

Original Article

Burden, Clinical Aspects and Management of Bronchial Asthma at Outpatient Clinics in Jeddah Saudi Arabia

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Abstract

Background: Asthma is a health disorder that is prevalent worldwide, and it imposes a great burden on primary health care (PHC) facilities. This work aims to study the magnitude and clinical aspects of bronchial asthma (BA) and to explore the pattern of its management at outpatient clinics (OPCs) in Jeddah, Saudi Arabia.

Methods: A cross-sectional study enrolled 2,501 patients who visited the OPCs at two private hospitals in Jeddah during the study period. All patients were examined by a specialist. Data were collected using a checklist form to obtain personal characteristics, clinical assessment and management, as well as the outcome of the visits.

Results: BA accounts for 4.27% of all visits, and for 19.49% of respiratory disorders visits to OPCs. Children under 6 years old were twice as likely to develop BA (OR: 1.89; 95% CI: 1.130, 3.147, $p < 0.015$) compared to individuals older than 40 years. The common BA symptoms were cough (77.4%), dyspnea (42.5%), wheeze (29.2%), and sputum production (25.7%). CXR was the most frequent investigation performed on patients with BA (26.4%). No lung function or immunological tests were performed. Cortisol (21.7%), short-acting β_2 agonist (21.7%), antibiotic (41%), paracetamol (17%), cough syrup and antihistamines (30% and 19.8%), and additionally, ketotifen (4.7%) and anti-leukotriene (7.5%) were prescribed to the patients. Counseling was neglected by physicians. The majority of cases were discharged.

Conclusion: BA is a common cause for PHC visits. OPC management and use of antibiotics for BA should be revised with emphasis on adherence to the standard recommendations. PHC physicians should prioritize educating people about the prevention and control of BA.

Keywords: bronchial asthma, Primary Healthcare, outpatient clinics, management, Saudi Arabia

Introduction

Bronchial asthma (BA) is an inflammatory disease of the bronchial tree, associated with narrowing of the airways and obstructive impairment in lung function (1). It is one of the most prevalent chronic diseases globally and presents a major public health challenge. It is associated with frequent hospitalization and visits to the emergency departments (ED). Although, it is rare, death from asthma could occur at any age (2-4). According to the Global Asthma Report 2011, an estimated 235 million people including 6 million children have BA worldwide (2). Asthma prevalence is high in Saudi Arabia (19.5% – 23%), and much higher than the prevalence reported in most countries (4). Age, gender and environmental conditions are important determinates of BA (1-5). Cough, shortness of breath and wheeze are common symptoms of asthma, with obstructive impairment of pulmonary function test, and in severe cases disturbance in blood gases (6-8). Asthma in children may lead to hospitalization and impaired quality of life. The severity and duration of asthma are related to airway remodeling. The goals of treatment for BA involve correcting severe hypoxemia, rapidly reversing airflow obstruction and decreasing relapse risk, both in the outpatient and ED settings (9, 10). Nasal allergy, migraine and repeated streptococcal infection are significantly associated with asthma (11-13). Different chemical and physiological investigations are usually used to assess asthma occurrence and severity in hospitals (14-20). Several drugs are used to treat asthma, of which, anti-inflammatory drugs are recommended for most cases with asthma (21-24). There is a need for greater emphasis on the importance of comprehensive education and regular follow-up of the performance of the primary health care practitioners in outpatient clinics (OPCs) (5).

This study is aimed to assess the burden and clinical aspects of BA in patients visiting OPCs in the private primary health care facilities in Jeddah, Saudi Arabia.

Methodology

A cross-sectional study was undertaken at outpatient departments of two private general hospitals. The first hospital is located at a high socioeconomic standard region in the Northern part of Jeddah city. The second hospital is in a comparatively lower socioeconomic standard region in the Southern part of Jeddah city. The sampling technique was a non-probability convenient one, where a total of 2,501 patients were examined at the OPCs during the study period from September 2018 to

June 2019. Data were collected from the patients by specialists in the outpatient department, which included medical history, assessment of vital signs, clinical assessment (physical examination, diagnosis, laboratory investigations and management) and outcome of the hospital visit. Patients with BA were identified and diagnosed by the specialists at the outpatient clinics. A checklist was employed to record information pertaining to the personal and clinical aspects of the OPC patients.

Data Analysis

Data were analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 22. Chi-square test and logistic regression were employed. The odds ratio and 95% confidence interval (95% CI) were calculated. The level of significance for the study was 0.05.

Ethical Considerations

Ethical clearance was taken from the Institutional Research Review Board (IRRB Number: H-02-09062021). Permission was received from the directors of the OPCs for collecting data on the outpatient visits. To protect the confidentiality of any information provided by study participants, the data collection procedure was performed anonymously.

Results

Visits due to BA disorder were encountered among 4.27% of all the visits to the outpatient clinics. BA accounted for 19.49% of all OPC visits for respiratory system disorders. The majority of visits to the OPCs were for individuals aged 16 years and older, or under 6 years, 55.8% and 29.5%, respectively. The proportion of children with BA who visited the OPCs (39.6%) was greater than those of the same age group who visited the OPCs for other illnesses (29.1%). However, this difference was not found to be statistically significant ($p = 0.067$). For subjects with BA, the median age was 8 and the mode was 4. For all visits to the OPCs, males were more frequently encountered than females 58.1% and 41.9%, respectively. No significant differences were found between subjects with BA or without BA ($p = 0.374$). However, the majority of patients with BA were males (62.2%). Most visits pertaining to BA were to the OPCs (97.3%) while only 2.8% of the visits were to the emergency room. A similar pattern was found among subjects with BA. The majority of BA patients had no investigations done on them (67.9%) when compared to the patients with other illnesses (45.7%). On the other hand, routine investigations were done on patients with BA more frequently than those with other illnesses

17.0% and 12.5%, respectively. Moreover, specific investigations were done on patients with other illnesses (41.8%) more frequently than on patients with BA (15.1%). These differences were found to be statistically significant ($p < 0.000$). The vast majority of patients with BA received either therapeutic or symptomatic treatment 49.1%, 46.25%, respectively. None of the patients with BA received any counseling from the treating doctors

(0%), and only 0.9% of them were referred for more specialized care (0.9%). Management differences showed statistical significance of $p = 0.03$. The majority of visitors to the OPCs were discharged after being seen by physicians (87.4%), while 12.6% of the subjects were admitted to the hospitals. This pattern was similar, in patients with or without BA (**Table 1**).

Table 1. Distribution of all studied subjects according to bronchial asthma and personal and clinical aspects

Independent Variables		Having bronchial asthma						Test of significance
Variables	Categories	No		Yes		Total		<i>p</i> -value
		#	%	#	%	#	%	
District of the Hospital	South district	1058	44.2%	46	43.4%	1104	44.1%	0.874
	North district	1337	55.8%	60	56.6%	1397	55.9%	
Age in years	< 6	697	29.1%	42	39.6%	739	29.5%	0.067
	6 - 16	350	14.6%	17	16.0%	367	14.7%	
	16 - 60	1209	50.5%	44	41.6%	1253	50.1%	
	> 60	139	5.8%	3	2.8%	142	5.7%	
Gender	Male	1387	57.9%	66	62.2%	1453	58.1%	0.374
	Female	1008	42.1%	40	37.7%	1048	41.9%	
Clinic	OPCs	2331	97.3%	103	97.2%	2434	97.3%	0.921
	ER	64	2.7%	3	2.8%	67	2.7%	
Investigations	No	1095	45.7%	72	67.9%	1167	46.7%	0.000*
	Routine	300	12.5%	18	17.0%	318	12.7%	
	Specific	1000	41.8%	16	15.1%	1016	40.6%	
Management	No	293	12.2%	4	3.8%	297	11.9%	0.030*
	Symptomatic	1094	45.7%	49	46.25%	1143	45.7%	
	Therapeutic	940	39.2%	52	49.1%	992	39.7%	
	Counseling	22	0.9%	0	0%	22	0.9%	
	Referral	46	1.9%	1	0.9%	47	1.9%	
Outcome	Discharged	2090	87.3%	95	89.6%	2185	87.4%	0.475
	Admitted	305	12.7%	11	10.4%	316	12.6%	

* *p*-value < 0.005 is statistically significant

Cough was the most frequent complaint among patients with BA (77.4%), and no significant differences were found among different age groups $p = 0.357$. The second most common complaint among patients with BA was dyspnea (42.5%) and was significantly more prevalent among those aged 40 – 60 years ($p = 0.049$). Wheezing was found among 29.2% of the patients with BA and was significantly more encountered among the ages of 19 to 40, and 40 to 60 (50%, 47.8%, respectively) ($p < 0.001$). Sputum production was reported by 25.7% of BA and was significantly more recorded among the ages of 19 to

40 and 40 to 60 ($p < 0.000$). Fever was found in 18.9% of the patients with BA and was significantly more encountered among those aged 6 to <19 and 19 to <40 (29.8%, 41.7%, respectively; $p < 0.000$). Vomiting was found among 6.6% of the patients and it was significantly higher in those between the ages of 6 to 19 years (25%, $p < 0.001$). Nasal symptoms and chest pain were reported by 5.7% and 7.6%, respectively. However, no significant differences were found between different age groups (Table 2).

Table 2. Distribution of the subjects with bronchial asthma visiting the OPCs according to presenting symptoms and age groups

Independent variable		Age groups in years										Test of significance
		< 6		6 -		19 -		40 +		Total		p-value
		#	%	#	%	#	%	#	%	#	%	
Vomiting	No	43	91.5	9	75	24	100	23	100	99	93.4	0.017*
	Yes	4	8.5	3	25.0	0	0.0	0	0.0	7	6.6	
Fever	No	33	70.2%	7	58.3%	23	95.8%	23	100%	86	81%	0.001*
	Yes	14	29.8%	5	41.7%	1	4.2%	0	0%	20	18.9%	
Cough	No	13	27.7%	4	33.3%	3	12.5%	4	17.4%	24	22.6%	0.357
	Yes	34	72.3%	8	66.7%	21	87.5%	19	82.6%	82	77.4%	
Dyspnea	No	31	66%	9	75%	13	54.2%	8	34.8%	61	57.5%	0.049*
	Yes	16	34%	3	25%	11	45.8%	15	65.2%	45	42.5%	
Sputum production	No	43	91.5%	12	100%	12	50%	11	50%	78	74.3%	0.000*
	Yes	4	8.5%	0	0%	12	50%	11	50%	27	25.7%	
Wheeze	No	41	87.2%	10	83.3%	12	50%	12	52.2%	75	70.8%	0.001*
	Yes	6	12.8%	2	16.7%	12	50%	11	47.8%	31	29.2%	
Nasal symptoms	No	43	91.5%	11	91.7%	23	95.8%	23	100%	100	94.3%	0.502
	Yes	4	8.5%	1	8.3%	1	4.2%	0	0%	6	5.7%	
Headache	No	47	100%	12	100%	24	100%	23	100%	106	100%	--
	Yes											
Sore throat	No	45	95.7%	12	100%	24	100%	23	100%	104	98.1%	0.465
	Yes	2	4.3	0	0%	0	0%	0	0%	2	1.9%	
Chest Pain	No	45	97.8%	12	100%	20	83.3%	20	87%	97	92.4%	0.083
	Yes	1	2.2%	0	0%	4	16.7%	3	13%	8	7.6%	

* p -value < 0.005 is statistically significant

Plain chest X-rays were ordered for 26.4% of the subjects. It was performed frequently on those aged 19 to 40, and > 40 and above (45.8% and 56.5%, respectively; $p < 0.000$). Blood gas and C-reactive protein tests were performed rarely among those with BA (2.8%

and 3.8%, respectively). Complete blood count was conducted on 9.3% of the patients. Lung function testing, IgE level, electrolyte assessment, and skin prick tests were not done on any of the patients with BA (**Table 3**).

Table 3. Distribution of the studied subjects with bronchial asthma according to investigations ordered for them

Independent variable		Age groups in years										Test of significance
		< 6		6 -		19 -		40 +		Total		p-value
		#	%	#	%	#	%	#	%	#	%	
Blood gases	NO	45	95.7%	12	100%	23	95.8%	23	100%	103	97.2%	0.677
	YES	2	4.3%	0	0%	1	4.2%	0	0%	3	2.8%	
Lung function test	NO	47	100%	12	100%	24	100%	23	100%	106	100%	0.519
	YES	0	0%	0	0%	0	0%	0	0%	0	0%	
Electrolyte	NO	47	100%	12	100%	24	100%	23	100%	106	100%	0.000*
	YES	0	0%	0	0%	0	0%	0	0%	0	0%	
CRP	NO	44	93.6%	12	100%	23	95.8%	23	100%	102	96.2%	0.136
	YES	3	6.4%	0	0%	1	4.2%	0	0%	4	3.8%	
IgE	NO	47	100%	12	100%	24	100%	23	100%	106	100%	0.136
	YES	0	0%	0	0%	0	0%	0	0%	0	0%	
Chest X-ray	NO	44	93.6%	11	91.7%	13	54.2%	10	43.5%	78	73.6%	0.000*
	YES	3	6.4%	1	8.3%	11	45.8%	13	56.5%	28	26.4%	
Skin prick test	NO	46	100%	12	100%	24	100%	23	100%	105	100%	0.136
	YES	0	0%	0	0%	0	0%	0	0%	0	0%	
CBC	NO	40	85%	12	100%	21	87.5%	23	100%	96	90.6%	0.136
	YES	7	14.9%	0	0%	3	12.5%	0	0%	10	9.4%	

* p -value < 0.005 is statistically significant

Cortisol was prescribed for 29.2% of the patients. Long-acting β_2 agonist (LABA) was prescribed for 9.4% of the patients with BA while short-acting β_2 agonist (SABA) was prescribed for 21.7% of them. Antibiotics were prescribed for 41.5% of the subjects and no significant differences were noted among the different age groups ($p = 0.153$). Antihistamine and cough syrups were prescribed to patients with BA (30.2% and 19.8%, respectively), particularly for young adults and older subjects ($p < 0.05$). Paracetamol was prescribed for 17%

of the patients with BA, particularly, those in the school age group ($p < 0.05$). The anti-inflammatory drugs, ketotifen and anti-leukotriene were prescribed for 4.7% and 7.5% of the patients with BA respectively. Non-steroidal anti-inflammatory drugs (NSAID) were prescribed for 4.7% of the patients with BA (**Table 4**). Lastly, children under 6 years of age were at two times higher risk of developing BA (OR: 1.89; 95% CI: 1.130, 3.147, $p < 0.015$) compared with those who were older than 40 years old (**Table 5**).

Table 4. Distribution of the studied subjects with bronchial asthma according to drugs prescribed to them

Independent variable		Age groups in years										Test of significance
		< 6		6 -		19 -		40 +		Total		p-value
		#	%	#	%	#	%	#	%	#	%	
NSAID	No	44	93.6	11	91.7	23	95.8	23	100	101	95.3	0.616
	Yes	3	6.4	1	8.3	1	4.2	0	0.0	5	4.7	
Paracetamol	No	3	72.3	8	66.7	24	100.0	2	95.7	88	83.0	0.004*
	Yes	4	27.7	4	33.3	0	00.0	1	4.3	18	17.0	
Nasal decongestants	No	38	80.9	10	83.3	23	95.8	21	91.3	92	86.8	0.297
	Yes	9	19.1	2	16.7	1	4.2	2	8.7	14	13.2	
Antibiotic	No	31	66.0	9	75.0	12	50.0	10	43.5	62	58.5	0.153
	Yes	16	34.0	3	25.0	12	50.0	13	56.5	44	41.5	
Inhalation therapy	No	33	71.7	8	66.7	19	79.2	16	69.6	76	72.4	0.838
	Yes	13	28.3	4	33.3	5	20.8	7	30.4	29	27.6	
LABA	No	43	91.5	11	91.7	21	87.5	21	91.3	96	90.6	0.952
	Yes	4	8.5	1	8.3	3	12.5	2	8.7	10	9.4	
SABA	No	35	74.5	9	75.0	21	87.5	18	78.3	83	78.3	0.642
	Yes	12	25.5	3	25.0	3	12.5	5	21.7	23	21.7	
Ketotifen	No	42	89.4	12	100.0	24	100.0	23	100.0	101	95.3	0.086
	Yes	5	10.6	0	0.0	0	0.0	0	0.0	5	4.7	
Antileukotrien e	No	41	87.2	12	100.0	22	91.7	23	100.0	98	92.5	0.194
	Yes	6	12.8	0	0.0	2	8.3	0	0.0	8	7.5	
Antihistamine	No	40	85.1	8	66.7	15	62.5	11	47.8	74	69.8	0.011*
	Yes	7	14.9	4	33.3	9	37.5	12	52.2	32	30.2	
Cough syrup	No	45	95.7	12	100.0	15	62.5	13	56.5	85	80.2	0.000*
	Yes	2	4.3	0	0.0	9	37.5	10	43.5	21	19.8	
Cortisol	No	32	68.1	7	58.3	19	79.2	17	73.9	75	70.8	0.575
	Yes	15	31.9	5	41.7	5	20.8	6	26.1	31	29.2	

* *p-value* < 0.005 is statistically significant

Table 5. Multi-nominal logistic regression for presence of BA and personal characteristics (Dependent variable BA: 1= yes, 2= no)

Independent variables	B	Sig.	Exp (B)	95% Confidence Interval for Exp (B)	
				Lower Bound	Lower Bound
Intercept	-3.550	0.000*			
Gender					
Male	0.227	0.270	1.255	0.838	1.881
Age groups in years					
< 6 years	0.634	0.015*	1.886	1.130	3.147
6 to < 19 years	0.246	0.499	1.279	0.627	2.609
19 to < 40 years	0.165	0.580	1.179	0.657	2.117
District					
South	-0.037	0.852	0.963	0.650	1.427

* *p*-value <0.005 is statistically significant

Discussion

Asthma is one of the most prevalent health disorders across the globe, and it imposes a huge burden on primary health care facilities. This study aimed to look into the magnitude and clinical aspects of BA, and its management at OPCs in Jeddah, Saudi Arabia. There is a strong relationship between housing quality and health outcomes regarding asthma (1, 2). In this study, asthma visits to the OPCs were higher in the Northern part compared to the Southern part; OPC visits due to BA were significantly higher among children and adolescents (median age 8 years), and the majority of patients with BA were males. These findings concurred with other studies (3, 4). The goals of BA therapy involve correcting severe hypoxemia, rapidly reversing any airflow obstruction and decreasing relapse risk, both in the OPC and ED (6). In this study, the vast majority of all visits were to the OPCs (97.3%), while 2.8% of the visits were to the emergency room (ER). This reveals that the majority of asthma attacks were mild to moderate and did not need emergency resuscitation. Cough is a predominant symptom in asthma; it can be classified into three categories: cough variant asthma, cough-predominant asthma and cough that persists despite standard therapy with inhaled corticosteroids and bronchodilators (8, 9). In this study, cough was the most frequent complaint in BA patients, and it was similar in different age groups. This concurs with previous studies (8, 9). Mechanical factors— including the load on and the activity of the respiratory muscles associated with pulmonary hyperinflation— have been proposed to

influence the perception of dyspnea during bronchoconstriction in asthma (25). Dyspnea was a complaint among 42.5% of the patients with BA in the present study. Also, wheezing was encountered among about one-third of the patients. These findings resonate with those of a previous study (26). Prolonged asthma may lead to the occurrence of airway remodeling, with worsening of asthma and airway structural changes including the appearance of mucous cells in new areas of the airways and increased production of mucus (10). In this study, sputum production was reported by about a quarter of the cases. Previous studies found fever episodes in BA patients as an independent risk factor, and linked it to common viral infection (13); this is in agreement with findings from this study. Rhinitis was identified as an important risk factor for developing asthma, and the sensation of chest tightness, chest pain and dyspnea are also symptoms reported by asthmatics (11, 12). These symptoms also concur with the study observations. Chest radiography continues to play an important role in the management of patients with severe asthma. A previous study showed severe to moderate radiograph abnormalities in 34% and moderate to minor abnormalities in an additional 41% of the examined BA patients (18). In the present study, CXR was done on about one-fifth of the patients mainly in the older subjects. Leptin and CRP levels may be useful biomarkers in monitoring the response of COPD and asthma to treatment during an exacerbation episode (16). In the present study, blood gases, and CRP were done on a few patients with BA (2.8% and 3.8% respectively).

Accurate prediction of eosinophilic asthma in cases where BA persists uncontrollably despite treatment is achievable with CBC (20). In this study, CBC was conducted on 9.3% of the patients. Spirometry should not be used in isolation to establish a diagnosis of asthma, rather, used only to support and confirm a clinical suspicion (14). Serum IgE level is predictive of asthma, and it may be used to differentiate between asthmatic and non-asthmatic individuals in conjunction with other biomarkers (17). Abnormal electrolytes levels in BA cases can happen because of lack of adequate intake or secondary to asthma medications (15). Skin prick testing can be relied upon for diagnosis of IgE-mediated allergic asthma (19). However, in the present study, lung function testing, IgE level, electrolyte assessment, and skin prick tests were not done on any patient with BA. Inhaled corticosteroids (ICS) are the standard first-line therapy for the management of asthma. Once-daily regimens can simplify treatment and offer increased convenience to patients, potentially improving adherence, and therefore asthma control. Combination therapies incorporating LABA with an ICS are effective in asthma when inadequately controlled despite low/medium-dose ICS therapy (21, 22). In the present study, cortisol was prescribed for 29.2% of the patients. LABA were prescribed to 9.4% of the patient with BA, while SABA were prescribed to 21.7% of them. The British Thoracic Society guidelines state that treatment of acute asthma exacerbations, even when an infection is considered the trigger, should be steroids, and not antibiotics (22). A recent Cochrane review found that using antibiotics for asthma exacerbation showed no reduction in symptoms (23). In the present study, antibiotics were prescribed for 41.5% of the subjects with BA. In the present study, antihistamine and cough syrups were prescribed to patients with BA (30.2% and 19.8% respectively), particularly for young adults and older subjects. Antihistamines in children with asthma and allergic rhinitis have been shown to significantly reduce the risk of emergency care (24). Anti-leukotrienes are an important novel therapy for asthma, leukotriene synthesis or action has a salutary effect in the treatment of both induced and spontaneously occurring asthma. These results provide strong biological proof that leukotrienes are important mediators of the asthmatic response (22, 23). In the present study, ketotifen and anti-leukotriene were prescribed for 4.7% and 7.5% of the patients with BA respectively. Aspirin (acetylsalicylic acid) and other NSAIDs cause deterioration in respiratory function in approximately 10% of adults with asthma and a smaller proportion of children with asthma

(21). However, in the present study, NSAIDs were prescribed for 4.7% of the patients with BA. The study findings support the public health importance of emphasis on comprehensive education on prevention and management of BA, and periodic follow-up of the performance of the primary health care staff in OPCs (5). No patients in this study reported receiving any counseling from the OPC staff, and only 0.9% of them were referred for more specialized care. Asthma deaths are now relatively rare (7). In this study, the majority of asthma patients in the OPCs were discharged after being seen by the physician.

Conclusion

Bronchial asthma is a common reason for visits to private primary health care facilities. It is common among children. Management of asthma at outpatient clinics as well as the use of antibiotics for treating bronchial asthma should be revised with emphasis on adherence to the standard recommendations for the management of asthma. Primary health care providers should make a greater effort to impart education to asthmatic patients about disease prevention and control.

Disclosure

Statement

The authors declare no conflict of interest.

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Ethical consideration

The ethical approval of this research was approved by the IRRB of Ibn Sina National College. IRRB approval number is (H-02-09062021). Protocol identification number (037MP03062021).

Data availability

Data that support the findings of this study are embedded within the manuscript.

Authors' contribution

All authors FG, AA, TB, SA, ZY contributed to proposing the points, collection of data, analysing the data and writing the manuscript.

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