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Eosinophilic Asthma According to Blood Eosinophil Count in Nigerian Adults with Asthma: A Single Center Cross-Sectional Study

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ABSTRACT

Objective: Eosinophilic asthma is increasingly being studied; however, its prevalence is largely unknown in sub-Saharan Africa. We aimed to determine the prevalence of eosinophilic asthma, defined in this study as a blood eosinophil count (BEC) of ≥ 300 cells/μL, among adults with asthma and its associated characteristics in a tertiary center in Nigeria.

Materials and Methods: A prospective cross-sectional study was conducted in a tertiary center on 77 consecutive adult patients aged ≥ 18 years with physician-diagnosed asthma (30% were males; the median (25th and 75th percentile) age and the duration of symptoms were 44 (29-59) years and 15 (8-29) years, respectively). Atopic status and lung function were assessed by the skin prick test and spirometry, respectively. Blood samples were collected for BEC, total Immunoglobulin E (IgE), and Interleukin 13 assays. Logistic regression was used to determine factors associated with BEC ≥ 300 cells/μL.

Results: Of the 77 asthma patients, 24 (31%; 95% Confidence Interval (CI); 21%–43%) had a BEC ≥ 300 cells/μL. Nineteen (25%; 95% CI 16%-36%) had both BEC ≥ 300 cells/μL and atopy overlap. Participants who had BEC of ≥300 cells/μL were more often male, had associated allergic rhinitis, and higher total IgE concentration. After adjusting for relevant cofactors, male sex and total IgE were associated with BEC of ≥300 cells/μL and atopy overlap with adjusted odds ratios of 2.27 (1.03-5.04) and 1.79 (1.14-2.81), respectively.

Conclusion: Eosinophilic asthma using BEC as a biomarker is moderately prevalent in Nigerian adult asthmatics with some characteristic clinical profiles. Adult asthmatics with these characteristics would need further evaluation and may also benefit from screening for other allergic diseases, in particular allergic rhinitis.

Keywords: Eosinophilic asthma, Blood eosinophil count, Atopy, Nigeria

INTRODUCTION

Asthma is a common, chronic, and complex inflammatory disease of the airways (1,2). Its complex heterogeneous nature has overlapping symptomatology, clinical presentation, and varied etiologies, resulting in classification into subtypes (3). The importance of identifying these subtypes, either phenotypically or endotypically, is gaining increasing recognition in this era of personalized and precision medicine. The subtypes can be identified based on clinical, functional, or inflammatory parameters.

Among inflammatory phenotypes, eosinophilic asthma (EA) is the most commonly understood and widely

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studied. EA refers to the clinical inflammatory phenotype of asthma, wherein a significant number of sputum, airway, and/or blood eosinophils are present, and it is a current biomarker for the type 2-high asthma molecular phenotype (4). Although the gold standard for diagnosis of eosinophilic asthma is usually the analysis of induced sputum, the blood eosinophil count (BEC) is a readily available and relatively reliable surrogate for eosinophilic airway inflammation.

Approximately one-third to half of asthmatic patients can be classified as having eosinophilic asthma, with associated increased asthma severity, exacerbation frequency, and symptoms burden (5,6). Greater recognition of the inflammatory eosinophilic phenotype is not only the starting point of precision medicine in asthma but also has important implications for the prognostication of exacerbation risk and the management of the disease to improve patient outcomes, including decreasing the administration of unnecessary treatments and identifying patients who may benefit most from specific medications (4).

Numerous studies have reported asthma subtypes and classifications in high-income countries. However, this has not been the focus of research in low- and lower-middle-income countries (LMICs), where most asthma-related deaths occur without easy access to quality-assured drugs and almost nonexistent access to biologics, and its antecedent burden on patients, families, society, and health care systems (2,7). Because of systematic differences in genetic, environmental, and lifestyle characteristics, it is difficult to generalize asthma classification findings from high-income countries to sub-Saharan Africa, which houses 89% of low-income countries globally (8). Moreover, asthma is said to be the most racially and ethnically disparate of all health conditions (9).

Relatively few studies have classified asthma in sub-Saharan Africa according to blood eosinophil count (BEC) or other biomarkers (10-12). For example, Nigeria, the largest black nation, is reported to have 6.4% of its population with clinical asthma, yet there have been no documented attempts to characterize asthma according to BEC or other inflammatory phenotypes (13). Evidence-based patient stratification is needed to address this gap; therefore, this study aimed to determine the prevalence of eosinophilic asthma using blood eosinophil count as a biomarker, its overlap with atopy, and its associated characteristics in Nigerian adult asthmatics at a single tertiary center.

MATERIALS and METHODS

Study Design and Patients

In the respiratory clinic of a tertiary health institution, we conducted a cross-sectional study and subsequently analyzed the data of 77 consecutive adult patients with asthma. They were stable asthmatics who did not require hospital admissions or emergency room visits and had not used oral systemic steroids during the previous month. We included those who were 18 years of age and older. Exclusion criteria included patients with any other concomitant diagnoses such as chronic obstructive pulmonary disease, bronchiectasis, lung cancer, autoimmune diseases, and pregnant women.

We obtained ethical clearance from the Ethical Committee of the institution. Written informed consent was obtained from all participants before the study procedure, which was conducted according to the Declaration of Helsinki and Good Clinical Practice guidelines. All participants completed questionnaires that included sociodemographic variables and clinical variables such as history of symptoms, duration of symptoms, and history of current drug therapy. We determined asthma control and asthma-related quality of life with the Asthma Control Test (ACT) and the Asthma Quality of Life Questionnaire (AQLQ), respectively.

Blood Eosinophil Count (BEC), Total Immunoglobulin E (IgE), and Interleukin (IL)13 Assay

Four ml of blood was obtained in a vacutainer EDTA tube for BEC and was immediately sent to the hematology laboratory with an effective quality control process. The blood serum was also obtained and stored at -80˚C for subsequent assays of total IgE and IL 13.

For the blood eosinophil count, the blood sample was diluted in the WBC pipette at a 1:20 dilution with Dunger's solution and mixed well for 30 seconds. The Neubauer counting chamber was loaded immediately, and the loaded counting chamber was allowed to stand for at least 3 minutes to permit lysis, staining, and settling of the cells. The eosinophils were counted through a 45-x microscope, and the absolute eosinophil was calculated according to the counting chamber manufacturer's instructions. All the blood eosinophil counts were performed by a dedicated laboratory technologist with over 15 years of experience.

The concentrations of total IgE and IL13 were determined using commercially available enzyme-linked immune sorbent assay (ELISA) kits from Immune-Biological Laboratory (Minneapolis, MN, USA) and Aviscera Bioscience (Santa Clara, CA, USA), respectively, based on the instructions of the manufacturer's instructions. The assay system is a solid-phase sandwich assay method based on a streptavidin-biotin principle. All samples were run in duplicate. The optical density of the wells was read at 450 nm using a DNM-9602 microplate reader (Beijing Perlong New Technology Co. Ltd., China).

Atopic Status

In accordance with the European Academy of Allergy and Clinical Immunology guidelines, atopic status was determined by skin prick testing (SPT) (14). We used the percutaneous multi-test method (Multi-Test II Device, Lincoln Diagnostics, Decatur, IL, USA). The standardized extracts are: house dust mite mix (Dermatogoides pteronyssinus / farinae), cockroach (Periplanata americana and Blattella germanica), mold mix (Alternaria alternata, Aureobasidium sorokiniana, Aspergillus niger, Cladosporium sphaerospermum, Drechslera pullulans, and Penicillium notatum), mixed feather (chicken, duck, and goose), dog epithelium (Canis familiaris), and grass mix (Timothy, Orchard, June, Redtop, Meadow Fescue, Perennial Rye, and Sweet Vernal). Histamine was used as the positive control, and glycerinated-saline was used as the negative control. All extracts are from ALK ABELLO, Port Washington, New York, USA. A wheal dimension of at least 3mm greater than the negative control was considered to be a positive reaction. Atopy was defined as a positive skin test reaction to at least one of the applied allergens.

Spirometry

Spirometry measurements were performed prebronchodilator using a desktop spirometer (Spirolab III MIR Roma, Italy), according to the European Respiratory Society (ERS) and American Thoracic Society (ATS) protocols (15). The following measurements were documented: forced vital capacity (FVC) , forced expiratory volume in 1 second ($FEV_{1)}$, FEV_1/FVC, force expiratory flow between 25% and 75% of FVC (FEF_{25-75}), and peak expiratory flow (PEF).

Sample Size and Statistical Analyses

Our primary endpoint was to describe the prevalence of eosinophilic asthma; therefore, we enrolled all subjects who fulfilled the inclusion criteria for a period of one year without formal sample size calculation based on any statistical assumptions. However, our sample of 77 patients would have provided a confidence width of 34% to 58% using an estimated prevalence of 45%, according to Kirenga et al. (10).

We summarized enrolled patients' demographic and clinical characteristics with descriptive statistics for the total population and according to BEC. Continuous variables were reported as the means and standard deviation if normally distributed, and if otherwise, as medians with 25th and 75th percentiles. Normality was tested with the Shapiro-Wilk test, while categorical variables were presented as frequencies and percentages. The distribution of total IgE was highly skewed, therefore, we log-transformed the values of total IgE.

For comparison of the participants' demographic and clinical characteristics stratified by eosinophil count, we used the Mann-Whitney U test or independent t test and the Chi-square or Fisher exact test as appropriate. To determine factors independently associated with high BEC (dependent variable), multivariate models with binomial logistic regression were used. Risk factors associated with high BEC in the univariate analysis ($P<0.2$) and parameters known to be associated with high BEC in the literature, such as age were included in the multivariate analysis (16). The strength of the association between variables was estimated by the odds ratio (OR). Missing data were assumed to occur completely at random and were excluded from the final analyses. The data were processed with IBM SPSS Statistics for Windows, Version 25.0 (Released 2017; IBM Corp., Armonk, New York, United States).

Some Definitions

Patients with asthma: patients with characteristic respiratory symptoms and signs consistent with asthma and a documented reversibility of FEV1 of >12% and at least 200 ml in spirometry with the use of 400 mcg salbutamol (2).

Eosinophilic asthma: patient with BEC of ≥ 300 eosinophils per μL (17-19).

High blood eosinophilia: BEC≥ 300 cells/μL

Atopy: positive Skin prick test to any aero-allergens

RESULTS

Eighty-eight adult asthmatic patients were seen over the study period; however, eleven patients were excluded from the final analysis due to the incompleteness of clinical data or non-performance of the skin prick test, or spirometry, or BEC. The final 77 participants had a median age (25th and 75th percentile) of 44 (29–59) years, and the median duration of symptoms was 15 (8-29) years. Twenty-three (30%) were male, 94% had never smoked, and none were current smokers. Almost half of them (48%) were not on regular inhaled corticosteroids. The median pre- bronchodilator FEV_1 percentage predicted, the median ACT score, and the median AQLQ score of all the participants were 76.0 (53.0-93.5), 18.0 (13.0-22.0), and 4.7 (3.7-5.8), respectively. Other socio-demographic characteristics of the total participants and according to BEC are shown in Table I.

Overall, 24 out of the 77 asthma patients had a blood eosinophil count ≥ 300 cells/μL (31%; 95% CI: 21%–43%), while 52 were classified as atopic by the skin prick test (68%; 95% CI: 56%-78%). According to recent literature, and commonly accepted phenotype overlap, we also classified the participants based on blood eosinophil count and atopy into four mutually exclusive phenotypes: high eosinophilia and atopy overlap; neither high eosinophilia nor atopy; atopy only; and high eosinophilia only (20). Nineteen patients (10 males and 9 females) {25%; 95% CI 16%-36%} were classified as having both high eosinophilia and atopy overlap. Twenty (6 males and 14 females) {26%; 95% CI 17%-38%} had neither high eosinophilia nor atopy.

Table I: Socio-demographics and clinical characteristics of participants by blood eosinophil count

Variables	Total participants n=77	BEC≥ 300 cells/μL n = 24	BEC< 300 cells/μL n = 53	p value
Age years, median	44.0 (29.0 -59.0)	47.5 (30.8 -62.5)	44.0 (28.5 -56.5)	0.406
Sex, male	23 (30%)	11 (46%)	12 (23%)	0.039
BMI, kg/m^2				
median	24.0 (21.3 – 27.9)	22.1 (19.9 – 27.3)	24.7 (21.9 -28.7)	0.080
> 24.9	33 (43%)	7 (30%)	26 (49%)	0.102
≤ 24.9	44 (57%)	17 (70%)	27 (51%)	
Age of Onset (years)				
median	22.0 (13.5 -33.1)	25.5 (12.0 -43.5)	20.0 (13.5 -33.0)	0.498
< 18	25 (33%)	8 (33%)	17 (32%)	0.913
≥ 18	52 (67%)	16 (67%)	36 (68%)	
Ever tobacco Smoker	5 (6%)	3 (13%)	2 (4%)	0.150
Family history of asthma	44 (57%)	13 (54%)	31 (58%)	0.722
ICS use	40 (52%)	14 (58%)	26 (49%)	0.452
Allergic rhinitis	30 (39%)	13 (54%)	17 (32%)	0.038
Atopy	52 (68%)	19 (79%)	33 (62%)	0.142
Total IgE kU/L				
Log total IgE	5.5 (0.9)	5.8 (1.1)	5.4 (0.5)	0.036
≥ 100kU/L	67 (87%)	24 (100%)	43 (81%)	0.023
IL13pg/ml, median	4.0 (3.3 – 4.5)	3.6 (3.1 – 4.1)	4.1 (3.4 – 4.6)	0.119
BEC, cells/μL				
Minimum value	44	304	44	
Maximum value	1904	1904	297	
Median	166.0 (88.5-343.0)	492.5 (352.5-742.0)	106.0 (74.5-168.5)	<0.001

Data are presented as mean (SD), median (25th and 75th percentile) or frequency (%). **BEC:** Blood eosinophil count, **BMI:** Body Mass Index, **Atopy:** Positive Skin prick test to any aero-allergens, **IL:** Interleukin, **ICS:** Inhaled corticosteroid.

Thirty-three (6 males and 27 females) {43%; 95% CI 33%-55%} had atopy only, and 5 (1 male and 4 females) {6.5%; 95% CI 2.4%-15%} had eosinophilic type only. The frequency of classification of asthma according to BEC stratified by atopy is shown in Figure 1.

Males were more likely to have eosinophilic asthma than females (46% vs. 23%, p = 0.039). Participants with eosinophilic asthma had a lower BMI, and a higher proportion of ever-smokers, although these differences did not reach statistical significance (p = 0.080 and p = 0.150, respectively).

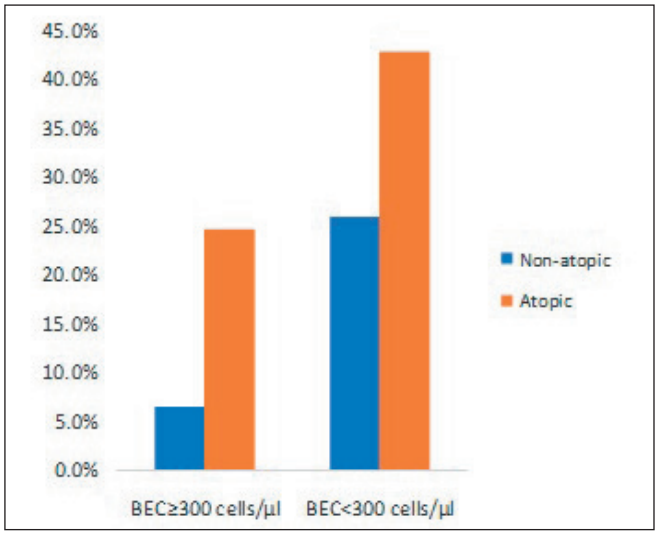

Figure 1: Prevalence of eosinophilic asthma according blood eosinophil count stratified by atopy.

Although, broadly comparable in terms of asthma control score and asthma-related quality of life score, patients with BEC ≥300 cells/µL had lower percentages of predicted FVC, FEF_{25-25}, and FEV_1/FVC, when compared to patients with BEC <300 cells/µL, however, these differences were not statistically significant. Interestingly, patients with BEC ≥300 cells/µL had significantly fewer emergency room visits in the last one-year (12% vs. 40%) (p = 0.041), when compared to patients with BEC<300 cells/µL, as shown in Table II.

After adjustment for age, BMI, smoking status, IL-13, atopy and asthma control; male sex, allergic rhinitis, and log total IgE were associated with BEC ≥300 cells/µL. For the overlap of BEC ≥300 cells/µL and atopy, it was only male sex and total IgE that were associated with the overlap after accounting for the above variables, as shown in Table III and Figures 2, 3.

DISCUSSION

In this cross-sectional study, in an outpatient clinic in a tertiary hospital in Nigeria, our results showed that approximately one-third of patients with physician-diagnosed asthma had an eosinophil count ≥ 300 cells/µL. This was associated with male sex, allergic rhinitis, and total IgE.

It is challenging to compare the prevalence of eosinophilic asthma in our study with other studies because of varied definitions as well as different cutoff values used in many studies, and more so, there are limited studies in sub-Saharan Africa that have studied eosinophilic asthma.

Table II: Healthcare utilization, asthma control, quality of life and lung function tests, according to blood eosinophil count

Variables	Total participants n=77	BEC≥ 300 cells/µL n = 24	BEC< 300 cells/µL n = 53	p Value
≥1 Emergency visit in the last one year	24 (31%)	3 (12%)	21 (40%)	0.041
ACT score	18.0 (13.0 -22.0)	20.0 (17.0-23.0)	18 (13.0-21.0)	0.119
AQLQ score	4.7 (3.7-5.8)	5.1 (3.9-6.0)	4.6 (3.7-5.8)	0.446
Lung Function				
Pb PEF % Predicted	56.0 (37.5 - 82.0)	56.0 (31.5– 79.0)	55.0 (41.0- 84.5)	0.758
Pb FEV_1 % Predicted	76.0 (53.0 – 93.5)	77.5 (45.0– 89.5)	76.0 (53.0- 94.5)	0.499
Pb FVC % Predicted	86.0 (69.5 -101.0)	83.0 (69.0-101.5)	86.0 (70.5– 99.5)	0.712
Pb FEF_{25-75} % Predicted	41.0 (27.5-70.0)	38.5 (21.5-65.0)	43.5 (28.5-72.4)	0.276
Pb FEV_1/FVC	0.76 (0.67-0.86)	0.75 (0.60-0.82)	0.78(0.67-0.82)	0.306
Pb FEV_1/FVC <0.7	24 (31%)	8 (33%)	16 (30%)	0.783

Data are presented as median (25th and 75th percentile) or frequency (%). **ACT:** Asthma Control Test, **AQLQ:** Asthma Quality of Life Questionnaire, **Pb:** Pre-bronchodilator, **PEF:** Peak Expiratory Flow, **FEV_1:** Forced expiratory volume in one second, **FVC:** Forced vital capacity, **FEF_{25-75}:** Forced expiratory flow over the middle one half of the FVC.

Table III: Multivariate analysis of factors associated with high blood eosinophilia and high blood eosinophilia and atopy overlap

	BEC ≥300 cells/µL		BEC ≥300 cells/µL and atopy overlap	
Variables	**Adjusted odds ratio (aOR)**	**p value for aOR**	**Adjusted odds ratio (aOR)**	**p value for aOR**
Age (years)	1.01 (0.99 - 1.03)	0.389	0.99 (0.98-1.02)	0.920
Sex (male vs female)	2.01 (1.23 -3.85)	0.034	2.27 (1.03-5.04)	0.043
BMI (kg/m^2)	0.95 (0.87 - 1.06)	0.373	0.94 (0.84-1.04)	0.197
Ever Smoker (yes vs no)	1.26 (0.45 -3.51)	0.487	2.27 (0.74-7.02)	0.153
Allergic rhinitis (yes vs no)	2.26 (1.17 - 4.35)	0.015	1.77 (0.79-3.95)	0.164
Atopic status (yes vs no)	1.61 (0.74-3.69)	0.259	-	-
Log total IgE	1.68 (1.10-2.45)	0.016	1.79 (1.14-2.81)	0.011
IL 13 pg/L	0.95 (0.65 -1.38)	0.840	0.92 (0.57-1.44)	0.902
≥1 Emergency visit in the last one year	0.33 (0.11-0.94)	0.039	0.43 (0.14-1.37)	0.153
ACT score	1.05 (0.95 – 1.15)	0.315	1.04 (0.93-1.15)	0.509

For adjusted odds ratio (aOR), each variable has been adjusted for other factors in the table. Odds ratio shows the odds of having BEC≥300 cells/µL and having BEC≥300 cells/µL with atopy overlap, as the covariate is increased by 1 unit (continuous variable) or compared to a reference category (categorical variable). **ACT:** Asthma Control Test, **BEC:** Blood Eosinophil Count, **BMI:** Body Mass Index, **IL 13:** Interleukin 13.

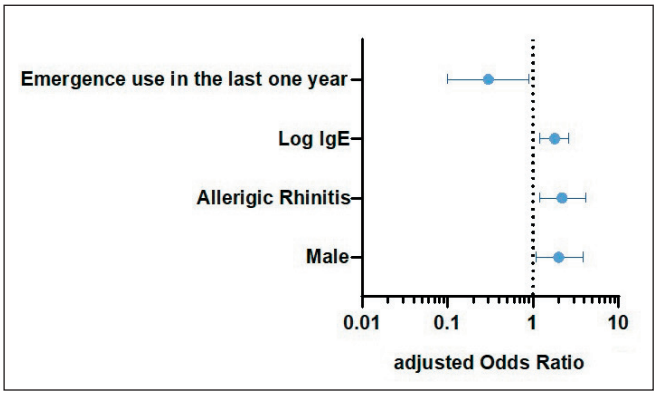

Figure 2: Factors associated BEC≥ 300 cells/µL

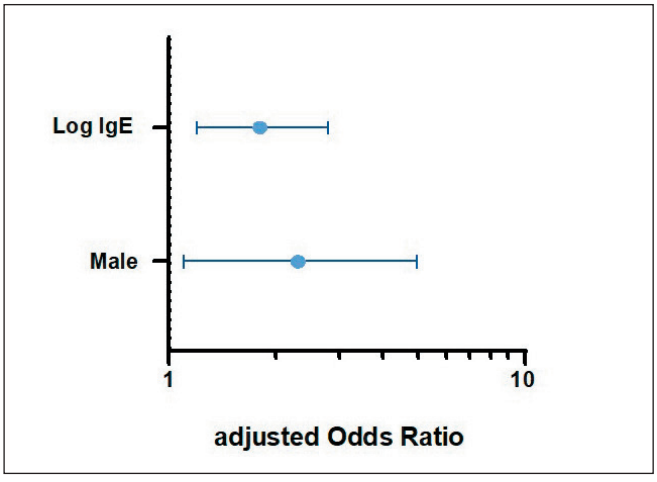

Figure 3: Factors associated with BEC≥ 300 cells/µL and atopy

However, a prevalence of 31% of eosinophilic asthma in this study is consistent with previously documented literature. The prevalence of eosinophilic asthma in all asthma patients has been reported to be between 16% and 50%, depending on the methodology, study populations, and cutoff values used for the eosinophilic asthma definition (5,21).

In a recent study in Ethiopia, Solomon et al. reported a prevalence of 19.6% (95% CI 14.8–24.1) among all asthmatics using a BEC cutoff of 400 cells/µL(11). Applying the same cutoff in this study would give a prevalence of 20.8%. In a multi-continental study, where Uganda was the only country included in Africa, the prevalence of eosinophilic asthma, using sputum eosinophils of ≥2.5% in the age group of 10-19 years, was 34% (12). This makes our finding comparable to other available studies in the region. Although Kirenga et al. in their multicenter study of the characterization of asthma in 3 east African countries reported a prevalence of 45% across all spectra of asthmatics using 300 cells/µL as the criterion, but this differs according to the severity of the diseases (10). There were 38%, 45%, and 50% for intermittent/mild persistent, moderate persistent, and severe persistent, respectively. Notably, an eosinophil count of ≥300 cells/µL was used in this study. The threshold of ≥300 cells/µL used in this study to define eosinophilic asthma has been used and is consistent with several other studies, in addition to other reasons stated in the methods section for blood eosinophil

count (17,20,22). Taken together, it may appear that eosinophilic asthma may seem less prevalent in sub-Saharan Africa than in high-income countries, in fact, the study of Pembrey et al. documented that LMICs had lower odds of eosinophilic asthma using sputum eosinophils: Brazil (0.73, 0.42-1.27), Ecuador (0.40, 0.24-0.66), and Uganda (0.62, 0.37-1.04) after adjusting for age and sex, with New Zealand as baseline (12).

Our finding that male sex, allergic rhinitis, and total IgE were associated with eosinophilic asthma is consistent with other studies. For example, de Groot JC et al. found out that chronic rhinosinusitis and male sex were independent factors associated with adult-onset eosinophilic asthma in their multicenter study of 491 adult patients (22). Similarly, it was documented that being female was negatively associated with eosinophilic asthma in Ethiopia (11). One important practice point is that male patients with eosinophilic asthma may need to be further evaluated for allergic rhinitis and possibly referred to an ear, nose, and throat specialist because untreated allergic rhinitis impacts poorly on asthma management.

We did not find any significant association between high blood eosinophil count and asthma control, asthma-related quality of life, or spirometry parameters, yet our finding that patients with high blood eosinophil count have a lower possibility of visiting the emergency department because of asthma is interesting. Although several cross-sectional and longitudinal studies have identified high blood eosinophilia as a risk factor for asthma exacerbations, hospitalization, and increased health care costs (5,6,23,24). Some studies have also reported that blood eosinophil counts are not linked to asthma exacerbations. Nagasaki et al., in their study of 217 patients with severe asthma in Japan, reported that baseline eosinophilia of 300 cells/μL was not a significant predictive factor for exacerbations during the 12-month follow-up period (25). Similarly, it was reported that in Korean asthmatics, the risk of severe asthma exacerbation was significantly higher in patients with blood eosinophil levels< 100 cells/μL than in patients with levels ≥ 100 cells/μL (26). This was also documented in sub-Saharan Ethiopia, where patients with eosinophilic asthma have lower odds of emergency hospital admission (11). The reasons for this discrepancy are not clear, however, the dynamics of biomarkers relevant to exacerbations may be different between patients with asthma, highlighting the heterogeneous and complex nature of the disease.

This study has some limitations. One major limitation is the sample size of the asthmatics included in this study as this is an exploratory study, and may probably account for some of the negative findings. However, the prevalence of 31% documented in our study is consistent with the reported prevalence in the subregion and globally. Moreover, our sample size of 77 patients, assuming the prevalence of 45% as documented by Kirenga et al., would have provided a 95% precision of width of 34% to 58% which is very close to our estimated 31%, therefore, we do not expect our findings to have varied substantially with a larger sample size (10). Additionally, this study did not particularly identify patients with severe asthma, as more than half of our participants are not using their inhaled corticosteroids at all (a well reported phenomenon in LMICs), and those on inhaled corticosteroids are on low to medium doses (12,27). Therefore, it will be challenging to classify these patients according to the recent paradigm of classifying the severity of asthma based on the dose of inhaled corticosteroids needed to maintain control or not controlled on these medications. While biologics have been demonstrated for patients with severe asthma in high-income countries, these biological therapies may not be accessible to these patients in LMICs. Future studies will need to include more participants in order to be able to characterize asthmatic patients in LMICs. We hope to conduct a more comprehensive study later in the future.

Another limitation is basing our eosinophilic asthma on BEC rather than sputum eosinophilia. The measurement of airway eosinophilia in induced sputum may be a better marker for eosinophilic asthma but is unsuitable for routine clinical practice or epidemiological study. Sputum analysis is not available in most clinical facilities, is laborious, time consuming, technically demanding, and is usually unsuccessful in a moderate proportion of patients. On the other hand, BEC is regarded as a good marker for airway eosinophilia, although it may not perfectly correlate with sputum eosinophilia. The advantage of using BEC as a marker for eosinophilic asthma is its ready accessibility, and more so, it has been adopted in the clinical characterization of severe asthmatic patients and used as an indication for biologic therapy in these patients, particularly in anti-IL5/IL-5 receptor alpha therapies.

We measured the BEC once, although it has been noted to vary diurnally and overtime, necessitating multiple measurements. In this study, blood samples were taken at approximately the same time of the day, with documented

evidence that a single BEC can predict persistent eosinophilia in adult asthma (28). Despite the above limitations, our study provided some data on the characterization of asthma in sub-Saharan Africa.

CONCLUSIONS

Biomarker-based classification and characterization of asthma has great potential for identifying clinical phenotypes, stratifying risks, monitoring disease progression, predicting treatment response and prognosis, and developing novel drugs. The purpose of this study was to fill up the data gap on the prevalence of eosinophilic asthma and associated clinical characteristics in sub-Saharan Africa. Our findings suggest that about one-third of asthma patients may have eosinophilic asthma. Patients with eosinophilic asthma also exhibited some clinical characteristics, such as being male and having associated allergic rhinitis. Adult asthmatics with these characteristics would need further evaluation and may also benefit from screening for other allergic diseases, in particular allergic rhinitis, and possibly referral to an ear, nose, and throat specialist as untreated allergic rhinitis impacts on asthma control.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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