Research Article ISSN: 2836-3647

American Journal of Pathology & Research

The Characteristics of Respiratory Manifestations Associated with Asthma in Mbarara, Uganda

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Received: 14 Sep 2026; **Accepted:** 25 Oct 2026; **Published:** 03 Nov 2026

Citation: Abdirahman Ali Araye, Mutaz Abbashar Mahdi Osman, Ebtihal Yousif ALhag, et al. The Characteristics of Respiratory Manifestations Associated with Asthma in Mbarara, Uganda. American J Pathol Res. 2026; 5(11): 1-7.

ABSTRACT

Background: *Uganda has the highest prevalence rates of asthma in East Africa. Therefore, the present study aimed to assess the characteristics of respiratory manifestations associated with asthma in Mbarara, Uganda.*

Methodology: *This is a prospective descriptive clinic-based study conducted in Mbarara, Uganda. We enrolled 139 individuals who presented to the respiratory clinic for an initial evaluation of respiratory symptoms suggestive of asthma.*

Results: *The prevalence of asthma in this study was 14%. Males were responsible for 60% of cases in the asthmatic group, and females 40%. The most common respiratory symptom was chest pain followed by cough, dyspnea, and chest tightness, constituting 78.4%, 76.3%, 74.8%, and 65.5%, respectively. The most prevalent respiratory symptoms linked to asthma were dyspnea (100%), succeeded by cough, noisy breathing, and chest pain (85% for each).*

Conclusion: *this study indicates that respiratory symptoms are highly prevalent among participants in Mbarara, with asthma cases characterized mainly by dyspnea, cough, noisy breathing, and chest pain. Asthma was more common among older adults and farmers, suggesting a possible role for age-related vulnerability and occupational or environmental exposures.*

Keywords

Asthma, Uganda, Mbarara, Respiratory symptoms, wheezing

Introduction

Asthma is defined as a long-term chronic inflammatory lung disease that is associated with swelling and narrowing of the respiratory airways, resulting in breathing difficulties [1]. It was estimated that asthma is affecting over 272 million individuals globally. Though the prevalence and mortality rates are declining, they continue to constitute a heavy burden on the healthcare system, mainly in developing countries [2].

Multiple genetic and environmental factors, and perhaps their combination, cause asthma throughout life. Genetic research has illuminated asthma pathophysiology, biology, and immunology, aiding drug discovery. Polygenic risk scores are increasingly used to diagnose asthma and identify high-risk patients. The global disability-adjusted life-years asthma burden is roughly 30% due to four modifiable environmental, social, and lifestyle risk factors: high BMI, occupational exposures, NO_2 (a proxy for traffic-related air pollution), and smoking [3]. Shortness of breath, wheezing, whistling sounds when breathing out, chest tightness, and a persistent cough that increases at night or early in the morning are the most typical asthma symptoms [1].

Childhood asthma was common in East Africa, and many risk factors were linked to it. Strategies and tailored treatments to address certain modifiable factors (e.g., environmental, allergy, and smoking exposure) should be prioritized [4].

A cross-sectional study of 263 Kampala secondary school students with asthma was conducted. In the study, 81.8% of teenagers had poor asthma control. Asthma control was affected by environmental factors; adolescents exposed to molds were four times more likely to have uncontrolled asthma (AOR = 3.84, 95% CI: 1.02, 14.46; p = 0.047), and public transport use significantly increased the odds (AOR = 5.75, 95%). Conclusion: Kampala secondary school students with asthma self-reported uncontrolled asthma. Public transportation and mold exposure lead to poor asthma management. Improve home ventilation and mold control, promote safer and less polluting student commuting, and improve school-based asthma management to reduce exposure. Regular asthma screening, teacher training, and better school care can improve early detection and control [5].

We intend to evaluate the clinical and cost-effectiveness of asthma screening in Ugandan children and adolescents with respiratory symptoms at primary care health institutions. The asthma diagnosis rate is the main result. Screening effectiveness will be assessed using a random-effects logistic regression model that accounts for baseline data and facility-level clustering. Cost-effectiveness will be calculated using the incremental cost-effectiveness ratio. FGD and KII data will be analyzed using framework analysis [6]. Therefore, the present study aimed to assess the characteristics of respiratory manifestations associated with asthma in Mbarara, Uganda.

Materials and Methods

This is a prospective descriptive clinic-based study, conducted in Mbarara, Uganda, between March and December 2020. We enrolled 139 individuals who presented to the respiratory clinic for an initial evaluation of respiratory symptoms suggestive of asthma. Symptoms included cough, chest tightness, wheeze, dyspnea, or chest pain. We used structured questionnaires to collect data on socio-demographics, medical history, and spirometry to measure forced expiratory volume in one second (FEV1) and forced vital capacity (FVC). We defined asthma and asthma severity according to Global Initiative for Asthma 2019 guidelines [7].

Inclusion and Exclusion Criteria

Any patients who attended with respiratory symptoms resembling asthma symptoms were included regardless of any demographical features except for age. Known asthmatic patients, those under the age of 12 years, were excluded. Furthermore, we excluded patients who had a known diagnosis of chronic lung disease and those with a known history of any of the following conditions because of the risks of spirometry: a history of abdominal, chest, or head and neck surgery within the past six weeks, myocardial infarction within the past four weeks, unstable angina, stroke, cerebral aneurysm, pneumothorax, hemoptysis, or pulmonary tuberculosis.

Ethical Consent

Each participant was asked to sign a written ethical consent before starting the interview to complete the questionnaire.

Statistical Analysis

The data were initially arranged in a data sheet, then entered into a computer in an Excel sheet, and then the file was transformed into Statistical Package for Social Sciences (SPSS) software version 31. Frequencies, percentages, cross-tabulations, and chi-square tests were performed. Relative risk (RR) considering a 95% confidence interval (95%CI) were calculated with a p-value < 0.05 considered as statistically significant**.**

Results

This study investigated 139 patients presenting with variable respiratory symptoms, aged 14 to 88 years old, with a mean age and standard deviation of 47±20.3. Of the 139 patients, 65/139 (46.5%) were males and 74/139 (53.5%) were females, giving a male-to-female ratio of 1.00: 1.13. Most of the patients were aged 41-54 & ≥ 66 years, constituting 32/139 (23%), followed by ≤ 25 years and 26-40, representing 29/139 (21%) and 25/139 (18%), respectively. Most males were aged 26-40 years (17/65 (26%)), while most females were aged ≥66 years (18/74 (24%)).

Most participants in this study had a university level of education, followed by those with primary education and those who were illiterate, representing 45/139 (32.4%), 36/139 (26%), and 31/139 (22.3%), respectively. Regarding education, most males had university level (25/65, 38.5%); hence, most females were illiterate (25/74, 33.8%), as indicated in Table 1, Figure 1.

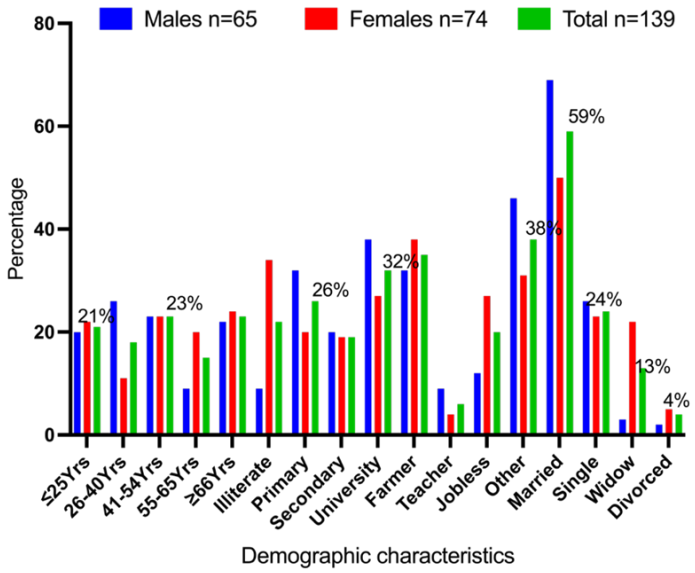


Figure 1: Description of participants by demographic features.

Farmers represented the highest occupation category in this study, followed by jobless individuals constituting 49/139 (35%) and 28/139 (20%), in this order.

Most patients were married, followed by single and divorced, representing 82/139 (59%), 34/139 (24%), and 18/139 (13%), respectively, as indicated in Table 1, Figure 1.

Table 1: Distribution of the study population by demographic characteristics.

Variable	Males n=65	Females n=74	Total n=139
Age			
≤ 25 years	13	16	29
26-40	17	8	25
41-54	15	17	32
55-65	6	15	21
≥66	14	18	32
Educational Level			
Illiterate	6	25	31
Primary	21	15	36
Secondary	13	14	27
University	25	20	45
Occupation			
Farmer	21	28	49
Teacher	6	3	9
Jobless	8	20	28
other	30	23	53
Marital Status			
Married	45	37	82
Single	17	17	34
Widow	2	16	18
Divorced	1	4	5

Table 2, Figure 2 summarized the distribution of asthma with respiratory symptoms. The most common respiratory symptom was chest pain followed by cough, dyspnea, and chest tightness, constituting 109/139 (78.4%), 106/139 (76.3%), 104/139 (74.8%), and 91/139 (65.5%), respectively**.** The most common respiratory symptoms associated with asthma were dyspnea (20/20, 100%), followed by cough, noisy breathing, and chest pain, each occurring in 17 out of 20 cases (85%).

Table 2: Distribution of Asthma with Respiratory Symptoms.

Variable	No-Asthma n-119	Asthma n=20	Total n=139
Cough			
No	30	3	33
Yes	89	17	106
Chest tightness			
No	44	4	48
Yes	75	16	91
Noisy breathing			
No	49	3	52
Yes	70	17	87
Dyspnea			
No	35	0	35
Yes	84	20	104
Chest Pain			
No	27	3	30
Yes	92	17	109

Males were responsible for 60% of cases in the asthmatic group, and females 40%. Conversely, non-asthmatic subjects showed a slightly higher proportion of females (55.5%) compared to males (44.5%).

The age distribution showed that asthma was most frequent among participants aged ≥66 years. Among the 32 participants in this age group, 9 were asthmatic, giving an asthma prevalence of 28.1%. This was followed by participants aged 55–65 years, among whom 3/21 were asthmatic, representing 14.3%.

Asthma prevalence was lower in younger and middle-aged groups. Among participants aged ≤25 years, 3/29 were asthmatic (10.3%). In the 26–40 years group, 4/25 were asthmatic (16%). The lowest rate of asthma was found in people aged 41 to 54, where only one person had it (3.1%). Among all asthma cases, participants aged ≥66 years had the highest proportion of asthma (45%).

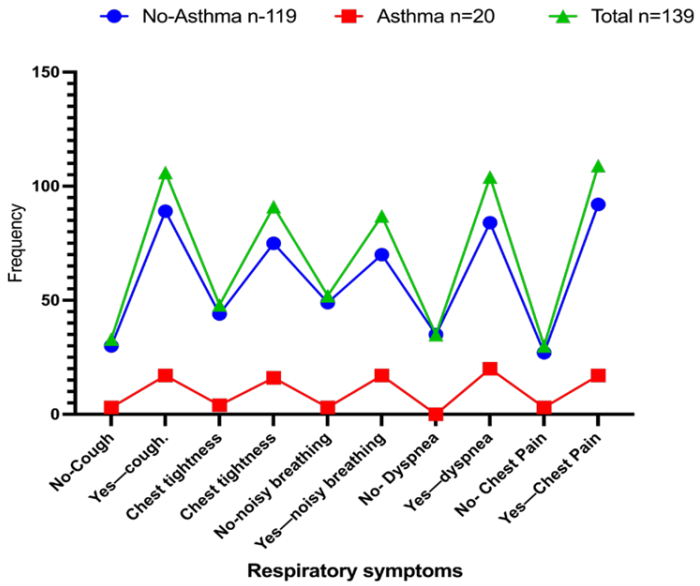


Figure 2: Description of Asthma with Respiratory Symptoms.

Table 3: Distribution of the cases by asthma status and some demographics.

Variable	Non-asthmatic	Asthmatic	Total
Gender			
Males	53	12	65
Females	66	8	74
Age			
≤25 years	26	3	29
26-40	21	4	25
41-54	31	1	32
55-65	18	3	21
≥66	23	9	32
Occupation			
Farmers	39	10	49
Teachers	7	2	9
Unemployed	25	3	28
other	48	5	53

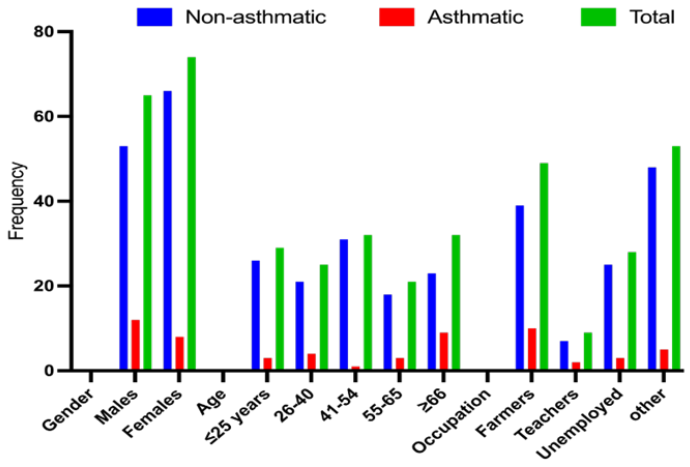


Figure 3: Description of the cases by asthma status and some demographics.

Regarding occupation, the largest occupational group was "other" occupations, comprising 53 participants, followed by farmers with 49 participants, unemployed participants with 28, and teachers with 9. Among farmers the prevalence of asthma was highest. Of the 49 farmers, 10 had asthma, giving an asthma prevalence of 20.4%. Among unemployed participants, 3/28 were asthmatic (10.7%), while among those in other occupations, 5/53 were asthmatic (9.4%). Farmers represented the largest proportion of asthmatic cases (50% of all asthmatic participants).

Discussions

Asthma is one of the frequent health problems, which afflicts most health systems, particularly low-resource settings. Consequently, our aim in the present study was to assess the characteristics of respiratory manifestations associated with asthma in Mbarara, Uganda.

This study describes the clinical and demographic characteristics of respiratory manifestations associated with asthma among participants in Mbarara, Uganda. Overall, respiratory symptoms were highly prevalent in the study population, with chest pain, cough, dyspnea, and chest tightness reported in 78.4%, 76.3%, 74.8%, and 65.5% of participants, respectively. All participants with asthma experienced dyspnea, while 85% reported cough, noisy breathing, and chest pain. These findings suggest that asthma in this setting may commonly present with a broad symptom complex rather than isolated wheeze or cough.

The predominance of dyspnea among asthmatic participants is consistent with the clinical definition of asthma as a heterogeneous airway disease characterized by variable respiratory symptoms, including wheeze, shortness of breath, chest tightness, and cough, together with variable expiratory airflow limitation. Current asthma guidance emphasizes that more than one respiratory symptom, symptom variability over time, and symptom triggers are important diagnostic clues, while isolated cough alone is less specific in adults [8]. In the present study, dyspnea, cough,

noisy breathing, and chest pain were frequent among asthmatic participants, supporting the need for clinicians in similar low-resource settings to consider asthma in patients presenting with multiple recurrent respiratory symptoms.

An important observation was the high frequency of chest pain, which was the most commonly reported respiratory symptom in the overall cohort and was present in 85% of asthmatic participants. Although chest tightness is classically recognized as an asthma symptom, chest pain is less specific and may overlap with other cardiopulmonary, gastrointestinal, musculoskeletal, or anxiety-related conditions. This has important implications for clinical practice in Uganda, where tuberculosis, chronic obstructive pulmonary disease, respiratory infections, cardiovascular disease, and occupational lung disease may coexist or mimic asthma. GINA highlights that the differential diagnosis of asthma in adults varies by age and includes conditions such as COPD, cardiac disease, infection, and other causes of dyspnea or chest pain [9]. Therefore, the high burden of chest pain in this cohort reinforces the importance of objective assessment, including spirometry or peak expiratory flow variability where available, rather than relying on symptoms alone.

The prevalence of asthma in the present study was found to be 14%. Several prevalence rates of asthma were reported from Uganda. However, most of them reported lower rates than the findings of the present study. One study investigated 1,308 cases and reported a prevalence of 6.8% [10]. This lower rate might be attributed to their study settings that included only those adults over 35 years old, and it was well-established that asthma is more common among children than adults [11,12]. Another study from Uganda had reported a prevalence of 11%, which is lower than the findings of the current study. However, that study has similar settings to our study, but with a sample size estimated to be 3416 cases [13], which is expected to yield a more reliable result than ours. However, a recent meta-analysis investigating asthma in East Africa had shown higher prevalence rates than the findings reported in the present study. The pooled prevalence of asthma was 15.2% (95% CI: 11.9%, 18.5%). Variability was encountered among different countries, ranging from 5.2% (95% CI: 3.3%, 7.1%) in Tanzania to 20.8% (95% CI: 17.6%, 24.0%) in Uganda [14]. The global prevalence rates of asthma have broad estimations ranging from 1 to 29% across different geographical regions [15,16].

The sex distribution showed that males accounted for 60% of asthma cases, whereas females accounted for 40%. In contrast, females were slightly more common among non-asthmatic participants. This pattern may reflect differences in occupational exposure, health-seeking behavior, smoking or biomass exposure, or chance variation due to the small number of asthma cases. In many adult asthma populations, sex patterns vary by age, hormonal factors, environmental exposures, and study setting. In this cohort, the male predominance among asthma cases may be partly explained by occupational patterns, particularly farming-related exposures, because farmers represented half of all asthma cases.

Age appeared to be an important factor. Asthma was most frequent among participants aged ≥66 years, with a prevalence of 28.1% in this group; this age group also accounted for 45% of all asthma cases. The second-highest prevalence was observed among participants aged 55–65 years. This age distribution indicates that older adults in this population experience a higher concentration of asthma-related respiratory morbidity. However, interpretation requires caution. In older adults, asthma may be underdiagnosed, misclassified as COPD, or coexist with chronic airflow limitation, heart failure, bronchiectasis, or previous pulmonary infection. The GINA strategy specifically emphasizes careful differential diagnosis in adults and older patients, particularly when dyspnea, cough, and chest discomfort are present [9].

Occupation was another important finding. Farmers had the largest burden of asthma, representing 50% of all asthmatic participants, and asthma prevalence among farmers was 20.4%. This finding is clinically plausible given the well-recognized relationship between agricultural exposures and respiratory disease. Farmers may be exposed to organic dust, crop dust, animal allergens, fungal spores, endotoxins, pesticides, diesel exhaust, smoke from biomass or crop burning, and other airway irritants. A European Academy of Allergy and Clinical Immunology position paper reported that livestock farming is associated with exposure to organic dust containing allergens, microbial matter, endotoxins, irritant gases, and disinfectants, all of which may contribute to respiratory symptoms and airway disease [17].

Evidence from large agricultural cohorts also supports a relationship between farming exposures and asthma or wheeze. In the Agricultural Health Study, animal production was associated with wheeze, with dose-response patterns observed for poultry and livestock exposure [18]. Other analyses from the same cohort linked pesticide exposure to adult-onset asthma among male farmers, with high pesticide exposure events associated with approximately double the odds of both allergic and non-allergic asthma. Pesticide-related respiratory effects have also been reported [19] among farm women and farm operators, supporting the broader relevance of agricultural exposures across sex and farming contexts [20].

These occupational findings are particularly relevant for Mbarara and southwestern Uganda, where agriculture is a major livelihood and exposure to crop dust, animal husbandry, biomass smoke, and pesticides may be common. Although this study did not quantify specific agricultural exposures, the high proportion of asthma among farmers suggests that occupational history should be integrated into routine respiratory assessment. Clinicians should ask about farming type, pesticide use, livestock contact, grain or hay storage, exposure to mold, use of personal protective equipment, and symptom variation during or after work. Clinicians may overlook occupationally related asthma if they concentrate solely on domestic exposures or acute infections.

The findings also have public health implications. In settings where spirometry is limited, asthma diagnosis often relies

heavily on symptoms, which can lead to both underdiagnosis and overdiagnosis. The symptom profile observed in this study—particularly the combination of dyspnea, cough, noisy breathing, chest pain, and chest tightness—supports the need for structured asthma assessment tools adapted to local clinical practice. However, symptom-based diagnosis should ideally be supported by objective evidence of variable airflow limitation, such as bronchodilator reversibility, peak flow variability, or spirometry. GINA recommends documenting the basis for asthma diagnosis, including objective measurements where available [8].

This study contributes locally relevant data on asthma-associated respiratory manifestations in Mbarara, Uganda, a setting where recent population-based asthma data remain limited. A Ugandan population-based survey noted the need for contemporary data on asthma prevalence and risk factors among adolescents and adults, highlighting the importance of local epidemiological studies [21]. The present findings add to this evidence by suggesting that asthma in this population is associated with high respiratory symptom burden, older age, male sex, and farming occupation.

Several limitations should be considered. First, the number of asthmatic participants was small, limiting statistical power and precision. Second, the study appears to be descriptive, so causal relationships between asthma and demographic or occupational factors cannot be inferred. Third, if the asthma diagnosis was based primarily on clinical history rather than spirometry, misclassification is possible, especially among older adults and individuals with occupational exposures. Fourth, important confounders such as smoking, biomass fuel exposure, history of tuberculosis, HIV status, obesity, allergic rhinitis, pesticide use, livestock exposure, and indoor air pollution were not described. Finally, chest pain was common and may reflect non-asthmatic cardiopulmonary or musculoskeletal conditions, underscoring the need for careful clinical evaluation.

In conclusion, this study indicates that respiratory symptoms are highly prevalent among participants in Mbarara, with asthma cases characterized mainly by dyspnea, cough, noisy breathing, and chest pain. Asthma was more common among older adults and farmers, suggesting a possible role for age-related vulnerability and occupational or environmental exposures. These findings support the need for improved asthma recognition, objective diagnostic capacity, occupational risk assessment, and locally adapted respiratory care pathways in southwestern Uganda. Future studies should use larger samples, spirometry-confirmed asthma definitions, and detailed exposure assessment to clarify the contribution of agricultural and environmental risk factors to asthma in this region.

Acknowledgement

The authors would like to thank people at the respiratory clinic in Mbarara, Uganda, for helping in data collection.

Ethical consideration

The protocol of the study was approved by the Research Ethics Committee at Mbarara University for Science and Technology. Approval number: MUREC 1/7.

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