guidelines, European Task Force Atopic Dermatitis
Madagascar	No		NA	No info	No		NA	Société française de dermatologie, AAD
Mali	No		NA	WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No		NA	Société française de dermatologie European Task Force Atopic Dermatitis
Mauretania	No		NA	No info	No		NA	European Task Force Atopic Dermatitis
Mocambique	No		NA	No info	No		NA	European Task Force Atopic Dermatitis
Namibia	No		NA	No	No		NA	No info
Niger	No		NA	No info	No		NA	
Nigeria	Yes	Guideline for asthma management in Nigeria 2017	2017	No	No		NA	European Task Force Atopic Dermatitis, AAD

(Continued)

TABLE I. (Continued)

Country	Asthma				Atopic dermatitis			
	Country treatment guideline	Names of the guideline	Last updated	Alternative treatment guideline	Country treatment guideline	Names of the guideline	Last updated	Alternative treatment guideline
Rwanda	No	NA	NA	No, but there is a national guideline for management of noncommunicable diseases 2016	No	NA	NA	No info
Senegal	No		NA	Global Strategy for Asthma Management and Prevention. Revised 2014	No		NA	Société française de dermatologie
South Africa	Yes	The diagnosis of asthma in children: An evidence-based approach to a common clinical dilemma	2018	No	Yes	Sinclair W et al, ⁷³ Dermatologic Society of South Africa, Allergy Foundation of South Africa	2020	
Sudan	No	NA	NA	WHO Prevention and Control of Noncommunicable Diseases: Guidelines for Primary Health Care in Low-Resource Settings	No	NA	NA	No info
Tanzania	No	NA	NA	Standard Treatment Guideline and National Essential Medicines List Tanzania Mainland	No	NA	NA	European Task Force Atopic Dermatitis, AAD
Togo	No		NA	No info	No		NA	European Task Force Atopic Dermatitis
Uganda	No	NA	NA	Global Strategy for Asthma Management and Prevention. Revised 2014	No	NA	NA	European Task Force Atopic Dermatitis, AAD
Zambia	No	NA	NA	2020 GINA Report, Global Strategy for Asthma Management and Prevention	No	NA	NA	No info
Zimbabwe	No	NA	NA	No	No	NA	NA	No info

AAD, American Academy of Dermatology; *Info*, information; NA, not applicable.

the situation in SSA regarding this field of emerging medicine will deteriorate dramatically.

Therefore, it is the responsibility of the medical community in the Northern Hemisphere in particular to support development and improvement in SSA. This includes education and training, transfer of resources, and cooperation with pharmaceutical and diagnostic companies around the world.

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