Factors Associated with Patient Visits to the Emergency Department for Asthma Therapy in Jordan

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Abstract
This study aimed at analyzing the factors associated with patient visits to the emergency department for asthma therapy in Jordan, by attempting to answer the study questions: What are the factors associated with patient visits to the emergency department for asthma therapy in Jordan University Hospital, and king Abdullah Hospital in Jordan? And how to reduce the use of the emergency departments for asthma treatment as a major goal of asthma management? This cross-sectional study was conducted from January 2016 to June 2016 on 400 patients reporting to the ED of two hospitals (Jordan University Hospital and King Abdullah Hospital. The researchers adopted the descriptive methodology by adopting the questionnaires as the study tool and data collection.

1.2 Introduction

Chronic obstructive pulmonary disease (COPD, *see figure 1*) affects more people, and is the fourth leading cause of death in the world. It continues to cause a tremendous health and economic burden. COPD exacerbations contribute to a significant proportion of this burden, resulting a huge emergency department (ED) visits per year (Tsai, Griswold, Clark & Camargo, 2007).

Asthma is a common and potentially serious chronic disease that imposes a substantial burden on patients, their families and the community. It causes respiratory symptoms, limitation of activity, and flare-ups (attacks) that sometimes require urgent health care and may be fatal.

Asthma is defined as a chronic inflammatory disorder of the airways that leads to symptoms like wheezing, coughing, breathlessness and tightness of chest, especially at night or in the morning (Bilal, Haseeb, Khan, Saad, Devi, Arshad & Javed, 2016).

It is a common condition that affects people of all ages throughout the world. According to the World Health Organization (WHO), 235 million people suffered from asthma worldwide. However, recent figures from the Global Asthma Report 2014 show that the figure may have risen to 334 million. Asthma is the most common chronic disease amongst children according to the World Health Organization (WHO).

Asthma patients that depend on ED services are generally considered to have extremely poor disease control and a poor prognosis. It is important to identify characteristics related to poor disease control and frequent visits to the ED in order to apply appropriate clinical management. Unfortunately, few data are available about the characteristics of those who rely on ED care for acute episodes of asthma in Jordan (Dalcin, Piovesan, Kang, Fernandes, Franciscatto, Millan & Menna, 2004).
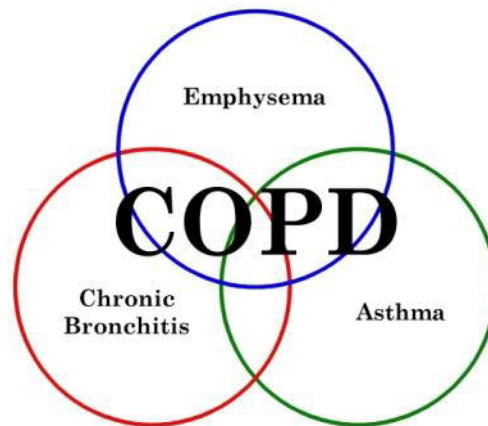
Figure (1): Chronic obstructive pulmonary disease (COPD)

There are many factors that lead patients to visit the ED. The most common reported factors include asthma severity, poor compliance, the inappropriate use of inhalers, incorrect perceptions about bronchial asthma as a disease or about its medication, the cost of medication, lack of an asthma action plan, comorbidities, over reliance on short acting bronchodilators, pollution and changes in the weather, the patient's level of education and low socioeconomic status (Hamdan, Anwar, Abdullah, Baharoon, Halwani, Al Shimemeri & Al-Muhsen, 2012).

Several meta-analysis studies have suggested that improper use of medications such as long-acting beta-2 agonists (LABA) as single therapy increases the risk of asthma-related hospitalizations and mortality.[3,15,16] Various studies have suggested that when the patient is given instructions and proper education on asthma disease, mild attacks can be managed at home and thus decrease significantly the number of days per month with daytime asthma symptoms (Al-Muhsen, Horanieh, Dulgom, Al Aseri, Vazquez-Tello, Halwani & Al-Jahdali, 2015).

Recently, a Canadian study confirmed that asthmatic patients referred to the Asthma Education center presented significantly lower rates of visits to both primary care and ER in the first year after referral (Gaudreau, Stryhn, Sanford, Cheverie, Conklin & Hansen, 2014).

Also, a Brazilian study demonstrated the effectiveness at significantly decreasing ED visits when the patients were treated with medications and followed a wide prophylactic management program based on GINA guidelines (Global Initiative for Asthma guidelines: see figure 2) (Fontes, Affonso, Calazans, de Andrade, Lasmar & Nader, 2011).
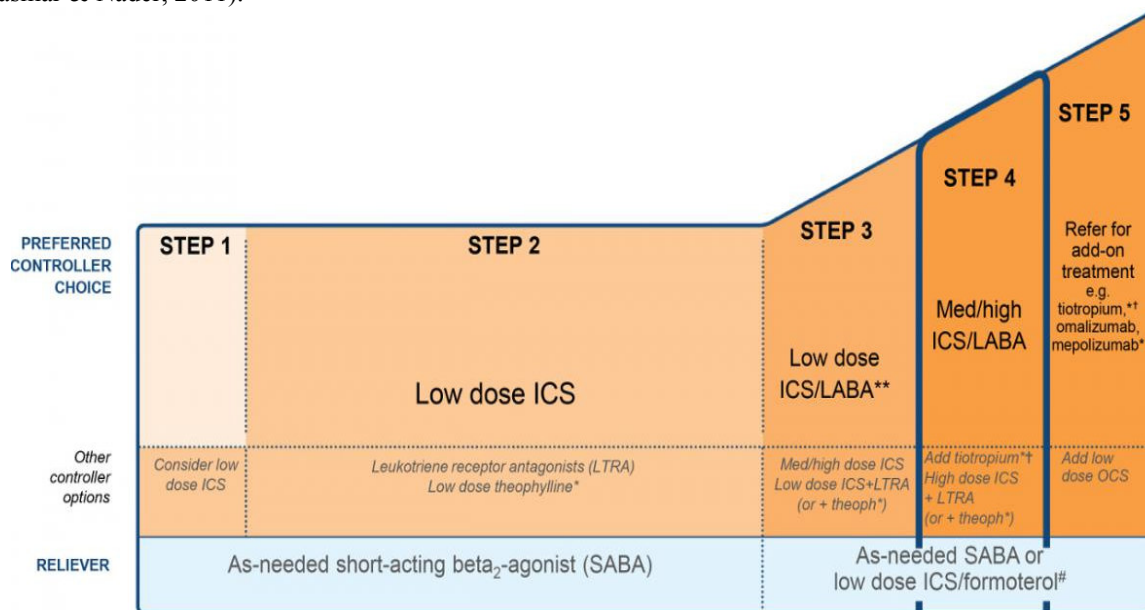

Figure (2): Global Initiative for Asthma (GINA) guidelines 2015

Emergency Room (ER) attendance due to asthma attacks is very common; this represents an important area where specialized health care delivery is needed.1 ER attendance can be minimized if asthma patients and their health care providers manage the disease according to established guidelines. The reduction in the acute use of

health services for asthma is an important goal of asthma management (Al Zabadi El Sharif, 2007).

In Jordan, studies have shown that 62% of children and 40% of adults return for ER care within one year,5 and that severe chronic asthma has been shown to be associated with ER attendance.

Therefore, effective management and the extent to which an intervention programme should be applied to control asthma and prevent ER attendance will depend primarily on understanding why this occurs. Therefore, educating the patient about management and control of disease symptoms at home is key to decrease unnecessary visits and use of resources of the ED while directing the patient to a primary care facility. On the other hand, ensuring a regular follow up appointment with the primary care physician or pediatrician can also decrease repetitive ED visits in the future and improve medication compliance (Butz, Sellers, Land, Walker, Tsoukleris & Bollinger, 2009).

1.2 Problem statement and questions of the study

The reduction in the acute use of health services for asthma is an important goal of asthma management, therefore, reducing the use of the ED for acute asthma treatment remains a major goal of asthma management that is recommended by all guidelines (Bateman, Hurd, Barnes, Bousquet, Drazen & FitzGerald, 2008).

It is not clear why many patients in our community still visit the ED and depends on the ED as their primary if not sole source of care. It is important to understand the factors associated with asthma-related ED visits in order to reduce the use of ED resource utilization for asthma treatment. There are many factors that encourage patients to seek asthma treatment at the ED and these factors may be different from one society to another. It is very important to identify characteristics of the patients and deficiencies in our health care delivery system related factors causing poor asthma control and frequent visits to the emergency department (ED). The objective of this study is to evaluate the most important factors associated with the increased usage of the emergency department in Jordan (Ministry of Health, 2016).

A cross-sectional survey of all the patients who visited the emergency room with bronchial asthma attacks over a 9-month period was undertaken at two major academic hospitals (Jordan University Hospital, and king Abdullah Hospital). The following data were collected: demographic data, asthma control in the preceding month, where and by whom the patients were treated, whether the patient received education about asthma or its medication and the patients' reasons for visiting the ED. Therefore, the problem of this study lies in its attempt to answer the following questions:

1- What are the factors associated with patient visits to the emergency department for asthma therapy in Jordan University Hospital, and king Abdullah Hospital in Jordan?
2- How to reduce the use of the emergency departments for asthma treatment as a major goal of asthma management?

1.3 Diagnosis and Management of Asthma

Asthma is a heterogeneous, multifactorial disease with variable and mostly reversible respiratory pathway obstruction based on a chronic bronchial inflammatory reaction. The symptoms (cough, rhonchus, wheezing, chest tightness, or shortness of breath) are variable and correlated with expiratory flow limitation. Although bronchial hyper responsiveness (BHR) is often present, the current GINA Guidelines no longer include it as a necessary or sufficient criterion for diagnosis (Horak, Doberer, Eber, Horak, Pohl, Riedler & Studnicka, 2016).

Owing to the heterogeneity of the disease, a number of different phenotypes can be described. Distinguishing between them can be particularly relevant to the therapy in severe cases:

1- Allergic asthma
2- Non-allergic asthma
3- Pediatric asthma/recurrent obstructive bronchitis
4- Late-onset asthma
5- Asthma with fixed airflow obstruction
6- Obesity asthma
7- Occupational asthma
8- Asthma in the elderly
9- Severe asthma

Classifications by other professional associations; the European Respiratory Society (ERS) and the American Thoracic Society (ATS) tend to focus more on a combination of clinical and pathophysiological aspects (Pijnenburg et al., 2015).

1.3.1 Diagnostic criteria

Asthma may be suspected if the patient has a positive medical history of recurrent dry coughing, especially at night, rhonchus, wheezing, chest tightness, or shortness of breath. Lung function testing can confirm the diagnosis if an airway obstruction is found reversible based on an FEV1 (Forced expiratory Volume in 1 second) increase of >12 % and >200 ml (in adults) after administering 200–400 µg salbutamol. If there is clinical

suspicion, but the lung function is normal, further bronchial challenge testing (e. g., with methacholine or indirect tests such as running exertion or inhalation of hyperosmolar solutions) may be helpful, especially to determine bronchial hyper-responsiveness in adults. Furthermore, an FEV1 increase of +12 % and >200 ml (in adults) after 4 weeks of anti-inflammatory therapy is considered diagnostic confirmation.

If an allergic trigger is suspected, an allergy diagnosis consisting of medical history, skin prick test, and/or definition of the specific IgE (Immunoglobulin group E) should be performed. This should also include sensitizations that are not clinically relevant because they can provide prognostic information. Measuring fractional exhaled nitric oxide (FeNO) has not yet become an established practice in general asthma management and is not recommended in the current guidelines for a general therapy decision (Riedler, 2015).

Nevertheless, in the view of this statement's authors, there are several indications in which an FeNO measurement makes sense, such as, for example:
1- As another component of asthma diagnosis in difficult cases (normal lung function, unclear symptoms),
2- To check on therapeutic adherence regarding inhaled corticosteroid (ICS), or
3- For the early detection of worsening asthma.

Asthma therapy aims to achieve maximum freedom from symptoms (nocturnal awakening, need for rescue medication, activity restrictions) and, thereby, maximum quality of life. This can in most cases be achieved with consistent therapy. Therapeutic adherence is a problem because patients often do not suffer in spite of poor lung function and discontinue their therapy without asking their physician once they have experienced a quick response. Regular lung function controls are necessary, and a questionnaire such as the Asthma Control Test (ACT: see figure 3) can provide additional help for evaluating therapeutic efficacy in relation to symptom control (McQuaid, Walders, Kopel, Fritz & Klinnert, 2005).

A lung function test should be performed for diagnosis or prior to starting therapy. Follow-up should occur individually based on asthma severity/symptoms in intervals of 3–6 months. In addition to these recommendations of the GINA Guidelines, lung function testing, performed approximately 4–6 weeks after a change of therapy, has proven successful for controlling treatment efficacy. A minimally relevant change in the FEV1 is indicated as 10 %. Spirometry can generally be performed in children from about 6 years of age. Prior to that, diagnosis and follow-up have to rely on clinical parameters. It is important to note that spirometry results tend to be normal in many children with asthma and only show FEV1 restrictions during exacerbations (Reddel, Taylor, Bateman, Boulet, Boushey, Busse & De Jongste, 2009).

Figure (3): Asthma Control Test (ACT)

1.3.2 Factors Associated with Patient Visits to the Emergency Department

There are many factors that lead patients to visit the ED. The most common reported factors include: Asthma severity, poor compliance, the inappropriate use of inhalers, incorrect perceptions about bronchial asthma as a disease or about its medication, the cost of medication, lack of an asthma action plan, comorbidities, over

reliance on short acting bronchodilators, pollution and changes in the weather, the patient's level of education and low socioeconomic status (Hamdan, Anwar, Abdullah, Baharoon, Halwani, Al Shimemeri & Al-Muhsen, 2012).

Some other studies indicated that other major reasons that lead patients to visit the ED: Duration of symptoms, poor adherence to medications, lack of awareness about the disease, low socioeconomic status, previous hospitalizations or ED consultations, lack of parental confidence in the medications, allergen exposure, lack of health insurance, single-parent and crowded families (Bilal, Haseeb, Khan, Saad, Devi, Arshad & Javed, 2016).

All these factors, surveyed from different previous studied for the previous five years (2011-2016) with their statistical estimates around the world are shown in table (1).

Table (1): Statistical estimates of the factors that lead patients to visit the ED

Factors (Causes) that lead patients to visit the ED	Percentage of ED visits
Asthma severity	61%
Poor compliance	55%
Inappropriate use of inhalers	43%
Incorrect perceptions about bronchial asthma as a disease	36%
Lack of an asthma action plan	44%
Over reliance on short acting bronchodilators	59%
Duration of symptoms	66%
Low socioeconomic status	71%
Previous hospitalizations or ED consultations	58%
Lack of parental confidence in the medications	60%
Lack of health insurance	44%
Single-parent and crowded families	56%

1.4 Methods and procedures

1.4.1 Study methodology

This cross-sectional study was conducted from January 2016 to June 2016 on 400 patients reporting to the ED of the two hospitals (Jordan University Hospital and King Abdullah Hospital). The inclusion criterion was such that patients with a reported diagnosis of asthma. The consenting patients were given a questionnaire to fill in the ED by the co-investigators. It had questions pertaining to their demographic information and socioeconomic status. Also, their education about the disease was evaluated from the following questions about the duration of the disease, the medications prescribed and adherence to them and the method of use of inhaler devices. They were also asked about the frequency of outpatient clinic and ED visits for issues related to asthma. Their files were cross-checked to compare the information that they provided with documented visits and confirm its validity.

The researchers adopted the descriptive methodology by adopting the questionnaires as the study tool and data collection. And this methodology helped in gathering the accurate data needed for the reaching of the results of this research.

1.4.2 demographic characteristics of the study sample

1.4.2.1 Gender

Figure 4 shows the gender distributions of the study sample of the asthma patients reporting to the ED of the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.

Figure (4): gender distributions of the study sample of the asthma patients reporting to the ED

1.4.2.2 Monthly income

Figure 5 shows the monthly income distributions of the study sample of the asthma patients reporting to the ED of the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016
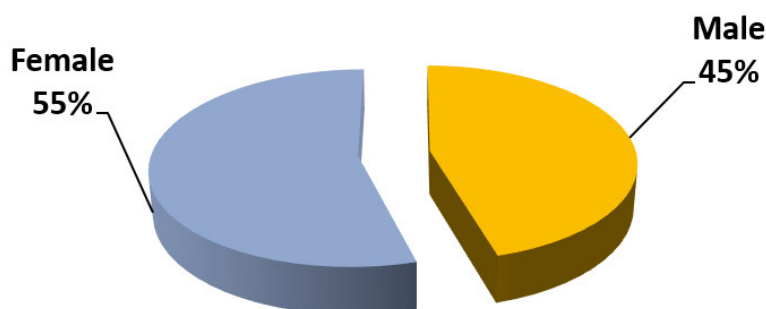
to June 2016.

Figure (5): Monthly income distributions of the study sample of the asthma patients reporting to the ED

1.4.2.3 Level of education

Figure 6 shows the level of education distributions of the study sample of the asthma patients reporting to the ED of the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.
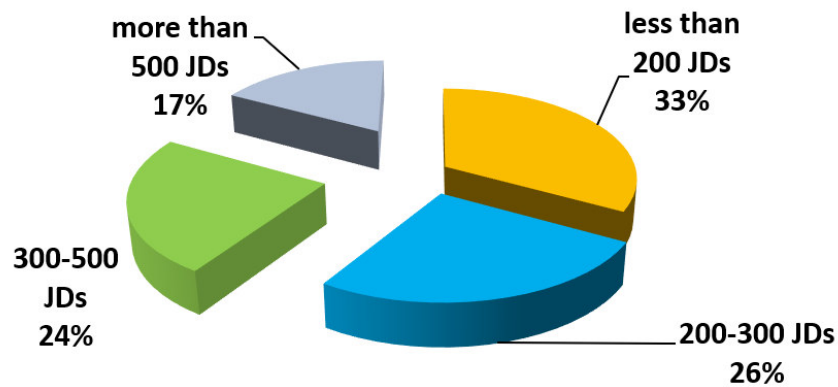
Figure (6): Level of education distributions of the study sample of the asthma patients reporting to the ED

1.4.2.4 Profession

Figure 7 shows the profession distributions of the study sample of the asthma patients reporting to the ED of the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.

Figure (7): Profession distributions of the study sample of the asthma patients reporting to the ED

1.4.2.5 ED visits

Figure 8 shows the ED visits distributions of the study sample of the asthma patients reporting to the ED of the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.
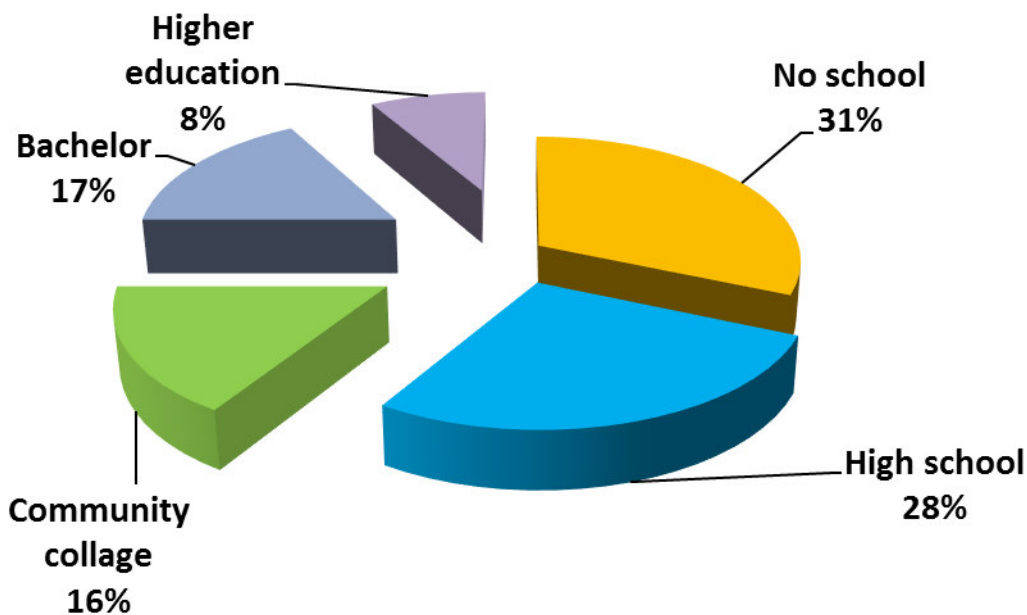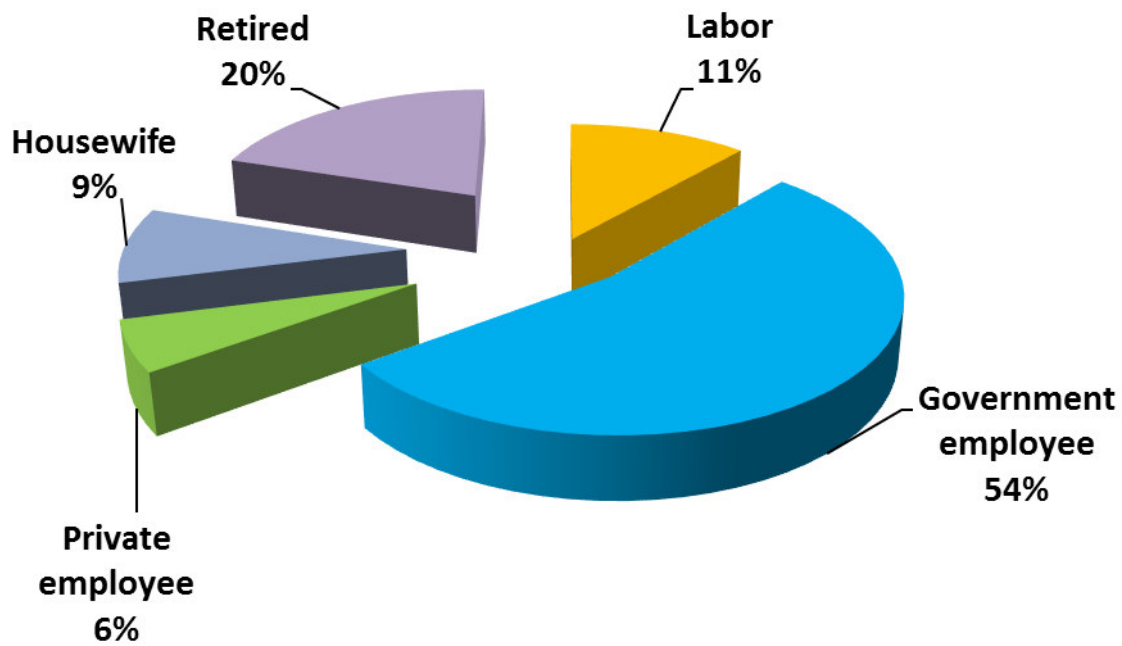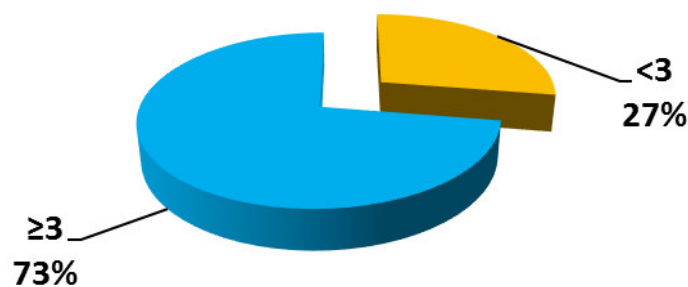

Figure (8): ED visits distributions of the study sample of the asthma patients reporting to the ED
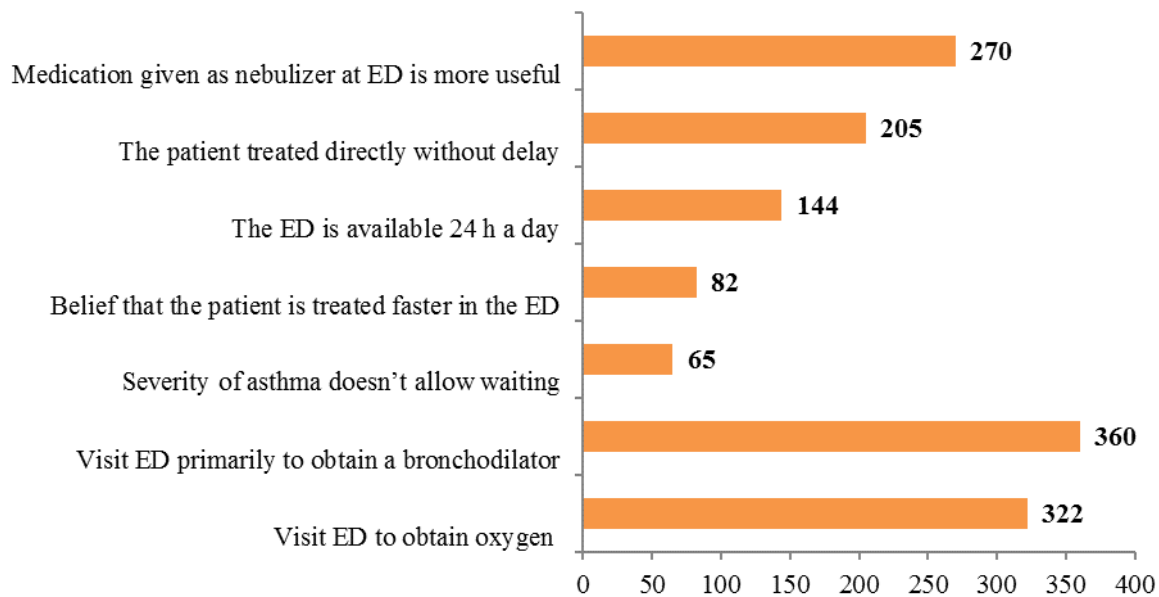
1.4.3 demographic characteristics of the reasons for ED visit

Table 2 below shows the frequencies and the percentages of the reasons for visiting the ED department by the study sample as reported by the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.

Table (2): Frequencies and the percentages of the reasons for visiting the ED department by the study sample

Reasons for visiting the ED	Frequencies	Percentages
Visit ED to obtain oxygen	322	80.50%
Visit ED primarily to obtain a bronchodilator	360	90.00%
Severity of asthma doesn't allow waiting for a clinic visit	65	16.25%
Belief that the patient is treated faster in the ED	82	20.50%
The ED is available 24 h a day	144	36.00%
The patient treated directly without delay	205	51.25%
Medication given as nebulizer at ED is more useful	270	67.50%

And figure 9 shows a histogram of the frequencies of the reasons for visiting the ED department.

Figure(9): Histogram distributions of the frequencies of the reasons for visiting the ED department
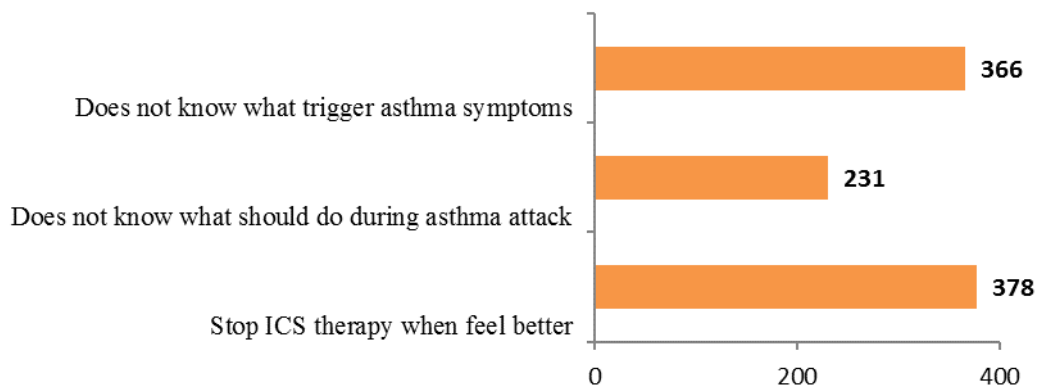
1.4.3 Knowledge about asthma management

Table 3 below shows the frequencies and the percentages of the level of knowledge about asthma management among the study sample as reported by the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.

Table (3): Frequencies and the percentages of the level of knowledge about asthma management among the study sample

Reasons for visiting the ED	Frequencies	Percentages
Does not know what trigger asthma symptoms	366	91.50%
Does not know what should do during asthma attack	231	57.75%
Stop ICS therapy when feel better	378	94.50%

And figure 10 shows a histogram of the frequencies of the level of knowledge about asthma management among the study sample as reported by the two hospitals (Jordan University Hospital and King Abdullah Hospital) for the period from January 2016 to June 2016.

Figure(10): Histogram distributions of the frequencies of the level of knowledge about asthma management among the study sample

1.5 Study results and discussion

The data was entered using Social Sciences (SPSS) software program for Windows (version 22) and the same software was used for statistical analysis. Descriptive statistics, such as means, standard deviations, or median were employed to outline age and duration of asthma disease. Percentages were also used to indicate gender, ICS use, follow up with clinics, general education level, education about medications, education about asthma, and reasons for visiting the ED. Moreover, in order to compare the distributions of asthma disease duration across

number of asthma-related ED visits (<3 versus ≥3).

A total of four hundred (N = 400) asthmatic patients were selected in this cross sectional study. The mean patients' age was 46.2 ± 17.6 years, and the mean duration of asthma illness was 37 ± 30 months.

1.5.1 Association between asthma-related ED visits and demographic and clinical characteristics
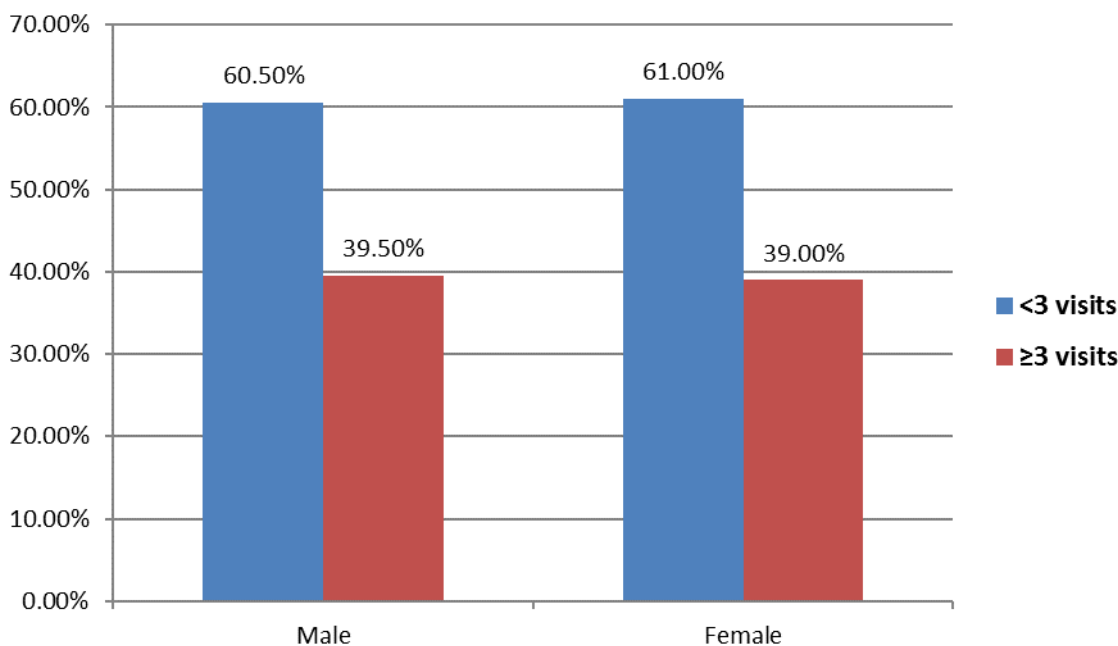
1.5.1.1 Gender and number of visits

Table 4 below shows the association between asthma-related ED visits (<3, ≥3) and gender.

Table (4): The association between asthma-related ED visits (<3, ≥3) and gender

Gender	Level	<3 visits	≥3 visits	P value
	Male	60.5%	39.5%	0.445
	Female	61.0%	39.0%	

Results show that males and females are mostly at the same level with visits to the ED, and the p-value reached 0.445. And figure 11 shows these correlations.

Figure(11): Histogram distributions of the association between asthma-related ED visits (<3, ≥3) and gender.
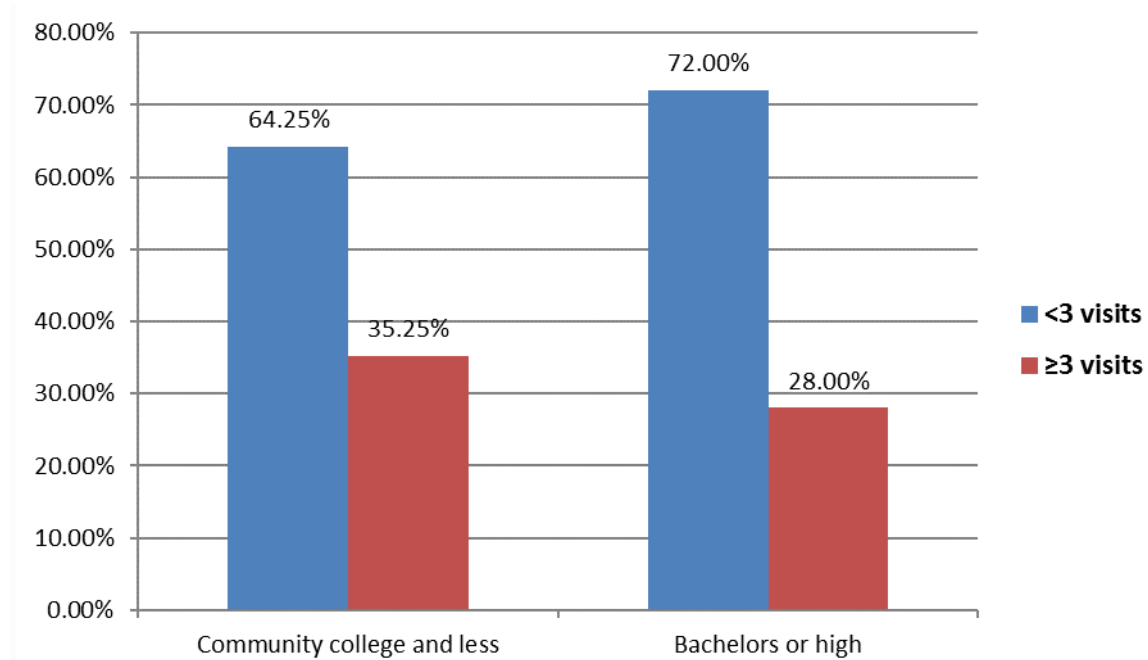
1.5.1.2 Education level and number of visits

Table 5 below shows the association between asthma-related ED visits (<3, ≥3) and the education level.

Table (5): The association between asthma-related ED visits (<3, ≥3) and education level.

Education	Level	<3 visits	≥3 visits	P value
	Community college and less	64.25%	35.25%	0.341
	Bachelors or high	72.0%	28.0%	

Results show that the Bachelors or high category had more percentage with visits to ED less than three reaching 72.0%, and the Community college and less category had more percentage with visits to the ED more than three reaching 35.25%, and the p-value reached 0.341. And figure 12 shows these correlations.

Figure(12): Histogram distributions of the association between asthma-related ED visits (<3, ≥3) and education level.
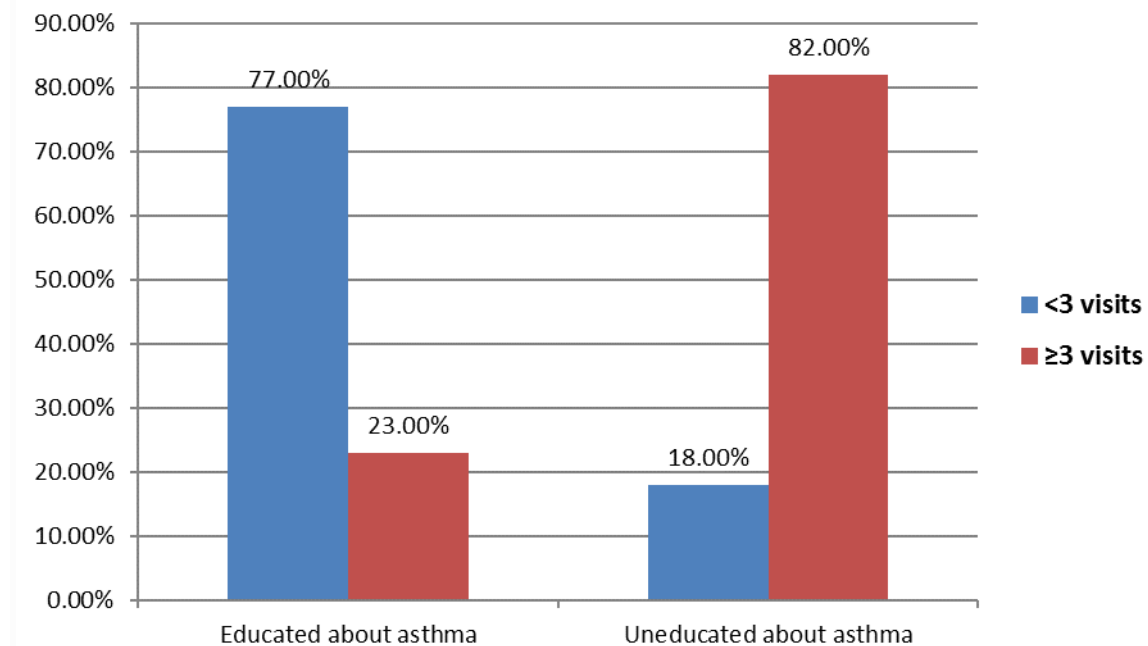
1.5.1.2 Educated about asthma

Table 6 below shows the association between asthma-related ED visits (<3, ≥3) and the education about asthma.

Table (6): The association between asthma-related ED visits (<3, ≥3) and education level.

	Level	<3 visits	≥3 visits	P value
Educated about asthma	Yes	77.0%	23.0%	0.211
	No	18.0%	82.0%	

Results show that the educated patents about asthma had more percentage with visits to ED less than three reaching 77.0%, and the uneducated patents about asthma had more percentage with visits to the ED more than three reaching 82.0%, and the p-value reached 0.211. And figure 13 shows these correlations.

Figure(13): Histogram distributions of the association between asthma-related ED visits (<3, ≥3) and education about asthma

1.6 Conclusion

several factors are identified as responsible for recurrent visits to the ED for asthma care. The important ones were patient misconceptions about the use of the ED in treating asthma, the lack of education regarding asthma, the lack of adherence to follow up appointments with exclusive asthma clinics and the decreased adherence to asthma medication. These factors need to be addressed by healthcare workers and there needs to be an overhaul at the highest level in order to improve the healthcare system.

References

Al Zabadi, H., & El Sharif, N. (2007). Factors associated with frequent emergency room attendance by asthma patients in Palestine. *The International Journal of Tuberculosis and Lung Disease*, *11*(8), 920-927.

Al-Muhsen, S., Horanieh, N., Dulgom, S., Al Aseri, Z., Vazquez-Tello, A., Halwani, R., & Al-Jahdali, H. (2015). Poor asthma education and medication compliance are associated with increased emergency department visits by asthmatic children. *Annals of thoracic medicine*, *10*(2), 123.

Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M, et al: Global strategy for asthma management and prevention: GINA executive summary. Eur Respir J. 2008, 31(1):143–78.

Bilal, M., Haseeb, A., Khan, M. H., Saad, M., Devi, S., Arshad, M. H., ... & Javed, K. M. A. A. (2016). Factors associated with patient visits to the emergency department for asthma therapy in Pakistan. *Asia Pacific family medicine*, *15*(1), 1.

Butz A, Sellers MD, Land C, Walker J, Tsoukleris M, Bollinger ME. Factors affecting primary care provider and caregiver concordance for pediatric asthma medications. J Asthma 2009;46:308-13.

Dalcin, P. D. T. R., Piovesan, D. M., Kang, S., Fernandes, A. K., Franciscatto, E., Millan, T., ... & Menna Barreto, S. S. (2004). Factors associated with emergency department visits due to acute asthma. *Brazilian journal of medical and biological research*, *37*(9), 1331-1338.

Fontes MJ, Affonso AG, Calazans GM, de Andrade CR, Lasmar LM, Nader CM, et al. Impact of an asthma management program on hospitalizations and emergency department visits. J Pediatr (Rio J) 2011;87:412-8.

Gaudreau K, Stryhn H, Sanford C, Cheverie C, Conklin J, Hansen J, et al. Use of emergency departments and primary care visits for asthma related conditions in the 3 years following an asthma education program. J Asthma 2014;51:288-93.

Hamdan, A. J., Anwar, A., Abdullah, A. H., Baharoon, S., Halwani, R., Al Shimemeri, A., & Al-Muhsen, S. (2012). Factors associated with patient visits to the emergency department for asthma therapy. *BMC pulmonary medicine*, *12*(1), 80.

Horak, F., Doberer, D., Eber, E., Horak, E., Pohl, W., Riedler, J., ... & Studnicka, M. (2016). Diagnosis and management of asthma–Statement on the 2015 GINA Guidelines. *Wiener klinische Wochenschrift*, *128*(15-16), 541-554.

McQuaid, E. L., Walders, N., Kopel, S. J., Fritz, G. K., & Klinnert, M. D. (2005). Pediatric asthma management in the family context: The family asthma management system scale. *Journal of Pediatric Psychology*, *30*(6), 492-502.

Ministry of Health, 2016, annual asthma management report, Amman, Jordan.

Pijnenburg MW, Baraldi E, Brand PL, Carlsen KH, Eber E, Frischer T, Hedlin G, Kulkarni N, Lex C, Mäkelä MJ, Mantzouranis E, Moeller A, Pavord I, Piacentini G, Price D, Rottier BL, Saglani S, Sly PD, Szefler SJ, Tonia T, Turner S, Wooler E, Lødrup CKC.Monitoring asthmain children. Eur Respir J. 2015;45:906–25.

Reddel, H. K., Taylor, D. R., Bateman, E. D., Boulet, L. P., Boushey, H. A., Busse, W. W., ... & De Jongste, J. C. (2009). An official American Thoracic Society/European Respiratory Society statement: asthma control and exacerbations: standardizing endpoints for clinical asthma trials and clinical practice. *American journal of respiratory and critical care medicine*, *180*(1), 59-99.

Riedler J. Asthma bronchiale bei Kindern und Jugendlichen [Asthma in children and adolescents]. Monatsschr Kinderheilkd. 2015;163:833–46.

Tsai, C. L., Griswold, S. K., Clark, S., & Camargo, C. A. (2007). Factors associated with frequency of emergency department visits for chronic obstructive pulmonary disease exacerbation. *Journal of general internal medicine*, *22*(6), 799-804.