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Research Article

Factors Associated with Poor Asthma Control among Sudanese Patients Attending Atbara Teaching Hospital in Sudan

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Abstract

Objective: To identify factors associated with poor bronchial asthma control in patients attending Atbara Teaching Hospital, Sudan, in 2020.

Methods: This was an analytical, descriptive, cross-sectional hospital-based study conducted at the Atbara Teaching Hospital in River Nile State, Sudan, between February and June 2020. All patients diagnosed with bronchial asthma who were attending any hospital department were included.

Results: In total, 292 patients were enrolled, 51.4% were aged 18–45 years and 51.4% were female. The most frequent complaints were an audible wheeze and shortness of breath (approximately 93%), and 49% had been diagnosed with asthma >10 years previously. Of the patients, 42% were admitted 1 to 3 times and 47.3% were admitted to the intensive care unit (ICU). Hospital admission was associated with improper inhaler use (P = 0.003), the presence of triggers at home or work (P = 0.003), and passive smoking (P = 0.016). ICU admission was associated with female sex (P = 0.039) and the presence of triggers at home or work (P = 0.026).

Conclusion: Asthma is a major problem in Atbara City. Improper inhaler use, the presence of triggers at home or work, and passive smoking were significantly associated with hospital admission. Female sex and the presence of triggers at home or work were significantly associated with ICU admission.

Keywords: poor asthma control, bronchoconstriction, exacerbation of asthma, asthma risk factors, Sudan

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1. Introduction

Asthma is a chronic disease caused by airway inflammation that results in narrowing or bronchoconstriction of the airways [1]. Worldwide, 334 million people are affected by asthma [2]. According to the World Health Survey (2002–2003), the prevalence of asthma is 4–8% in some African countries [2].

According to a systematic review by Song *et al.* [3], the prevalence of asthma in people aged 5–69 years worldwide was estimated to be 11.5% (95% confidence interval [CI] = 9.1–14.3), 17.9% (95% CI = 14.2–22.3), 5.4% (95% CI = 3.2–9.0), and 9.8% (95% CI = 7.8–12.2), based on different asthma definition of current wheezing, ever wheezing, current asthma, and ever asthma, respectively. According to World Health Organization (WHO) data, deaths due to asthma in Sudan reached 1.04% (2639). Moreover, Sudan ranks 41st in the world in terms of asthma deaths, with an age-adjusted mortality rate of 11.98 per 100,000 population [4].

Genetic susceptibility, exposure to allergens such as pollen and house dust mite, air pollution (indoor and outdoor), tobacco smoking (active and passive), urban living, and viral respiratory infections are all associated with asthma [5–7]. In addition, family history, young age, previous illnesses such as tuberculosis, and current illnesses such as hypertension have been found to be risk factors for asthma in various studies [3, 7].

Several international studies have addressed poor symptom control reported by both physicians and patients [8, 9]. Poor control of asthma was found in a sample of the country's general population: in the Recognize Asthma and Link to Symptoms and Experience (REALISE) survey, 45% of respondents had uncontrolled asthma [9].

In all the aforementioned studies, limited attention was paid to important risk factors other than treatment-related problems and poor asthma control, such as exposure to allergens and irritants [10, 11]. Implementing interventions that address these factors is important for improving asthma-related quality of life.

2. Materials and Methods

2.1. Study design

This study is a cross-sectional, descriptive hospital-based study.

2.2. Study site

Inpatients and outpatients in the respiratory clinic and respiratory wards at Atbara Teaching Hospital in River Nile State, Sudan.

2.3. Study duration

Five months, from February to June 2020.

2.4. Study population

All patients diagnosed with bronchial asthma.

2.5. Inclusion criteria

(i) Age over 18 years and

(ii) Receiving treatment for asthma for at least one year.

2.6. Exclusion criteria

Patients with comorbid heart disease.

2.7. Sampling

All eligible patients were included. Sampling was not employed.

2.8. Data collection method and tools

Data were collected through direct interviews with patients using a close-ended questionnaire. The questionnaire included information on patients' sociodemographic characteristics, clinical history and examination, and risk factors that could contribute to poor asthma control.

Poor asthma control was measured by the number of asthma exacerbations requiring hospital or intensive care unit (ICU) admission.

2.9. Data management and statistical analysis

Data were analyzed using the SPSS (version 25; IBM Corp., Armonk, NY, USA). Categorical data were reported as frequencies and percentages, and continuous data were reported as mean and standard deviation. Binary logistic regression was used to assess factors contributing to poor asthma control. *P*-values < 0.05 were considered statistically significant.

3. Results

Two hundred and ninety-two patients were enrolled in this study. More than half of the patients were aged 18–45 years. Of those, 51.4% were female, 66.1% were married, and the most common occupation was housewife (21.2%). The patients' other sociodemographic characteristics are shown in Table 1.

The most frequently reported symptoms were audible wheezing (93.8%) and shortness of breath (93.5%). Approximately half of the patients had had asthma for >10 years.

As shown in Table 1, 42% of the patients had been admitted to the hospital one to three times and 47.3% were admitted to the ICU. Of the patients, 20.8% had a medical history of hypertension or ischemic heart disease (IHD), and 62.3% received beta blockers for hypertension or IHD. Moreover, 61.3% of the patients used a beta-2 agonist inhaler and 74.7% used inhaled corticosteroids. More than half of the participants reported good drug compliance.

On clinical examination, the mean pulse rate was 96 ± 15 beats per min and the mean blood pressure was 110/69 mmHg. The average respiratory rate was 24 ± 5 breaths per min with a mean oxygen saturation of 93%.

Furthermore, 58% of the patients had proper inhalation use technics. Most of the patients (80%) reported triggers at home or work. Additionally, 65% reported symptoms of exacerbation, of whom 91.6% reported discussing the symptoms with a physician.

While, 31.5% of the patients were smokers and smoked a mean of 3.5 ± 2 packs/day, 41.9% reported passive smoking exposure, and 28.8% reported using snuff. Almost all patients (98.6%) denied alcohol use.

As shown in Table 2, improper inhaler use, the presence of triggers at home (odds ratio [OR]: 14.339, *P* = 0.003) or work (OR: 9.949, *P* = 0.003), and passive smoking (OR 12.813, *P* = 0.016) were significantly associated with hospital admission.

As shown in Table 3, female sex (OR: 2.047, *P* = 0.039) and the presence of triggers at home or work (OR: 2.310, *P* = 0.026) were the significantly associated with ICU admission.

Table 1: Socio-demographic characteristics and medical history of asthmatic patients attending Atbara Teaching Hospital.

	Category	Frequency	Percentage (%)
Age (yrs)	18–45	164	56.2
	46–60	97	33.2
	>60	31	10.6
Gender	Male	142	48.6
	Female	150	51.4
Marital status	Married	193	66.1
	Not married	99	33.9
Occupation	Accountant	8	2.7
	Farmer	24	8.2
	Housewife	62	21.2
	Medical field	46	15.8
	Student	47	16
	Others	95	32.5
	Not working	10	3.4
Hospital admission		262	89.7
	1–3 times	110	42
	4–6 times	87	33.2
	>6 times	65	24.8
ICU admission		138	47.3
Past medical history of HTN or IHD		61	20.8
Beta blocker for HTN or IHD		38	62.3
Use of beta 2 agonist inhaler	Yes	179	61.3
	No	113	38.7
	Unsafe	62	54.8
	Addictive	95	84
	Expensive	113	100
	Unavailable	109	96.5
Use of inhaled corticosteroid		218	74.7
Stop inhaled corticosteroids when seem to be improved	Yes	218	74.7
	Expensive	186	85.3
	Unavailable	218	100
	No	66	22.6

Table 2: Factors affecting hospital admission among asthmatic patients attending Atbara Teaching Hospital.

	P-value	Odds ratio
Age	0.291	1.477
Gender	0.279	2.116
Compliance to medications	0.461	0.594
Technique of inhaler use	0.003	14.339

Table 2: Continued.

	P-value	Odds ratio
Triggers at work or home	0.003	9.949
physician discusses symptoms of exacerbation	0.116	2.816
Active smoking	0.15	0.071
Snuffer	0.150	3.132
Passive smoking	0.016	12.813
Alcohol	0.999	0.00

Table 3: Factors affecting ICU admission among asthmatic patients attending Atbara Teaching Hospital.

	P-value	Odds ratio
Age	0.143	1.355
Gender	0.039	2.047
Compliance to medications	0.353	1.400
Technique of inhaler use	0.172	0.627
Triggers at work or home	0.026	2.310
Physician discusses symptoms of exacerbation	0.326	1.376
Active smoking	0.490	0.732
Snuffer	0.352	0.845
Passive smoking	0.331	1.507
Alcohol	0.999	0.000

4. Discussion

Asthma is the leading cause of disability and mortality in both children and adults. According to different national and international asthma guidelines, controlling asthma symptoms and preventing asthma flare-ups are the main goals in the treatment of asthma, and it is imperative to assess each patient's asthma control status. This study aimed to investigate the factors contributing to poor asthma control in patients with asthma attending the Atbara Teaching Hospital.

Females predominated in this study, which is consistent with the findings of studies by Burr *et al.*, Almqvist *et al.*, and Postma *et al.* [12–14]. However, other studies have reported a male dominance [15, 16]. In this study, audible wheezing was the most common symptom in asthmatics, which is consistent with other studies [15]. When asthma is not controlled, the first step is to assess the adequacy of the prescription and patient adherence to medications because nonadherence leads to increased morbidity and mortality [17]. Questionnaire responses revealed that 47% of participants had poor medication adherence, which is consistent with the results of studies by Apter *et al.*, Milgrom *et al.*, and Bender *et al.*, which found that only a small proportion of people with asthma regularly take prescription medications [18–20]. Medication nonadherence was not identified as a risk factor for hospital or ICU admission, although many previous studies have reported an association between medication adherence and reduced rates of asthma exacerbation [21].

Most patients in this study had asthma for 10 years or longer. Long disease duration, which reflects longstanding inflammation, was the main

cause of uncontrolled asthma. This result was consistent with that of a study by Cassino *et al.*, which found a significant relationship between a longer duration of asthma and a lower predicted FEV1 value [22]. The same study also found a significant difference in functional residual capacity (FRC) according to asthma duration, suggesting that chronic asthma can lead to irreversible changes in the airways, leading to parenchymal remodeling [22].

Our study assessed the association between hospitalization owing to uncontrolled asthma and inadequate inhalation technique. The findings were similar to those of a Saudi study, which found an association between inappropriate use of asthma inhalers and uncontrolled asthma [23]. Similar findings were also reported in Ethiopian, and Nigerian studies, with ORs of 2.5 (95% CI: 1.26–4.98) and 18.9 (95% CI: 2.3–155.6), respectively [24, 25]. Inadequate inhalation technique decreases drug delivery and effectiveness, which in turn contributes to uncontrolled asthma.

In this study, home or work triggers were significantly associated with hospital and ICU admission rates. This finding is consistent with previous studies, which have shown that frequent exposure to multiple triggers exacerbates asthma [26–28]. Asthma guidelines recommend that patients with asthma identify triggers and reduce exposure to these triggers to improve control and reduce their need for medication [29, 30]. Our study found that smoking was significantly associated with hospitalization. This is consistent with the results of previous studies by Kiljander *et al.*, Boulet *et al.*, and Braido *et al.* which showed that smoking negatively affects asthma control, although the definitions of control differed between studies [31–33]. Furthermore, Çolak *et al.* assessed the effect of active smoking and showed that active smokers had a higher risk of exacerbations than nonsmokers [34].

This study has limitations, as it is a cross-sectional study, and association does not imply causality. Recall bias may also have influenced patient responses. Despite these limitations, this study was able to assess the level of asthma control and related factors in patients attending Atbara Teaching Hospital in Sudan.

5. Conclusion

Asthma is a major health problem in Atbara, Sudan. Inappropriate inhaler use, home and work triggers, and exposure to secondhand smoke were significant predictors of hospitalization, whereas female sex and the presence of home or work triggers were significant predictors of ICU admission.

Declarations

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None.

Ethical Considerations

Ethical clearance was obtained from the Scientific Research and Publishing Unit of Nile Valley University and the hospital authorities. Written consent was obtained from the participants.

Competing Interests

None.

Availability of Data and Material

All data presented in this article or any additional information shall be available on request.

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None.

Abbreviations and Symbols

FEV1: Forced expiratory volume in 1 second

FRC: Functional residual capacity

HTN: Hypertension

ICU: Intensive care unit

IHD: Ischemic heart disease

WHO: World Health Organization

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