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Acute severe asthma and its predictors of mortality in rural Southwestern Nigeria: a-five year retrospective observational study

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Abstract

Objectives: There is an observed paucity of data regarding the predictors of asthma mortality in Nigeria. This study aimed to ascertain the clinical presentations and predictors of acute severe asthma mortality in rural Southwestern Nigeria.

Methods: A retrospective observational study using a data form and a standardized questionnaire was used to review the 124 patients admitted at Emergency Department between January 2015 and December 2019. The data were analyzed using SPSS Version 22.0. The results were presented in descriptive and tabular formats. Binary logistic regression analysis was used to determine the predictors of asthma mortality and a *p*-value <.05 was considered statistically significant.

Results: A total of 124 patients were studied. The acute severe asthma mortality was 4.8% and its predictors were older age (Crude odds Ratio (COR), 14.857; 95% CI: 2.489–88.696, $p < .001$), Tobacco smoking (COR, 6.741; 95% CI: 1.170–38.826, $p = .016$), more than three co-morbidities (COR, 2.750; 95% CI: 1.147–26.454, $p = 0.012$), diabetes mellitus (COR, 13.750; 95% CI: 2.380–79.433, $p < .001$), Human Immunodeficiency virus (COR, 117.000; 95% CI: 9.257–1479.756, $p < .001$), ≥2 days before presentation (COR, 7.440; 95% CI: 1.288–42.980, $p = .039$), and Short-acting-B2-agonists overuse (COR, 7.041; 95% CI: 1.005–62.165, $p = .044$).

Conclusion: The mortality rate was 4.8% and its predictors were older age patients, tobacco smoking, multiple co-morbidities, diabetes mellitus, HIV, SP02 <90%, delay presentation, and Short-acting-B2-agonists over use, The study showed that there is high prevalence of asthma mortality in rural Southwestern Nigeria. The findings may be used to plan for asthma preventions and control programs in rural settings, and may also provide an impetus for prospective research on these outcomes.

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Introduction

Acute severe asthma is one of the leading causes of presentations to hospital emergency room, and contributes for a cause of disability adjusted life years (DALYs) in 2015.[1,2] Despite recent advances in the management of patients with asthma and the recommendation of several asthma guidelines over the past decades, recent reports indicate that people still die of asthma.[2] The majority of deaths due to asthma occur in sub-Sahara Africa.[3] In 2015 alone, 383,000 people died of asthma, and a projection of additional 100 million new cases by the year 2025.[2] However, there has been a reduction of nearly 26% in the asthma mortality when comparing 2015 to 1990.[4] Recent studies reports that the risk of death of patients who are hospitalized for asthma attack is less than 0.5%[5,6] The risk is higher in patients that require intubation and mechanical ventilation, and suggests the importance of early presentation and prompt management of acute severe asthma.[5,6]

Studies have shown that mortality rate for acute severe asthma varies widely across different regions and is affected by several factors.[7,8] Asthma patients with past history of several emergency care visits, delay presentation to the emergency room(ER), currently using or having recently stopped using oral corticosteroids, not currently using inhaled corticosteroids, poor adherence to asthma medications and history of psychosocial problems have all been associated with increase asthma mortality.[7,9] Other reports have found an association between acute severe asthma mortality and low socioeconomic status of the patients. The reports linked older aged patients, underlying co-morbidities, winter months, and lifetime tobacco consumption to increased asthma mortality.[8,9] Therefore, A brief review of patient medical records is necessary to ascertain pertinent information in the patient's history that need to be looked into closely.

The Global Initiative for Asthma (GINA) guidelines described acute severe asthma as patients presenting with variety of signs and symptoms such are agitation, drowsiness, confusion, breathlessness at rest, with patients talking in words, respiratory rate of more than 30 beats per minute, use of accessory respiratory muscles, heart rate of over 110 beats per minute, oxygen saturation on air less than 90% and peak expiratory rate ≤50% of their best or predicted value.[10,11]

Despite the increased asthma mortality in developing countries of the world, there is an observed paucity of data regarding the clinical presentations and predictors of asthma mortality in Nigeria. Few related studies from the tertiary hospitals located in urban centers have been reported in the literature with little or none from the rural areas where the majority of the populace resides.[12,13] Prevalence and predictors of acute severe asthma mortality are important outcome measures in asthma epidemiological studies and clinical trials.[2,3] Therefore, data on acute severe asthma and its predictors of mortality are necessary to enhance healthcare providers' readiness towards meeting patient expectations, leading to improved health care delivery and better outcomes. Thus, the study aims to ascertain the clinical presentations, and predictors of mortality among patients admitted for acute severe asthma in a tertiary hospital in rural Southwestern Nigeria.

Materials and methods

Study area

The study was carried out at adult Emergency Department (ED) of Federal Teaching Hospital, Ido-Ekiti (FETHI), South western Nigeria. Ido-Ekiti is a rural community and about 15 km from Ado- Ekiti, the State capital. It has a total land area of 332 km,[2] and as at last recent population census of 2006, it had a total population of 159,114 with an annual growth rate of 3.2%.[14] Apart from FETHI, there are other two tertiary hospitals which are located in Ado Ekiti, the State capital. FETHI has 180 beds and serves as a referral centre to patients from private and government owned health facilities in Ekiti State and its environs. The ED of the hospital offers medical and surgical emergencies with 14 male and 10 female beds. From the medical records of ED, the number of admission is low given an average of 100 patients per month across all specialties. The department runs three shifts from Monday to Friday and 48 hours call on Saturdays and Sundays. The medical team included two Consultant Family Physicians and a Consultant Orthopedics and trauma surgeon and eight medical officers. They are supported by nurses, health assistants, medical records, pharmacists and information staff and cleaners.

Study protocol

The protocol for this study was approved by the Ethic Committee of Federal Teaching Hospital, Ido-Ekiti (FETHI) with approval number ERC/2021/06/25/605A) and carried out in accordance with approved guidelines. The need for patient approval and/or informed consent was waived by the Ethic Committee of FETHI due to the retrospective nature of the study

Study design. This was a descriptive, retrospective review of hospital records of asthma admissions at Emergency

Department (ED) between 1st January 2015 and 31st, December 2019.

Study population. This included all asthma patients confirmed by Spirometry during their clinical management at general outpatient clinic and presented to ED between 2015 and 2019. The data were limited to 2019 due to a change in hospital protocol for admission as a result of the outbreak of covid-19 pandemic.

Study participants and sample size. The sample size was derived from all admissions from January 2015 to December 2019.

Inclusion criteria. Asthma patients who presented with exacerbations at ED were admitted.

Exclusion criteria. Asthma patients whose data were incomplete, not available or whose initial diagnosis of asthma was later changed to other cause. Patients with COPD or asthma-overlaping COPD were excluded.

Instruments for data collection. The instruments for data collection were designed and developed by the researchers. The instruments included a data form and a standardized questionnaire, which contained the variables to be measured based on the previous literature approach to asthma surveillance.[2]

Methods of data collection. The data form and the standardized questionnaire were used to obtain information from the case records of each patient on admission or discharged in the nursing report books. Information retrieved included the date and year of admission and sociodemographic profiles. Data relating to risk factors for acute severe asthma were extracted and included season's period of admission, duration of diagnosis, family history, exposure to fumes from biomass fuel, previous attack of asthma, and co-existing co-morbid ailments (such as lower respiratory infection, allergic rhino sinusitis, hypertension, obesity, obstructive sleep apnea, diabetes mellitus, gastroesophageal reflux disease (GERD), psychosocial illness, and Human Immunodeficiency virus (HIV). Also, data on presenting complaints, duration of illness, and admission vital signs (such blood pressure, respiratory rate, heart rate, saturated pressure of oxygen in room air (SPO2) were extracted. Other information included medication history prior to admission at ED and treatment received at ED. Data on Short-acting-B2-agonists (SABA) use were extracted and recorded. Mortality was also recorded for those patients who died of the illness. The data were collected by two trained casualty officers, a nursing officer supported by one resident doctor from the respiratory unit, and cross-checked by the principal investigator.

Some definitions

Acute severe asthma. This is defined as an ED visit or a hospital admission for asthma.

Co-morbidity. These were identified based on diagnoses (ICD-10 Codes) recorded as part of inpatient and outpatient hospital.

Short-acting-B2-agonists overuse. This in the present study was calculated assuming that the patients received three or more canisters of SABA per year or which correspond to an average of ≥1.5 puffs per day.[15]

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 ± standard deviation, while categorical variables as frequencies and percentages. Comparison of categorical data was performed using Pearson's chi-square test and p <.05 was considered statistically significant.

Results

In this study, the medical records of all patients admitted at ED from January 2015 to December 2019 were 5,944 (Medical 3501) vs. Surgical 2,443) patients. From these (3501) medical admissions, 132 patients who had Spirometry were recorded to have been diagnosed with acute severe asthma. Among these admissions, only 124 patients (sample size) who had complete medical records were used for this study. Their mean age was 41.6 ± 19.4 (range: 16–85) years. Of the 124 asthma patients, six (4.8%) of them died, and among the proportion of deaths, four (22.2%) were 60 years and above, one (2.6%) had family history of asthma, 12.9% had history of tobacco smoking, and 7.0% had previous history of acute severe asthma admission. There was a statistically significant association between asthma mortality and age (x^2 = 15.48, p <.001), and tobacco smoking (x^2 = 5.838, p = .016), Table 1 and Table 2.

In this study, six (11.8%) of the patients who had co-morbidities died, and five (25.0%) of the patients with 2-3 co-morbidities died. Among those with co-morbidities, three (27.3%) of the patients with diabetes died, and all the patients 2 (100.0%) with HIV died. There was a significant association between asthma mortality and presence of co-morbidity (x^2 = 9.025, p = .003), number of co-morbidities (x^2 = 23.255, p < .001), diabetes (x^2 = 13.194, p < .001), and HIV (x^2 = 39.989, p < .001), (Table 3)

The current study showed that a higher proportion of deaths was found in those who presented after two days of illness (9.4%) compared to those who presented before 2 days of illness (1.4%) (x^2 = 4.245, p = .039). Also, a higher

Table 1. Relationships between demographics, risk factors and asthma mortality.

Variable	Asthma mortality		Total *n* (%)	X^2	*p*-value
	Yes *n* (%)	No *n* (%)			
Age in years					
16–40	0 (0.0)	71 (100.0)	71 (100.0)	15.481	<0.001
41–60	2 (5.7)	33 (94.3)	35 (100.0)		
>60	4 (22.2)	14 (77.8)	18 (100.0)		
Mean age ± SD			41.6 ± 19.4		
Sex					
Male	3 (5.8)	49 (94.2)	52 (100.0)	0.168	0.682
Female	3 (4.2)	69 (95.8)	72 (100.0)		
Family history					
Yes	1 (2.6)	38 (97.4)	39 (100.0)	0.639	0.424
No	5 (5.9)	80 (94.1)	80 (100.0)		
Season variation					
Wet	6 (7.5)	74 (92.5)	80 (100.0)	3.468	0.063
Dry/hot	0 (0.0)	44 (100.0)	44 (100.0)		
Duration of asthma diagnosis					
<5 years	2 (3.2)	61 (96.8)	63 (100.0)	0.770	0.380
≥5 years	4 (6.6)	57 (93.4)	57 (93.4)		
Fumes from biomass fuel					
No	0 (0.0)	20 (100.0)	20 (100.0)	1.213	0.271
Yes	6 (5.8)	98 (94.2)			
Tobacco smoking					
Yes	4 (12.9)	27 (87.1)	31 (100.0)	5.838	0.016
No	2 (2.2)	91 (97.8)	93 (100.0)		
Recurrent asthma					
Yes	6 (7.0)	80 (93.0)	86 (100.0)	2.786	0.095
No	0 (0.0)	38 (100.0)	38 (100.0)		

proportion of deaths was found in those who inhaled ≥1.5 puffs of SABA per day per year (11.8%) compared to those who inhaled <1.5 puffs per day per year (x^2 = 6.177, p = .013) (Table 4).

Similarly, five (9.1%) of the patients with SPO2 <90% died compared with one (1.4%) whose SP02 >90% (x^2 = 3.881, p = .049) died, (Table 5).

Using binary logistic regression model, patients' aged >60 years (COR, 14.857; 95% CI: 2.489–88.696, p < .001), Tobacco smoking (COR, 6.741; 95% CI: 1.170–38.826, p = .016), more than three co-morbidities (COR, 2.750; 95% CI: 1.147–26.454, p = .012), diabetes mellitus (COR, 13.750; 95% CI: 2.380–79.433, p < .001), HIV (COR, 117.000; 95% CI: 9.257–1479.756, p < .001), ≥2 days before presentation (COR, 7.440; 95% CI: 1.288–42.980, p = .039), SP02 <90% (COR, 6.800; 95% CI: 1.432–60.029, p < .049), and SABA overuse (COR, 7.041; 95% CI: 1.005–62.165, p = .044) were the predictors of asthma mortality in this study. (Table 6).

Discussion

The study ascertained the clinical presentations of acute severe asthma and examined its predictors of mortality in rural Southwester Nigeria. This is to serve as a guide to clinicians and other stakeholders who manage these patients to further improve their outcomes. The study found 4.8% as asthma mortality rate between 2015 and 2019. The mortality rate in this study supported a wide range of hospital mortality estimates of 0.4–12%[16–18] The similarity of our study with the other studies could be due to similar study design. Comparatively, our findings was higher than 1% mortality rate reported by Kaur et al. in USA, and may due to the differences in the level of health care services and the time of presentation to the hospital.[8] In the same vein, our result was lower than 9.8% found among patients requiring mechanical ventilation.[19] The difference in our mortality rate as compared to this other study could be due to difference in the study design, period at which the studies were conducted and the critical condition of the patients on admission.[8,19] Previous reports have shown that the risk of death is higher in patients who require mechanical ventilation.[8,19]

In this study, old age patients have been found to increase the risk of death when compared to the younger patients. This was consistent with the reports of previous studies that found the effect of increasing age to be the most important predictors of repeated acute severe asthma across a

Table 2. Relationship between co-morbidities and asthma mortality.

Variable	Asthma mortality		Total *n* (%)	X^2	*p*-value
	Yes *n* (%)	No *n* (%)			
Comorbidity					
Yes	6 (11.8)	45 (88.2)	51 (100.0)	9.025	0.003
No	0 (0.0)	73 (100.0)	73 (100.0)		
Number of comorbidities					
None	0 (0.0)	73 (100.0)	73 (100.0)	23.255	<0.001
1	0 (00)	22 (100.0)	22 (100.0)		
2–3	5 (25.0)	15 (75.0)	20 (100.0)		
>3	1 (11.1)	8 (88.9)	9 (100.0)		
Types of co-morbidity					
Lower respiratory infect	2 (5.0)	38 (95.0)	40 (100.0)	0.095	0.922
Allergic rhinosinusitis	2 (6.7)	28 (93.3)	30 (100.0)	0.287	0.592
Hypertension	2 (8.3)	22 (91.7)	24 (100.0)	0.789	0.374
Obesity	1 (7.7)	12 (92.3)	13 (100.0)	0.257	0.612
Obstructive sleep apnea	2 (15.4)	11 (84.6)	13 (100.0)	3.508	0.061
Diabetes mellitus	3 (27.3)	8 (72.7)	11 (100.0)	13.194	<0.001
GERD	1 (16.7)	5 (83.3)	6 (100.0)	1.916	0.166
Psychosocial illness	0 (0.0)	3 (100.0)	3 (100.0)	0.156	0.693
HIV	2 (100.0)	0 (0.0)	2 (100.0)	39.978	<0.001

Table 3. Relationships between clinical presentations and asthma mortality.

Variable	Asthma mortality		Total *n* (%)	X^2	*p*-value
	Yes *n* (%)	No *n* (%)			
Clinical presentation(s)					
Cough	5 (4.9)	98 (95.1)	103 (100.0)	0.000	0.986
Dyspnea	5 (5.4)	87 (94.6)	92 (100.0)	0.275	0.600
Wheezing	4 (4.9)	78 (95.1)	82 (100.0)	0.001	0.977
Chest tightness	2 (4.2)	46 (95.8)	48 (100.0)	0.077	0.782
Agitation	1 (2.6)	37 (97.4)	38 (100.0)	0.580	0.446
Talking in words	2 (10.5)	17 (89.5)	19 (100.0)	1.576	0.209
Confusion	4 (13.8)	25 (86.2)	29 (100.0)	6.591	0.010
Duration of illness before presentation					
<2 days	1 (1.4)	70 (98.6)	71 (100.0)	4.245	0.039
≥2 days	5 (9.4)	48 (90.6)	53 (100.0)		
Medication history before admission					
Using inhaled corticosteroid	2 (4.0)	48 (96.0)	50 (100.0)	0.128	0.721
Using oral corticosteroid	4 (5.4)	70 (94.6)	74 (100.0)		
Adherent to medication	1 (2.6)	38 (97.4)	39 (100.0)	0.639	0.424
SABA use					
<1.5 puffs/day	1 (1.4)	69 (98.6)	70 (100.0)		
≥1.5 puffs/day	5 (9.3)	49 (90.7)	54 (100.0)	4.060	0.044

prolonged period.[11,20] The actual reason for this effect is not fully understood but could partially results from repeated viral respiratory tract infections coupled with decreased immune cell function in older aged patients.[11,20] Other studies have found a decreased effect of β-adrenergic, and increased non-reversibly airway obstruction as the reasons for the increased mortality rate observed in old aged patients.[11,19]

This study recorded an association between asthma mortality and tobacco smoking. Globally, several other studies have found an association between asthma mortality and tobacco smoking.[21,22] These studies have linked

Table 4. Relationships between vital signs and asthma mortality.

Variable	Asthma mortality		Total *n* (%)	X^2	*p*-value
	Yes *n* (%)	No *n* (%)			
Respiratory rate					
<20 c/m	0 (0.0)	0 (0.0)	0 (0.0)	—	—
≥20 c/m	6 (4.8)	118 (95.2)	124 (100.0)		
Heart rate					
≤100 b/m	0 (0.0)	3 (100.0)	3 (100.0)	0.156	0.693
>100 b/m	6 (5.0)	115 (95.0)	121 (100.0)		
Blood pressure					
<90/50	4 (8.2)	45 (91.8)	49 (100.0)	1.945	0.163
≥90/50	2 (2.7)	73 (97.3)	75 (100.0)		
Temperature					
≤37.5°C	2 (2.8)	69 (97.2)	71 (100.0)	1.475	0.225
>37.5°C	4 (7.5)	49 (92.5)	53 (100.0)		
SPO_2					
<90%	5 (9.1)	50 (90.9)	55 (100.0)	3.881	0.049
≥90%	1 (1.4)	68 (98.6)	69 (100.0)		
PEFR done					
Yes	1 (16.7)	5 (83.3)	6 (100.0)	1.916	0.166
No	5 (4.2)	113 (95.8)	118 (100.0)		

Table 5. Relationships between treatment modalities and asthma mortality.

Variable	Asthma mortality		Total *n* (%)	X^2	*p*-value
	Yes *n* (%)	No *n* (%)			
Treatment modalities					
Given nebulized salbutamol	5 (4.7)	102 (95.3)	107 (100.0)	0.047	0.829
Given IV theophylline	1 (5.0)	19 (95.0)	20 (100.0)	0.001	0.971
Given IV corticosteroid	6 (5.3)	108 (94.7)	114 (100.0)	0.553	0.457
Given intranasal oxygen	3 (5.7)	50 (94.3)	53 (100.0)	0.136	0.713
Given IV antibiotics	4 (7.5)	49 (92.5)	53 (100.0)	1.475	0.225
Given intravenous fluid	6 (6.7)	84 (93.3)	90 (100.0)	2.382	0.123
Chest X-ray done	3 (6.8)	41 (93.2)	44 (100.0)	0.580	0.446
Given inhaled corticosteroid at discharged	0 (0.0)	66 (100.0)	66 (100.0)	7.175	0.070

smoking in asthma patients with increased inflammation, declining lung function, decrease responses to corticosteroids, and acute severe asthma mortality.[21,22] 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 by Huovinen et al. found no association between mortality and tobacco smoking among people with asthma.[23]

The study also found asthma patients who had three or more co-morbidities at presentation to have 5.612 times as likely the risk of death compared to those without co-morbidities. This finding is consistent with other studies that suggested that co-morbidities among asthma patients are associated with greater mortality, decreased adherence to therapeutic interventions and decreased quality of life.[24,25] This finding calls for the screening of asthma co-morbidities in clinical practice so that appropriate interventions can be instituted. It also strengthen the reason for the stakeholders to educate asthma patients in every encounter, on the importance of paying attention to co-morbid conditions, as these may impact negatively on their treatment outcomes.

In this study, patients with diabetes mellitus was observed to have 3.194 times as likely the risk of asthma mortality as compared with those without diabetes. The finding is consistent with the reports of other studies which had linked diabetes to reduce lung volume, by inducing structural alterations in respiratory function, a factor that

Table 6. Bivariate logistic regression analysis for the factors associated with asthma mortality.

Variable	COR (95% CI)	*p*
Age> 60 years	14.857 (2.489–88.696)	<0.001
Male gender	1.408 (0.273–7.271)	0.682
Tobacco smoking	6.741 (1.170–38.826)	0.016
>3 comorbidities	2.750 (1.147–26.454)	0.012
Lower respiratory infection	2.973 (0.336–26.279)	0.305
Allergic rhinosinusitis	1.607 (0.279–9.244)	0.592
Hypertension	2.182 (0.376–12.675)	0.374
Obesity	1.767 (0.190–16.405)	0.612
Obstructive sleep apnea	4.864 (0.798–29.638)	0.061
Diabetes mellitus	13.750 (2.380–79.433)	<0.001
GERD	4.520 (0.441–46.288)	0.166
HIV	117.000 (9.257–1479.756)	<0.001
Cough	1.020 (0.113–9.211)	0.986
Dyspnea	1.782 (0.200–15.853)	0.600
Wheezing	1026 (0.180–5.841)	0.977
Chest tightness	0.783 (0.138–4.446)	0.782
Agitation	0.438 (0.049–3.881)	0.446
Talking in words	2.971 (0.504–17.500)	0.209
Confusion	2.140 (0.377–122.138)	0.380
SPO_2 <90%	6.800 (1.432–60.029)	0.049
Duration of illness before presentation		
≥2 days	7.440 (1.288–42.980)	0.039
Medication history		
Using oral corticosteroid	1.374 (0.242–7.788)	0.720
Medication non-adherence	2.375 (0.268–21.042)	0.424
SABA use (≥1.5 puffs/day)	7.041 (1.005–62.165)	0.044

increase the risk of individuals asthma patient with diabetes to be hospitalized.[26,27] The implication of this finding is important to the clinicians as they highlight the potential clinical outcome of early screening for asthma in individuals with T2DM. When deem necessary, the prompt initiation of specific treatments for asthma would be accounting for the accompanying modifiable risk factors.[26,27]

Similarly, asthma patients with HIV were found to have 8.047 times as likely the risk of death as com23.pared to those without HIV. This is consistent with the reports of previous studies. These studies have linked HIV with decreased pulmonary function that compromises asthma survival.[28] Although, the actual reason for this finding is not entirely clear, these studies have suggested that direct-virus related pulmonary toxicity, and persistent systemic inflammation resulting in oxidative stress and weakening immune system are parts of the complex mechanisms that may explain the increased risk of death.[28] The risk of death may also be found in patients who achieve viral suppression on Highly active antiretroviral therapy (HAART), because the level of damage seen during uncontrolled HIV viraemia may be irreversible.[28] The degree of immune-suppression is a significant factor that contributes to higher mortality.[29,30] This was not investigated and form part of the limitation in this study.

This study has also shown that asthma patients who presented late to the emergency room have double the likely risk of death compare to those who presented early. This is consistent with the reports of previous studies which found that long duration of asthma illness has been associated with continuing inflammation, and airway remodeling, which in turn leads to adverse outcomes.[19,31] Delay presentation to hospital has been a major factor contributing to adverse outcomes in developing countries. Some patients lacked the funds to pay for the services required, and others prefer to die at home or obtain treatment elsewhere. Therefore, effective and sustained health education and communication strategies are needed to improve in the area of early presentation and access to quality health care services. Continuing enrolment of citizens on National Health Insurance Scheme (NHIS) should be intensified to reduce the incidence of delay presentation due to financial constraint in our hospitals.

In this study, asthma patients with SP02 less than 90% were found to have 7.772 as likely the risk of death compared to those with higher SP02. The observed

association of hypoxia with mortality in this study is consistent with other studies which had linked hypoxia to the presence of lower respiratory infection as a common co-morbidity.[32,33] This may be due to mitochondrial damage resulting in cellular apoptosis during inflammation.[32] The finding calls for increase supplemented oxygen supply at ED to improve treatment outcomes.

The current study found an association between SABA over-use and asthma mortality. This is in keeping with previous study that found SABA over-use as a general marker for asthma mortality.[15] Excessive reliance on SABA therapy may indicate poor asthma control and is potentially harmful for patients with asthma, adversely increasing their risk of exacerbation and mortality.[15] It is on the basis of this finding and reports from previous studies that the latest iteration of the GINA report no longer recommend treatment with SABA alone, noting that such therapy does not protect against severe exacerbations and that frequent use actually increases the risk of such event.[34] The current finding should alert the clinicians to monitor these patients closely.

Limitations

The study was retrospective and with a relatively small sample size of this nature, and was based on data solely derived from a single hospital-based severe asthma admissions. Thus, it might not provide an accurate picture of the asthma mortality rate and its predictors in the general population. Furthermore, there were apparent deficiencies in standard assessment of using PEFR meter. Also, our study population included age ≥60 years, all of whom were eligible for provincial drug plan coverage. This may limit findings generalisability, especially to a younger population. Lack of postmortem on the possible cause of death is also a limitation.

Conclusion

The study revealed 4.8% acute severe asthma mortality. Old age, tobacco smoking, co-morbidities, diabetes mellitus, HIV/AIDs, hypoxia, delay presentation, and SABA over-use were the predictors of severe asthma mortality. The findings may help with priorities for public health policy-makers, so that they may plan for preventions and control programs to reduce asthma mortality in rural settings. Future research is encouraged in order to further understand the specific predictors of asthma mortality.

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