

Reasons for recurrent visits of emergency department by pediatric asthmatic patients in Al-Qassim Region

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ABSTRACT

Introduction: Bronchial asthma has been the subject of controversy for several decades. The Global Initiative for Asthma (GINA) describes asthma as “a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness, and cough that vary over time and in intensity, together with variable expiratory airflow limitation.” Although not strictly a definition, this description captures the essential features for clinical purposes. Bronchial asthma is defined as a chronic lung disease characterized by airway obstruction, inflammation and hyper-responsiveness that leads to symptoms like wheezing, coughing, chest tightening and shortness of breath especially at night or in the morning. It is one of the most common medical emergency conditions in the pediatrics all over the world. The primary care provider is the cornerstone of this study; his/her awareness about reasons of recurrent visits of emergency department by pediatric asthmatic patients would help to reduce the frequency of ED visits, which lead to minimizing the load on hospitals by addressing patient’s concerns, correcting some misconceptions, and improving the patients’ and their parents’ knowledge and awareness. **Aim:** This study aims to identify the predictors associated with frequent visits to the ED among asthmatic children at main governmental hospitals in Al-Qassim Region. **Materials and Methods:** This is a cross-sectional study conducted at three different emergency departments in Qassim region such as Maternity and Children Hospital in Buraidah, King Saud Hospital in Unayzah, and Alrass General Hospital. A validated interview questionnaire was used which includes general demographic characteristics, whether the caregiver has been educated about asthma as a disease, about the use of medicines and inhalers, about the management of symptoms, reasons for using the ED for asthma care, prescription received during the ED visit, and referral from ED. **Results:** Children with less than 3 visits to ED for the last 6 months were 70.3% while those with 3 or more visits were 29.7%. Nearly all patients (88.3%) had already been diagnosed with asthma with their attending physician. The most commonly known medication was beta-agonist (62%) while the most common reason for ED visit was “to obtain oxygen” and “to obtain a bronchodilator.” The prevalence of ED referral to PHC was low (9.7%). Based on the adjusted regression model, we observed that medication used (AOR = 1.760, $P = 0.046$) and referral from ED (AOR = 3.711, $P < 0.001$) were the significant factors being associated with 3 or more visits to ED. **Conclusion:** Recurrent ED visitation of children with asthma was moderately low. Furthermore, medication used and referral from ED were identified as the predictors being associated with recurrent visits to ED. Further research is needed in order to validate the predictors being associated with recurrent ED visitation of asthmatic children in our region.

Keywords: Asthma, emergency department, pediatric, recurrent visit

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Statistical Analysis Method

Descriptive statistics has been presented as counts and proportions (%). The relationship between the frequency of ED

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visits versus the characteristics of the children with asthma and ED revisit had been conducted using Chi-square test. $P < 0.05$ was considered statistically significant. Multivariate regression analyses had been conducted as well to predict the impact of 3 or more visits from the selected characteristics of patients with P value as well as confidence was also being reported. All data analyses were performed using the statistical package for social sciences, version 21 (SPSS, Chicago, IL, USA).

Results

As seen in Table 1, we recruited 300 asthmatic children out of 359 estimated sample size giving an overall response rate of 83.6%. Age range was from 1–14 years old (mean 8.39) of whom the majority were in the middle age group (6–9 years) with 39.7% followed by 10–14 years old group (38.3%). More than half of them were males (55.3%) with 57% of them were in primary school. Nearly all patients (88.3%) had previously diagnosed with asthma by their attending physician with parents indicated the same assumptions (89.7%). With regards to the frequency of ED visits in the previous 6 months, more than 70% of them indicated less than 3 visits, whereas 29.7% indicated 3 visits or more to ED. Regarding medication used, 62% of them used beta-agonist, while 35.3% used a combination of ICS and beta-agonist.

Figure 1 described the educational level of parents. The majority of parents were having bachelor degree (father and mother: 46.3% and 46%, respectively), followed by secondary education for mother (37.3%), or master degree for father (23.7%), whereas parents were few in Ph.D. (father and mother: 3.3% and 7% respectively).

Table 2 presented the reason for ED visit, follow-up, and referral to the frequency of ED visits in 6 months. Based on the results, the most common reason for ED visit was to obtain oxygen (56.3%), followed by to obtain a bronchodilator (56.3%) and nebulizer at ED is more useful (21.0%), while the least reason was 24 h availability of ED (8.3%). With regards to follow-up clinic, 23.3% of them had a regular follow-up visit to PHC/family medicine, whereas 22.7% preferred hospital/OPD. Moreover, 15.3% of them were referred to hospital, while 9.7% were referred to PHC/family medicine. It was also revealed that the most common medication as prescribed by ED was beta-agonist (56.7%) and a combination of ICS and beta-agonist (40%). When measuring the relationship between frequency of ED visits among the reason to ED visit, follow-up, referral from ED, and prescription of medication from ED, it was found that to obtain a bronchodilator ($P < 0.001$), to obtain oxygen ($P < 0.001$), nebulizer at ED is more useful ($P < 0.001$), follow-up clinic ($P < 0.001$), and referral from ED ($P < 0.001$) were all statistically significant to frequency of ED visits.

Table 3 described the myths, beliefs, and education about asthma treatment and management according to frequency ED visits in 6 months. It was revealed that the most common belief about asthma treatment was about “prolong use of inhaler was not good” and

Table 1: Description of sociodemographic characteristics of children (n=300)

Study variables	n (%)
Age group in years	
1-5 years	66 (22.0%)
6-9 years	119 (39.7%)
10-14 years	115 (38.3%)
Gender	
Male	166 (55.3%)
Female	134 (44.7%)
Education of child	
Toddler	56 (18.7%)
Preschool	22 (07.3%)
Primary	171 (57.0%)
Intermediate	51 (17.0%)
Previous asthma diagnosis made by the physician	
Yes	265 (88.3%)
No	35 (11.7%)
Parents belief that their child has asthma	
Yes	269 (89.7%)
No	31 (10.3%)
Frequency of ED visits in the previous 6 months	
<3 visits to ED	211 (70.3%)
≥3 visits to ED	89 (29.7%)
Medication used	
Beta-agonist alone	186 (62.0%)
Inhaled corticosteroid alone	04 (01.3%)
ICS and Beta-agonist	106 (35.3%)
Leukotrienes	01 (0.30%)
Other	03 (01.0%)

ED=Emergency Department, ICS=Inhaled corticosteroid

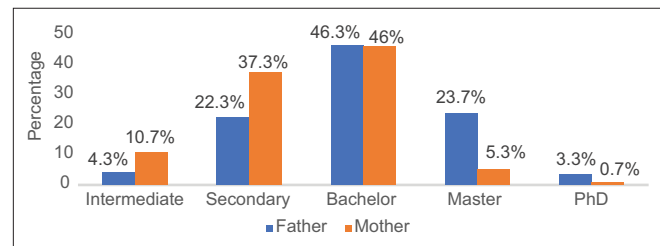


Figure 1: Described the educational level of parents. Majority of parents were having bachelor degree (Father/Mother; 46.3% and 46% respectively), followed by secondary education for mother (37.3%), or master degree for father (23.7%) whereas parents were few in PhD (Father/Mother; 3.3% and 0.7% respectively)

“asthma runs strongly in family.” It was also revealed that statement about “Inhaler can lead to dependence or addiction” ($P = 0.006$), “after asthma exacerbation, use of the inhaler should stop” ($P = 0.005$), and “asthma runs strongly in families” ($P < 0.001$) had significant relationship with the frequency of ED visits. With regards to education about asthma management, the most commonly known education was about “asthma medication device” ($P < 0.001$) followed by “education about BA” ($P = 0.023$) and “physician discussed ways on how to prevent asthma symptoms” ($P = 0.025$).

When comparing the frequency of ED visits among the sociodemographic characteristics of participants, it was found

Table 2: Reason for ED visit, follow-up, and referral according to frequency of ED visits in 6 months (n=300)

Statement	Overall n (%)	Frequency of ED visits		P [§]
		<3 visits n (%)	≥3 visits n (%)	
Reason for ED visit				
To obtain a bronchodilator	155 (51.7%)	128 (60.7%)	27 (30.3%)	<0.001 **
To obtain oxygen	169 (56.3%)	135 (64.0%)	34 (38.2%)	<0.001 **
Severity of asthma	58 (19.3%)	36 (17.1%)	22 (24.7%)	0.125
Belief of fast response	28 (9.3%)	20 (9.5%)	08 (9.0%)	0.894
24 h availability	25 (8.3%)	19 (9.0%)	06 (6.7%)	0.517
Treatment was quick	32 (10.7%)	25 (11.8%)	07 (7.9%)	0.307
Nebulizer at ED is more useful	63 (21.0%)	60 (28.4%)	03 (3.4%)	<0.001 **
Other	13 (4.3%)	08 (3.8%)	05 (5.6%)	0.478
Follow-up clinic				
No follow-up	126 (42.0%)	103 (48.8%)	23 (25.8%)	<0.001 **
PHC/Family medicine	70 (23.3%)	50 (23.7%)	20 (22.5%)	
Hospital/OPD	68 (22.7%)	45 (21.3%)	23 (25.8%)	
Mix	30 (10.0%)	10 (4.7%)	20 (22.5%)	
Other	06 (2.0%)	03 (1.4%)	03 (3.4%)	
Referral from ED				
No referral	221 (73.7%)	175 (82.9%)	46 (51.7%)	<0.001 **
PHC/Family medicine	29 (9.7%)	15 (7.1%)	14 (15.7%)	
Hospital/OPD	46 (15.3%)	18 (8.5%)	28 (31.5%)	
Other	04 (1.3%)	03 (1.4%)	01 (1.1%)	
Prescription medication from ED				
Beta-agonist alone	170 (31.7%)	125 (59.2%)	45 (50.6%)	0.494
Inhaled corticosteroid alone	03 (1.0%)	02 (0.9%)	01 (1.1%)	
ICS and Beta-agonist	122 (40.0%)	80 (37.9%)	42 (47.2%)	
Leukotrienes	05 (1.7%)	04 (1.9%)	01 (1.1%)	

ED=Emergency Department, PHC=Primary Health Care, OPD=Outpatient Department, ICS=Inhaled corticosteroid. [§]P value has been calculated using Chi-square test. ** Significant at P<0.05 level

Table 3: Myths, belief, and education about asthma treatment and management according to the frequency of ED visits in 6 months (n=300)

Statement	Overall n (%)	Frequency of ED Visits		P [§]
		<3 visits n (%)	≥3 visits n (%)	
Myths and beliefs about asthma treatment				
Inhaler can lead to dependence or addiction	95 (31.7%)	77 (36.5%)	18 (20.2%)	0.006 **
It is not good to use the inhaler for too long	119 (39.7%)	88 (41.7%)	31 (34.8%)	0.266
After asthma exacerbation, use of the inhaler should stop	34 (11.3%)	31 (14.7%)	03 (3.4%)	0.005 **
Medication should be administered only when the children are symptomatic	70 (23.3%)	51 (24.2%)	19 (21.3%)	0.598
It is better to use inhalers without a holding chamber	29 (9.7%)	23 (10.9%)	06 (6.7%)	0.265
It is better to go to ED even if symptoms are mild	15 (5.0%)	08 (3.8%)	07 (7.9%)	0.139
Tablet or syrup medication is better than inhaler	38 (12.7%)	29 (13.7%)	09 (10.1%)	0.388
Asthma runs strongly in families	119 (39.7%)	109 (51.7%)	10 (11.2%)	<0.001 **
Other	16 (5.3%)	09 (4.3%)	07 (7.9%)	0.205
Education about asthma management				
Received any education about BA	226 (75.3%)	176 (83.4%)	50 (56.2%)	<0.001 **
Received education about asthma medication device	260 (86.7%)	189 (89.6%)	71 (79.8%)	0.023 **
Physician discussed a prospective plan how to manage asthma	182 (60.7%)	133 (63.0%)	49 (55.1%)	0.196
Physician discussed ways on how to prevent asthma symptoms	197 (65.7%)	147 (69.7%)	50 (56.2%)	0.025 **
Physician discussed ways on how to treat both mild and severe symptoms	79 (26.3%)	60 (28.4%)	19 (21.3%)	0.203
Received a written plan guides for self-management	78 (26.0%)	55 (26.1%)	23 (25.8%)	0.968

ED=Emergency Department, BA=Bronchial Asthma. [§]P value has been calculated using Chi-square test. ** Significant at P<0.05 level

that age group in years ($P = 0.001$), education of child ($P = 0.004$), and medication used ($P = 0.004$) revealed to have a significant relationship with the frequency of ED visits. Other variables such

as gender, previous asthma diagnosis made by the physician, and parents' belief that their child has asthma were not statistically significant at the frequency of ED visits [Table 4].

A multivariate regression analysis has been conducted [Table 5] to predict which factors are independently associated with 3 or more visits to ED. It was revealed that non-beta agonist user was significantly more associated with having 3 or more visits (AOR = 1.762, $P = 0.046$). Those with a referral from ED were 3 times more likely to have more recurrent ED visitation compared to those without a referral from ED (AOR = 3.711, $P < 0.001$).

Discussion

Bronchial asthma has been the subject of controversy for several decades. The Global Initiative for Asthma (GINA) describes asthma as “a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness, and cough that vary over time and in intensity, together with variable expiratory airflow limitation.” Although not strictly a definition, this description captures the essential features for clinical purposes.^[1] Bronchial asthma is defined as a chronic lung disease characterized by airway obstruction, inflammation and hyper-responsiveness that leads to symptoms like wheezing, coughing, chest tightening and shortness of breath especially at night or in the morning. It is one of the most common medical emergency conditions in the pediatrics all over the world.^[2,3]

The purpose of the present study is to determine the predictors associated with frequent visits to ED among asthmatic children at main government hospitals in Al-Qassim Region. In this study, 29.7% of the asthmatic children had three or more visits to ED, while 70.3% had less than 3 visits in the previous 6 months. Several published studies reported frequent visitation to ED (3 or more ED visits) among asthmatic children ranging from 26.9% to 61.6%.^[4-9] In Saudi Arabia, AlJahdali *et al.*^[4] when studied the factors associated with patients visits to the emergency department for asthma therapy found that the majority of the patients had 3 or more visits to ED accounting to 61.6% which was relatively higher compared to our study finding. Another study published in Central Region^[5] reported that 36.7% of asthmatic children had ED visits of 3 or more which was consistent with our report. In Colombia, Rodriguez-Martinez *et al.*^[6] reported 26.9% of 3 or more visits to ED for asthma in the last 6 months which was in agreement with our result. However, Rha *et al.*^[7] found 47% of the children with repeated visits to ED for asthma which was more frequent visits than the outcome of our study.

As seen in our findings, we identified that the most common medication being used was beta-agonist (62.0%). Al-Muhsen *et al.*^[6] discovered inhaled corticosteroid as the most frequently used medication which was not congruent with our report. Moreover, we also found that the prevalence of referral from ED to PHC was relatively low (9.7%) and this was not in agreement from the study published in Riyadh with 39.4% of ED referral to PHC.^[4]

Moreover, it can be seen in our report that the most common reason for ED visitation was to obtain oxygen and to obtain

Table 4: Relationship between sociodemographic characteristics and the participants’ frequency of ED visits in 6 months (n=300)

Factor	Frequency of ED visits		P [§]
	<3 visits n (%)	≥3 visits n (%)	
Age group in years			
1-5 years	35 (16.6%)	31 (34.8%)	0.001 **
6-9 years	94 (44.5%)	25 (28.1%)	
10-14 years	82 (38.9%)	33 (37.1%)	
Gender			
Male	110 (52.1%)	56 (62.9%)	0.086
Female	101 (47.9%)	33 (37.1%)	
Education of child			
Preschool or toddler	45 (21.3%)	33 (37.1%)	0.004 **
Primary or Intermediate	166 (78.7%)	56 (62.9%)	
Previous asthma diagnosis made by the physician			
Yes	185 (87.7%)	80 (89.9%)	0.586
No	26 (12.3%)	09 (10.1%)	
Parents belief that their child has asthma			
Yes	192 (91.0%)	77 (86.5%)	0.244
No	19 (9.0%)	12 (13.5%)	
Medication used			
Beta-agonist	142 (67.3%)	44 (49.4%)	0.004 **
Non-Beta agonist	69 (32.7%)	45 (50.6%)	

ED=Emergency Department. [§]P value has been calculated using Chi-square test. ** Significant at $P < 0.05$ level

Table 5: Multivariate regression analysis to predict the effect of 3 visits or more from the selected characteristics of asthmatic children (n=300)

Factor	AOR	95% CI	P
Age group in years			
1-5 years	Ref		
6-9 years	0.554	0.096-3.193	0.508
10-14 years	1.639	0.853-3.150	0.138
Education of child			
Preschool or toddler	Ref		0.874
Primary or Intermediate	0.877	0.172-4.470	
Medication used			
Beta-agonist	Ref		0.046 **
Non-Beta agonist	1.760	1.010-3.069	
Follow up clinic			
Yes	1.525	0.826-2.816	0.177
No	Ref		
Referral from ED			
Yes	3.711	2.009-6.856	<0.001 **
No	Ref		

ED=Emergency Department, AOR=Adjusted Odds Ratio, CI=Confidence Interval. ** Significant at $P < 0.05$ level

a bronchodilator. It was also important to note that 19.3% of the patients visited ED because of the severity of asthma, whereas 10.7% believe that ED has a quick response to treatment; only 8.3% indicated 24 h availability as the reason for ED visitation. Various published papers documented that the most common reason for asthmatic children to visits ED was to obtain nebulized bronchodilator or oxygen.^[4,5,8]

Al-Muhsen *et al.*^[5] reported that the majority of the patients visited ED to obtain a bronchodilator by nebulizer as well as to obtain oxygen. They further revealed that one-fifth of the patients believed that the ED managed the patient faster than the clinic and claimed that their symptoms were severe enough so that they could not wait for a clinic visit. Another published study in Saudi Arabia^[4] indicated that the majority of the patients visited the ED to receive a bronchodilator by nebulizer preceding admission to ED and to obtain oxygen. Furthermore, they also found half of the patients visited the ED because of the convenience of being open 24 h or they received patient immediately. In Pakistan,^[8] researchers documented that nebulized bronchodilator or oxygen were the main reason for ED visitation. They also reported many of the patients visited ED because the treatment has no delay and one-fourth of them considered that the severity of asthma does not allow the patient to wait for clinic visits.

It could be beneficial for a patient to have sufficient education about asthma management. In our study, we discovered that most patients (86.7%) received education about asthma medication device and three out of four among them received education about bronchial asthma. In a study published by AlJahdali *et al.*,^[4] about 60% of the asthmatic children obtained any education about asthma medication device with 52.9% were being educated about bronchial asthma which was in accordance with our study findings. On the other hand, many of the patients from the study published by Al-Muhsen *et al.*^[5] did not have a formal education about asthma consisting of 51.6% and 40% of them did not receive any education regarding how to use asthma medication. In Pakistan,^[8] patients who did not have formal education regarding asthma were relatively higher (65.9%) with 70.4% were uneducated with regards to the usage of the devices and medications which was not congruent with our report.

There are many factors which may be attributed to frequent ED visitation among asthmatic children. In our study, asthmatic children who were using beta-agonist are associated with fewer ED visits, whereas those children who were using different medication are associated with more ED visits which suggested that beta-agonist are more effective than any other medications. Those patients who got a referral from ED are more likely to have more visits to ED than those who do not receive a referral, which suggested that referral coming from ED is beneficial to patient. Factors associated with recurrent visits to ED vary with each region.^[5-9] For example, in a study published by Bilal *et al.*,^[8] they documented that irregular follow-ups with clinics, low education about asthma, and an education level higher than a bachelor's degree were the most important factors associated with three or more ED visits per year, whereas Al-Muhsen *et al.*,^[5] reported no education about asthma and uncontrolled asthma were the major factors leading to frequent ED visits (three or more visits/year). Similarly, Rodriguez-Martinez *et al.*^[6] reported age, educational level of the father, and severity of the disease, and parents of children with "recurrent ED visits" were the factors being attributed to recurrent ED visits, while

Johnson *et al.*^[9] documented younger children, black children, children with excellent reported access to primary care, and children with a history of inhaled steroids were more likely to experience emergency revisits.

Conclusion

Recurrent ED visitation of children with asthma was moderately low. Asthma medication and asthma devices are the most commonly known reasons for ED visitations, whereas beta-agonist was the most common medication among asthmatic children. Furthermore, medication used and referral from ED were identified as the predictors being associated with recurrent visits to ED. Further research is needed in order to validate the predictors being associated with recurrent ED visitation of asthmatic children in our region.

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Conflicts of interest

There are no conflicts of interest.

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