



*Original Research Article*

# Prevalence, Risk Factors and Treatment Outcomes of Acute Asthma Exacerbations in Rural South-Western Nigeria: A Three-year Retrospective Observational Study

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## Abstract

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There is increasing evidence that asthma-related morbidity and mortality may be greater in older population due to greater risk of coexisting co-morbidities. The study ascertained the prevalence, risk factors, and treatment outcomes of asthma exacerbation admissions at a tertiary hospital in rural southwestern Nigeria. A retrospective observational survey using data form and pre-determined questionnaire was used to review the patients admitted for asthma exacerbation between January 2019 and December 2021. The data were analyzed using SPSS Version 22.0. The results were presented in descriptive and tabular formats. A p-value of <0.05 was used to determine the significant of association. A total of 102 asthma patients were studied. The prevalence of asthma exacerbation was 5.1%, and its risk factors were family history (p = 0.032), tobacco smoking (p = 0.040), keeping pets (p = 0.028), co-morbidity (p=0.001), numbers of co-morbidities (p<0.001), hypertension (p<0.001), obesity (p<0.001), obstructive sleep apnea (p=0.004), COPD (P<0.001), Diabetes mellitus (p<0.001), and gastro-esophageal reflux disease (p=0.037). The treatment outcomes showed that 85.3% of the patients were discharged, 11.8% DAMA, and 2.9% died on admission. The study strengthens the argument that asthma exacerbation morbidity and mortality are higher in older age population. The results may provide an impetus for asthma preventive intervention, control strategies, and future research in the study area.

**Keywords:** Asthma exacerbation, Prevalence, Risk factors, Rural Nigeria, Treatment outcomes

**Abbreviations:** AED: Accident and Emergency Department; FETHI: Federal teaching hospital, Ido-Ekiti; WHO: World Health Organization; COPD: Chronic Obstructive Pulmonary Disease; DM: Diabetes mellitus; GERD: Gastro-esophageal reflux disease; DAMA: Discharge against Medical Advice; HIV: Human immune deficiency virus.

## INTRODUCTION

Asthma is a chronic disorder that is characterized by variables respiratory airflow limitation, respiratory symptoms, and exacerbations, and which may results in

hospitalization (The Global Asthma Report, 2018). Asthma is a heterogeneous disease that results from a complex interaction between genetic, immunological and

environmental factors (Al-Ghamdi et al., 2019). The underlying pathogenesis of asthma is complex and involves airway inflammation, intermittent airflow obstruction, and bronchi hyper responsiveness (The Global Asthma Report, 2018). Exacerbation of asthma are episodes characterized by a progressive increase in symptoms of shortness of breath, cough, wheezing or chest tightness and progressive decrease in lung function that is sufficient to require changes in treatment.<sup>3</sup>Common precipitants of exacerbations include viral respiratory infections, allergen exposure, outdoor air pollution, seasonal changes, and poor adherence to inhaled corticosteroids (The Global Asthma Report, 2018).

Globally, asthma has currently affected an estimated 339 million people and the number may increase to 400 million people by the year 2025 (The Global Asthma Report, 2018). The global burden of disease collaboration estimated that at least 400,000 people died prematurely from asthma, and the majority of deaths occur in sub-Saharan countries (Soriano et al., 2015). The prevalence of asthma varies widely across countries due to differences in genetic make-up, climatic, and environmental factors (Negash et al., 2020). According to Croatian Medical Journal 2013, asthma prevalence in Africa as at 2010 has been estimated to be 119.3million which was 12.8% of the global prevalence population.<sup>5</sup> The reports further stated that 49.7million occurred in the age of <15 years (13.9%), and 102.9 million in the age of <45 years (13.8%) (Adeoye et al., 2013). The reports implies that acute asthma exacerbation affects patients and their families and could results in shortage of productive hours, frequent hospitalization and poor quality of life (Negash et al., 2020). Asthma-related morbidity and mortality may be greater in older population due to greater number of co-morbidities (Curto et al., 2019).

There is increasing evidence that the prevalence of asthma will continue to increase in SSA due to their sequential lifestyle changes, rapid urbanization, and increased exposure to environmental and occupational factors (Moyo et al., 2017). The risk and intensity of exposure to these environmental and occupational pollutants in SSA continue to increase due to lack of clear environmental regulatory policies (Moyo et al., 2017). A study in South Africa found the risk factors for asthma exacerbation to be rural residence, poverty and lack of use of inhaled corticosteroids (Sanya et al., 2014). Several studies have found family history, respiratory infection, co-morbid conditions, environmental air pollution, tobacco smoking and drugs as an important risk factor (Larenas-Linnemann et al., 2020). There were enough evidences to suggest that air pollutants including in door pollutants, decreased lung function, trigger exacerbations of asthma and increased rates of hospitalization (Larenas-Linnemann et al., 2020; Desalu et al., 2009).

In view of these evidences, the primary focus of stakeholders is to identify modifiable risk factors that can inform the design of appropriate public health interventions in order to reduce asthma morbidity and mortality in developing countries. In low and middle income countries of Africa, majority of the people lives in rural areas where awareness about asthma risk factors is poor due to high level of poverty, lack of formal education and poor accessibility to quality health care (Sanya et al., 2014; Desalu et al., 2009). Most of the data that were used in the prevention and management of asthma were derived from studies carried out in developed countries (Curto et al., 2019; Kostakou et al., 2019). Few related studies in Africa were conducted in hospitals located in urban centers (Desalu et al., 2009; Ozoh et al., 2019), and none in rural setting. Hence, this study would generate evidence based data for improving the asthma prevention strategies, and contribute to better management of asthma in rural setting. The objectives of this study were to ascertain the prevalence, risk factors and treatment outcomes of asthma exacerbation admissions at a tertiary hospital in rural southwestern Nigeria.

## MATERIALS AND METHODS

### Study setting

The study was carried out at the adult Accident and Emergency Department (AED) of the Federal Teaching Hospital, Ido-Ekiti (FETHI). FETHI is located in one of the rural communities of Ekiti State, Southwestern Nigeria. The community has a total land area of 332km<sup>2</sup>, and as at the last census of 2006 a total population of 159,114 with an annual growth rate of 3.2%, with a projected population (by 2019) of 225,305 ([www.slideshare.net/EkitiState](http://www.slideshare.net/EkitiState)). The major occupation of people is farming and trading in the informal sector with a relatively small portion of the working population and retirees in the formal sector. Apart from FETHI, there are two other tertiary hospitals in the State. The AED of the study centre has 14 male and 10 female beds with an average of 200 new admissions per month. Many of the patients including patients with asthma were either referred from nearby private and government owned health facilities or brought in by relations without prior appointment. In FETHI during the study period, the department of medicine had 13 Consultant specialists, including two consultant pulmonologists, who are responsible for the management of asthma patients at AED.

### Study design

This was a descriptive, retrospective review of hospital records of asthma admissions at adult AED between 1<sup>st</sup>

January 2019 and 31<sup>st</sup>, December 2021.

### Study population

This included all patients who were registered and admitted at adult AED between 2019 and 2021.

### Sample size

The sample size was derived from the number of patients with asthma exacerbations who were admitted on beds at AED during the study period. From January 2019 to December 2021, a total of 4,100 (Medical 2,330) vs Surgical 1,770) patients were admitted on beds at AED. From these medical admissions, 118 patients were recorded to have been clinically diagnosed with asthma exacerbation. Among these admissions, only 102 patients (sample size) who had complete medical records were used for this study.

### Inclusion criteria

Patients who were diagnosed of asthma with Spirometry at outpatient clinic and later presented with exacerbations at AED.

### Exclusion criteria

Asthma patients whose data were incomplete, not available or whose initial diagnosis of asthma was later changed to other cause.

### Data collection instruments and methods

The researchers of this study designed and developed the instruments for data collection, which were data form and standardized questionnaire containing the variables to be measured based on the previous literature from the WHO step wise approach to asthma surveillance (GINA, 2014; Torres et al., 2021). The case records of each asthma patient and admissions and discharge from the Nursing Report Books were manually retrieved and inputted into the data form. Information retrieved included the date and year of admission, demographic profile such as age and sex. The risk factors related to asthma such as family history, household fuel, tobacco smoking, keeping pets, and previous history of asthma hospitalization were systematically extracted from the patient's records. Also, the patients' co-morbid conditions such as hypertension, allergic rhino sinusitis, diabetes mellitus, obstructive sleep apnea, chronic obstructive pulmonary disease (COPD), obesity, Human immune

deficiency virus (HIV/AIDS), and gastro-esophageal reflux disease (GERD) were recorded. The treatment outcomes as retrieved were to show if the patient was discharged home, discharged against medical advice (DAMA), referred to other facility or died. The data were collected by two trained casualty officers and nurses and supported by one resident doctor from respiratory unit and were cross-checked by the principal investigator. The reporting of this study conforms to the strengthening the Reporting of observational studies in Epidemiology (STROBE) statement (Lindsay and Heaney, 2012).

### Ethical Clearance and Consideration

The institution's Ethics and Research Committee (ERC) approved the study on 15<sup>th</sup>, February 2022 with approval number (ERC/2022/02/15/726A).

### Statistical analysis

All data collected were checked for completeness and entered into Epi info version 7, and was later exported to SPSS version 22.0 for analysis. Continuous variables were expressed as mean  $\pm$  standard deviation, while categorical variables as frequencies and percentages. Comparison of categorical data was performed using Pearson's Chi-square test and  $p < 0.05$  was considered statistically significant.

## RESULTS

There were 4,100 admissions at the adult Accident and Emergency Department of the FETHI during the study period (Medical admissions 2,330 (56.8%) vs surgical admissions 1,770 (43.2%). Among the medical admissions, 118 (5.1%) were clinically diagnosed for asthma. Of these admissions, the medical records of only 102(86.4%) asthma patients were retrieved from records office and were included in the study. The medical records of the remaining 16 (13.6%) asthma patients were not analyzed since they had incomplete data.

In this study, 58 (56.9%) of asthma admissions were less than 40 years, and the majority were females 59 (57.8%). There was no significant association between asthma exacerbation and gender ( $p= 0.630$ ), Table 1.

The study showed that less than one-third 31 (30.4%) had family history of asthma and the majority 66 (64.7%) were admitted during the wet seasons. A few of the patients 15 (14.7%) smoked tobacco while the majority 84 (82.4%) were exposed to fumes from biomass fuel. Less than one third 25 (24.5%) of the patients kept pets at home while the majority 69 (67.6%) had frequent asthma exacerbations, There was a significant association between asthma exacerbation and family

**Table 1.** Socio-demographic characteristics distributed by age groups (N=102)

Variable	Age in years			Total n (%)	X <sup>2</sup>	p-value
	16 – 40 n (%)	41 – 60 n (%)	>60 n (%)			
<b>Sex</b>						
Male	23 (39.7)	12 (41.4)	8 (53.3)	43 (42.2)	0.924	0.630
Female	35 (60.3)	17 (58.6)	7 (46.7)	59 (57.8)		

**Table 2.** Risk factors distributed by age groups

Variable	Age in years			Total n (%)	X <sup>2</sup>	p-value
	16 – 40 n (%)	41 – 60 n (%)	>60 n (%)			
<b>Family History</b>						
Yes	23 (39.7)	7 (24.1)	1 (6.7)	31 (30.4)	6.880	<b>0.032</b>
No	35 (60.3)	22 (75.9)	14 (93.3)	71 (69.6)		
<b>Season variation</b>						
Wet	32 (55.2)	22 (75.9)	12 (80.0)	66 (64.7)	5.425	0.066
Dry/hot	26 (44.8)	7 (24.1)	3 (20.0)	36 (35.3)		
<b>Tobacco smoking</b>						
Yes	13 (22.4)	1 (3.4)	1 (6.7)	15 (6.7)	6.450	<b>0.040</b>
No	45 (77.6)	28 (96.6)	14 (93.3)	87 (85.3)		
<b>Household fuel</b>						
Clean	14 (24.1)	4 (13.8)	0 (0.0)	18 (17.6)	5.192	0.075
Unclean	44 (75.9)	25 (86.2)	15 (100.0)	84 (82.4)		
<b>Keeping pet</b>						
Yes	9 (15.5)	9 (31.0)	7 (46.7)	25 (24.5)	7.182	<b>0.028</b>
No	49 (84.5)	20 (69.0)	8 (27.6)	77 (75.5)		
<b>Frequent exacerbations</b>						
Yes	37 (63.8)	21 (72.4)	11 (73.3)	69 (67.6)	0.916	0.632
No	21 (36.2)	8 (27.6)	4 (26.7)	33 (32.4)		

**Table 3.** Co-morbidity/ Risk factors distributed by age groups

Variable	Age in years			Total n (%)	X <sup>2</sup>	p-value
	16 – 40 n (%)	41 – 60 n (%)	>60 n (%)			
<b>Co-morbidity</b>						
Yes	14 (24.1)	16 (55.2)	10 (66.7)	40 (39.2)	13.371	<b>0.001</b>
No	44 (75.9)	13 (44.8)	5 (33.3)	62 (60.8)		
<b>Number of co-morbidities</b>						
None	44 (75.9)	13 (44.8)	5 (33.3)	62 (60.8)	34.987	<b>&lt;0.001</b>
1	13 (22.4)	3 (10.3)	1 (6.7)	17 (16.6)		
2 – 3	1 (1.7)	9 (31.0)	6 (40.0)	16 (15.7)		
> 3	0 (0.0)	4 (13.8)	3 (20.0)	7 (6.9)		
<b>Type of co-morbidity</b>						
Allergic Rhino-sinusitis	10 (17.2)	9 (31.0)	5 (33.3)	24 (23.5)	2.984	0.225
Hypertension	2 (3.4)	12 (41.4)	6 (40.0)	20 (19.6)	22.286	<b>&lt;0.001</b>
Obesity	0 (0.0)	8 (27.6)	3 (20.0)	11 (10.8)	16.844	<b>&lt;0.001</b>
Obstructive sleep apnea	1 (1.7)	7 (24.1)	2 (13.3)	10 (9.8)	11.231	<b>0.004</b>
COPD	0 (0.0)	4 (13.8)	8 (53.3)	12 (11.8)	32.817	<b>&lt;0.001</b>
Diabetes Mellitus	1 (1.7)	2 (6.9)	5 (33.3)	8 (7.8)	16.524	<b>&lt;0.001</b>
GERD	0 (0.0)	2 (6.9)	2 (13.3)	4 (3.9)	6.575	<b>0.037</b>
Psychosocial illness	0 (3.4)	0 (0.0)	0 (0.0)	2 (1.9)	1.548	0.461
HIV	0 (0.0)	1 (3.4)	1 (6.7)	2 (1.9)	3.222	0.200

**Table 4.** Treatment Outcomes

Variable	Frequency N = 102	Percentage (%)
<b>Duration of hospital stay</b>		
≤ 1day	42	41.2
>1 – 3 days	35	34.3
> 3 days	25	24.5
<b>Return to clinic within 30 days of discharged</b>		
Yes	33	32.4
No	69	67.6
<b>Outcome</b>		
Discharged	87	85.3
DAMA	12	11.8
Dead	3	2.9

history ( $p = 0.032$ ), tobacco smoking ( $p = 0.040$ ), keeping pets ( $p = 0.028$ ), Table 2.

More than one third had co-morbid ailments 40 (39.2%) with 7 (6.8%) had more than three co-morbidities. The most common co-morbidities were allergic rhino sinusitis 24 (23.5%), hypertension 20 (19.6%), COPD 12 (11.8%), and obesity 11(10.8%). There was a significant association between asthma exacerbation and co-morbidity ( $p=0.001$ ), numbers of co-morbidities ( $p<0.001$ ), hypertension ( $p<0.001$ ), obesity ( $p<0.001$ ), obstructive sleep apnea ( $p=0.004$ ), COPD ( $P<0.001$ ), Diabetes mellitus ( $p<0.001$ ), and GERD ( $p=0.037$ ), Table 3.

The treatment outcomes showed that many of the patients 42 (41.2%) were on admissions for a day. The majority of the patients 87 (85.3%) were discharged, 12 (11.8%) were DAMA, and 3 (2.9) were dead, Table 4.

## DISCUSSION

The study showed that the prevalence of asthma exacerbation was 5.1%. This finding was in accordance with the previous reports (Torres et al., 2021). However, the finding was higher than the average African prevalence of 4.2% (Adeoye et al., 2013). The difference might be related to the overall exposure to air pollution, which has been found to be higher in Nigeria than other African countries (Desalu et al., 2018). In contrast, our finding was less than 9.8% and 10% prevalence of asthma in two previous meta-analysis for the prevalence of asthma in urban areas of Nigeria (Adeoye et al., 2013; Ozoh et al., 2019). The difference might be due to the setting, level of industrialization, lifestyle changes and exposure to allergen factors. Previous studies have reported asthma exacerbation to be higher in urban areas compared to rural settings Ozoh et al., 2019; Patra et al., 2021).

This study recorded an association between asthma exacerbation and family history. The study showed that 30.4% of the asthma admissions had family history and which was higher than 7.3% recorded in another study conducted in Nigeria.<sup>10</sup> The association between asthma exacerbation and family history is linked to genetic causes, exposure to environmental factors and lifestyle changes (Al-Ghamdi et al., 2019; Desalu et al., 2009). Previous studies have linked several genes, of which chromosomes 5q and 11 are the most prevalent in the evolution of asthma (Al-Ghamdi et al., 2019; Desalu et al., 2009).

There was an association between asthma exacerbation and hypertension. This was consistent with previous studies which have established a strong overlap between genes associated with asthma and hypertension (Zolotareva et al., 2019). These studies have found asthma patients more likely to have high blood pressure (Zolotareva et al., 2019) and, in turn, the presence of hypertension is associated with severe asthma exacerbation (Desalu et al., 2009).

This study recorded an association between asthma exacerbation and tobacco smoking. The study recorded 6.7% of patients to have smoked tobacco which was less than 17.8% and 91.8% recorded in Nigeria and UK audit respectively (Desalu et al., 2009; Lindsay and Heaney, 2012). Globally, several other studies have found an association between asthma exacerbation and tobacco smoking (Desalu et al., 2009; Tiotiu et al., 2021). These studies have linked smoking in asthma patients with increased inflammation, declining lung function, decrease responses to corticosteroids, and repeated exacerbation (Desalu et al., 2009; Tiotiu et al., 2021). The finding calls for the implementation of anti-smoking law and other policies to reduce environmental pollution and improve the quality of air inhaled into the lungs. However, a study in Uganda by Sanya et al. found no association between asthma exacerbation and tobacco smoking (Sanya et al., 2014).

In this study, there was an association between asthma exacerbation and keeping pet animals at home. The study recorded 24.5% of the patients to have kept pet animals and majority of asthma patients who kept pet animals were middle age. The association between asthma exacerbation and pet animals is hardly understood, while some studies have found pet animals to be protective, whereas, others have found animal furs and danders as triggers of asthma (Apelberg et al., 2001). Large scale longitudinal studies are needed to fully understand the association between asthma exacerbation and pet animals. In this study, keeping pet animals might stimulate the development of atopies and allergens which have been documented to increase the risk of asthma hospitalization (Patra et al., 2021; Apelberg et al., 2001).

The study recorded an association between asthma exacerbation and the presence of co-morbid conditions. The study showed that 39.2% of the patients had co-morbid conditions, and 66.7% of the patients with co-morbidities were recorded among the elderly. The increasing incidence of co-morbid conditions among the elderly patients is not surprising, given the fact that chronic medical conditions are associated with ageing population (Gabriel et al., 2017). The presence of co-morbidities co-existing with asthma in this study was consistent with previous study (Ndarukwa et al., 2022). Co-morbidity has been linked to greater morbidity, decrease adherence to therapeutic interventions and decrease quality of life (Ndarukwa et al., 2022). It is therefore imperative to screen for asthma related co-morbidities in every encounter with asthma patient, so as to institute appropriate interventions needed to minimize asthma exacerbation in the study area.

In this study, there was an association between asthma exacerbation and presence of obesity. The study recorded 10.8% of obese individuals co-existing with asthma and majorities were in the middle age (20%). This was consistent with previous studies (Curto et al., 2019; Desalu et al., 2009; Patra et al., 2021). Obesity is linked with asthma exacerbation through various mechanisms such as inflammation, immunological and genetic pathways (Curto et al., 2019; Desalu et al., 2009; Patra et al., 2021). Obese individuals tend to have asthma symptoms more frequent (Patra et al., 2021), poor asthma control (Desalu et al., 2009), and severe (Patra et al., 2021). However, a study by Jay et al. found no association between asthma exacerbation and obesity (De-Lei et al., 2017).

This study recorded an association between asthma exacerbation and obstructive sleep apnea and more patients were recorded in the middle age group. This was consistent with findings of other studies.<sup>4,26</sup> These studies have linked sleep apnea to the worsening of asthma control due to increase vagal tone while sleeping (Negash et al., 2020; Mueller et al., 2013).

There was an association between asthma exacer-

bation and diabetes mellitus (DM). The study showed that majority of asthma patients co-existing with DM were in the elderly age group (33.3%). This was consistent with longitudinal observational studies which found a risk of between 21% and 37% of the incidence of T2DM with adults' self-reported asthma (Torres et al., 2021). The association between asthma exacerbation and DM has been linked to structural alteration of the respiratory function (Torres et al., 2021), reduction in diffusion capacity, and increased asthmatic persons with T2DM to be hospitalized (Torres et al., 2021). The finding highlights the potential benefits of screening for DM in individuals with asthma. When deemed necessary, there should be immediate initiation of therapeutic intervention to reduce the incidence of asthma exacerbation. However, an observational study found no association between asthma exacerbation and T2DM (Holm et al., 2014).

Furthermore, the study recorded an association between asthma exacerbation and COPD, and majority of asthma patients co-existing with COPD were elderly. This was not surprising given the fact that COPD is commonly diagnosed after the age of 45, and is usually considered a disease of the elderly (Wu and Segal, 2017). COPD have the potentials to initiate poor structural changes of the respiratory system which is associated with worsening of the asthma symptoms (Wu and Segal, 2017).

In this study, there was an association between asthma exacerbation and GERD, and majority of the patients were elderly. This was consistent with previous study who recorded 66.5% of asthma patients with GERD (Curto et al., 2019).

The treatment outcomes showed that the majority (85.3%) of the patients were discharged; however, only 32.4% were reviewed within 30 days of discharge. This was consistent with 67.3% and 66.8% reported in another Nigeria study and UK audit respectively (Desalu et al., 2009; Lindsay and Heaney, 2012). Lack of follow-up is a common problem in asthma patients; and low rate of follow-up visits in asthma patients after they were discharged from AED have been reported in previous studies (Desalu et al., 2009; Lindsay; Apelberg et al., 2001). Regular follow-up visits may help to improve patient-health care provider partnership, improve medication adherence, and help to monitor the performance of lung function (Desalu et al., 2009; Lindsay; Apelberg et al., 2001).

However, the high number of DAMA patients (11.8%) was similar to the reports of another study and was a source of concern (Ibrahim et al., 2022). Some DAMA patients lacked the funds to pay for the services required. Some patients lose all hope, especially when recovery was slow, and prefer to die at home or obtain treatment elsewhere. DAMA most often was observed to be due to wrong cultural or religious beliefs or attributing the cause of illness to spiritual attacks (Ibrahim et al., 2022).

Therefore, effective and sustained health education may be needed to improve in early presentation and access to quality health care services. Continuing enrolment of citizens on the National Health Insurance Scheme (NHIS) should be intensified to reduce the incidence of DAMAs due to financial constraints in our hospitals (Ibrahim et al., 2022).

The mortality rate in this study was 2.9%. The delay in pre-hospital transfer, delay presentation, and inability to afford hospital expenses may have contributed to this mortality. The mortality rate of 2.9% in this study was less than the reports of previous studies (Kirenga et al., 2018). This was because the mortality rate in our study was only during the admission period and could be higher than the previous studies that looked at the 30- day mortality, which was difficult to extrapolate from the case notes because of low turnout of discharged patients at the follow up clinic. However, the mortality rate in our study was higher than what was obtained in a US cohort study in patients with asthma (Kaur et al., 2015). The presence of HIV and other co-morbidities in this study which were identified with asthma deaths in previous studies may explain some of this apparent large discrepancy in mortality rate (Ibrahim et al., 2022).

## LIMITATIONS

The study was retrospective and with a relatively small sample size of this nature, we recommend further studies to effectively document asthma exacerbation prevalence, risk factors and treatment outcomes in rural Nigeria. The study was based on data solely derived from a single hospital –based asthma admissions. Thus, it might not provide an accurate picture of the asthma prevalence in the general population. Lack of postmortem for possible cause of death is also a limitation.

## Ethical clearance, consideration and consent

This study adhered to the Helsinki Declaration and was approved by the Institutional Review Board (IRB) of the Federal Teaching Hospital, Ido-Ekiti with approval reference number (ERC/2022/02/15/726A). Because all patient records and information were de-identified and anonymized prior to analysis, the requirement for written informed consent was waived by the IRB. The reporting of this study conforms to the strengthening the Reporting of observational studies in Epidemiology (STROBE) statement (Lindsay and Heaney, 2022).

## ACKNOWLEDGEMENT

Appreciation goes to all the medical team at AED. The authors also thank the staff of the records department for

supplying the needed information in their archives.

## Dissemination of results

The results of this study were shared with members of staff of the Accident and Emergency Department through an informal presentation. The results were also published in the service's newsletter

## Declaration of conflicts of interest

The authors declare that they have no conflicts of interest.

## Funding

The researcher received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

## Availability of data and materials

The datasets for this study would be made available from the corresponding author on a reasonable request

## CONCLUSION

The prevalence of asthma exacerbation was 5.1%, and its risk factors were family history, being hypertensive, tobacco smoking, keeping pet animals, co-morbid condition, obesity, obstructive sleep apnea, diabetes mellitus, COPD and GERD. The treatment outcomes showed that 85.3% of the patients were discharged, 11.8% DAMA, and 2.9% died on admission. The study may help with priorities for public health policymakers, so that they may plan for preventions and control programs to reduce asthma morbidity and mortality in rural settings.

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