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**Determinants for the Attendance of Asthma Patients at
Emergency Room of Alia Hospital**

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Determinants for the Attendance of Asthma Patients at Emergency Room of Alia Hospital

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Dedication

To my dear mother and father, sisters and brothers who supported me throughout all this master program and without whom their love this thesis would not have been done.

To my Supervisor Dr. Nuha El Sharif for her guidance and precious time she devoted to make this work Possible.

To All my friends who supported me and helped whenever I was in need.

To all those appreciating the value of mankind.

Hamzeh Mohammad Abid Al-Hadi Al-Zabadi

Declaration:

I Certify that this thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed



Hamzeh Mohammad Abid Al-Hadi Al-Zabadi

Date: 12.06.2006

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Abstract

Despite the nature of asthma and its complexity, there is an improvement in understanding of its pathophysiology, better diagnosis and more availability of effective anti-inflammatory therapy. However, emergency rooms (ERs) usage due to asthma attacks, is highly common and represents an important place where specialized health care delivery is needed. Further, the determinants for the attendance of asthma patients at the ERs and the possible effective interventions are one of the most observed public health problems in the world today. Yet, effective management and the extent to which intervention program should be applied to appropriately manage asthma and prevent ER frequent attendance will depend primarily on understanding why this occur. We sought to determine the risk factors for frequent attendance of asthma patients at ER of Alia hospital in Hebron district as baseline study for setting a future intervention program for proper asthma management and reduce ER attendance.

In this study, we used a questionnaire, face to face interview, to collect information on socio-demographic factors, health services utilization information, medications prescribed and asthma severity criteria. We interviewed 121 patients ≥ 5 years old who attended the emergency room of Alia hospital through April to the end of May 2005 using the non-random purposive sampling method. The study was approved by the scientific research committee at AL-Quds University, and a permission to conduct the study from Alia hospital's manager was obtained. A written informed consent was obtained from each participant or the parents.

Participants were categorized into one time versus frequent ER attendees. Also data was analyzed by asthma severity classification according to GINA 2002 guidelines. Univariate analysis was used to check for the significance of the association in using a chi-square p value less than 0.05. Multivariate analysis was used in for both ER attendance and chronic asthma severity outcome variables to determine the major determinants for both outcome variables.

The mean age of the participants was 47 years, standard deviation 18.5 years, 53% males, and 77% were married. Of the 121 participants, 73.5% were frequent ER attendees, 54.5% had mild asthma and 45.5% had moderate/severe asthma. Asthma severity, indicators of severity (ever been admitted to hospital with asthma) and reporting difficulty in asthma inhalers/devices use were more likely to be associated with the frequent ER attendees. Patients living in cities and refugee camps showed six fold increased risk to be frequent ER attendees compared to villages ($p > 0.05$). We also found that most days regular intake of inhaled short B-agonist was significantly more likely to be associated with frequent attendees and moderate/severe asthma compared to none regular use. For asthma severity, hospital admissions in less than a year ago and number of admissions (1-2 times or 3-4 times compared to no admission) were a strong risk factor. Under-treatment with inhaled beclomethasone, get regular treatment, follow up with patient carer, inability to obtain asthma medicines, using other remedies for asthma, most day regular intake of oral theophylline, and using 10-15 courses per year of oral steroids were more likely to be associated with moderate/severe asthmatics. On the other hand, reporting beneficial results from doctor in managing asthma at home, and an occasional regular intake of inhaled steroid were less likely to be associated with moderate/severe asthmatics. Married and older ages (≥ 50 years) patients were more likely to have moderate/severe asthma compared to single and younger ages (5-19 years) patients. Meanwhile, higher levels of

schooling (≥ 10 years) and being on a monthly-based salary employee were less likely to have moderate/severe asthma compared to lower level of schooling (0-6 years) and being unemployed.

In conclusion, frequent ER attendees represent a group of asthmatic patients with moderate/severe, poorly controlled and managed asthma. Having access to health services does not necessarily ensure a good quality of care and proper treatment. However, low socio-economic status contributes to asthma morbidity in Palestine. Further, compliance and adherence to asthma medications should be considered for patients attending the ER for asthma especially those with the more severe disease. Lack of inhalers/devices proper use is a major problem for patients with asthma in Palestine. Meanwhile, over-reliance on reliever therapy rather than controller therapy added an increased risk for frequent ER usage and asthma morbidity.

We strongly recommend an ER and/or PHC based asthma educational intervention program with an integral activity of all health workers concentrated mainly on proper usage of asthma inhalers/devices, as well as a training program for health professionals on proper pharmacotherapy of asthma. Exploring the barriers to financing and asthma medications could further stratify targeted interventions in reducing the ER attendance for asthmatics, and would increase patients' compliance and adherence to prescribed medications, specially in low socio-economic status patients.

العوامل المؤدية لحضور مرضى الربو إلى غرفة الطوارئ في مستشفى عالية

ملخص

بالرغم من طبيعة مرض الربو و تعقيداته، إلا أن هناك تحسنا في فهم الجوانب المرضية-السيولوجية له، و في التشخيص الأفضل والعلاج الفعال من خلال توفر مضادات الالتهابات، و مع ذلك استمر الحضور المتكرر بسبب نوبة الربو إلى غرف الطوارئ التي تمثل مكانا هاما لتواجد الرعاية الصحية المتخصصة، حتى غدت العوامل التي تقف وراء ذلك الحضور من أكثر قضايا الصحة العامة أهمية على المستوى العالمي في هذه الأيام. إن الإدارة الفعالة و برامج التدخل التي يجب أن تطبق لإدارة مرض الربو بشكل صحيح للحد من الحضور المتكرر إلى غرف الطوارئ تعتمد بشكل أساسي على فهم الأسباب الكامنة وراء ذلك. تهدف هذه الدراسة لتحديد العوامل التي تؤدي إلى الحضور المتكرر لمرضى الربو إلى غرفة الطوارئ في مستشفى عالية في محافظة الخليل لوضع برنامج وطني للوقاية و الحد من انتشار الربو وتقليل الحضور إلى غرف الطوارئ.

استخدمت في الدراسة استبانة لجمع البيانات المتعلقة بالعوامل الاجتماعية والسكانية، الخدمات الصحية، الأدوية الموصوفة للمرضى ومدى خطورة المرض لديهم. كان عدد المرضى الذين تمت مقابلتهم ١٢١ مريضاً أعمارهم ≤ 5 أعوام أثناء حضورهم إلى المستشفى وجها لوجه في الفترة الواقعة ما بين بداية نيسان إلى نهاية أيار من العام ٢٠٠٥م، حيث استخدم منهاج العينة غير العشوائية الهادفة. تمت الموافقة على هذه الدراسة من لجنة البحث العلمي في جامعة القدس ومدير المستشفى. وقد أرفق بالاستبيان رسالة توضيحية بأهداف الدراسة حيث تم الحصول على الموافقة الطوعية للمشاركة من جميع المرضى أو من الآباء.

جرى تقسيم المشاركون في الدراسة إلى مجموعتين (الحضور لمرة واحدة أو الحضور المتكرر) كما تم تصنيف مدى خطورة المرض لديهم حسب مبادئ "جينا" (GINA, 2002). استخدم اختبار كاي تربيع ($p > 0,05$) في تحليل المتغير الأحادي، كما استخدم تحليل المتغيرات المتعددة لمعرفة العوامل الكامنة وراء الحضور المتكرر وخطورة المرض نفسه.

أظهرت البيانات أن معدل أعمار المشاركين كان ٤٧ سنة بانحراف معياري بلغ ١٨,٥، منهم ٥٣٪ ذكور، كما بلغت نسبة المتزوجين ٧٧٪، ومن أصل ١٢١ مريضاً شاركوا في الدراسة ٧٣,٥٪ كان حضورهم متكرراً. وفيما يتعلق بدرجة المرض فإن ٥٤,٥٪ كان الربو لديهم خفيفاً، في حين كان متوسطاً/خطيراً لدى ٤٥,٥٪.

لقد أظهرت النتائج أن خطورة الربو والدخول إلى المستشفى بسببه في الماضي بالإضافة إلى التعبير عن الصعوبة في استعمال البخاخات/ أجهزة الربو كانت ذات ارتباط إحصائي إيجابي للحضور المتكرر. كذلك تبين أن المرضى الذين يسكنون المدن والمخيمات كان لديهم ستة أضعاف زيادة في عامل الخطر للحضور المتكرر لغرفة الطوارئ مقارنة مع سكان القرى دون وجود دلالة إحصائية. كما أظهرت النتائج أن الاستعمال اليومي المنتظم لبخاخات محفزات بيتا القصيرة الفاعلية كان ارتباطه إيجابياً مع كل من الحضور المتكرر والربو المتوسط/الخطير مقارنة مع الاستعمال الغير المنتظم لتلك البخاخات. أشارت النتائج أيضاً أن خطورة الربو ترتبط إيجابياً مع الدخول إلى المستشفى قبل عام بسبب الربو ومع عدد مرات الدخول (١-٢ مرة أو ٣-٤ مرات) مقارنة مع عدم الدخول. كما

تبين أن المعالجة ببخاخات البيكلوميثازون تحت الجرعة الدوائية المطلوبة، المعالجة المنتظمة، المتابعة مع الشخص المرافق للمريض، عدم القدرة على الحصول على أدوية الربو، استخدام أدوية أخرى (مثل الأعشاب) للربو، الاستعمال اليومي المنتظم لحبوب الثيوفيلين، واستعمال (١٠ - ١٥) دورة علاجية في السنة من حبوب الكورتيزون كانت جميعها ذات ارتباط إحصائي ايجابي مع درجة الربو المتوسط/الخطير. في حين أن التعبير عن الحصول على نتائج ايجابية من الطبيب في إدارة الربو في البيت ، والاستعمال المنتظم غير اليومي لبخاخات الكورتيزون كانت جميعها ذات ارتباط إحصائي عكسي مع درجة الربو المتوسط/الخطير.

أشارت الدراسة أيضا إلى وجود علاقة إحصائية ايجابية بين المرضى المتزوجين وذوي الأعمار الكبيرة (≤ 50 سنة) وبين الربو المتوسط/الخطير مقارنة مع غير المتزوجين وذوي الأعمار الصغيرة (٥ - ١٩ سنة). وتبين أيضا أن درجة الربو المتوسط/الخطير ذو علاقة عكسية مع ذوي المستوى التعليمي ≤ 10 سنوات و الموظفين أصحاب الرواتب الشهرية الثابتة مقارنة مع المرضى ذوي المستوى التعليمي (٠ - ٦) سنوات وغير الموظفين.

كنتيجة، فإن الذين يتكرر حضورهم إلى غرف الطوارئ يمثلون مجموعة من مرضى الربو ذات مستوى متوسط/خطير من المرض ناتج عن سوء الإدارة والسيطرة. إن القدرة على الوصول إلى الخدمات الصحية لا تعني بالضرورة أن نوعية هذه الخدمات جيدة أو أن المعالجة صحيحة. إن المستوى الاجتماعي والاقتصادي المتدني يلعب دورا في خطورة مرض الربو في فلسطين. كما أن التزام المريض بعلاجه وقدرته على الحصول عليه يجب أن يؤخذ بعين الاعتبار لمرضى الربو الذين يحضرون بشكل متكرر إلى غرف الطوارئ وخصوصا أولئك ذوو الدرجة الخطيرة من المرض. إن عدم المعرفة الصحيحة لكيفية استخدام بخاخات/أجهزة الربو مشكلة أساسية عند مرضى الربو في فلسطين. وفي الوقت نفسه، فإن الاعتماد الزائد على العلاج الذي يزيل أعراض المرض وليس المسيطر عليه يضاف إلى عوامل الخطر للحضور المتكرر إلى غرف الطوارئ وخطورة مرض الربو.

إننا نوصي بشكل قوي ببرنامج تدخل تعليمي للوقاية و الحد من انتشار مرض الربو يكون مرتبطا بغرف الطوارئ و/أو مراكز الرعاية الصحية الأولية مع مشاركة فعالة لجميع مزودي الخدمات الصحية بحيث يركز هذا البرنامج بشكل أساسي على كيفية الاستخدام الصحيح لبخاخات/أجهزة الربو. كما نوصي أيضا ببرنامج تدريب للأطباء يركز على المعالجة الدوائية الصحيحة للربو.

إن الأخذ بعين الاعتبار للحواجز المالية لأدوية الربو يلعب أيضا دورا مهما في أي برنامج للتقليل من الحضور المتكرر لمرضى الربو إلى غرف الطوارئ و يجعل المريض أكثر قدرة على الالتزام بعلاجه والحصول عليه، خصوصا المرضى ذوو المستوى الاجتماعي والاقتصادي المتدني.

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Definitions

Disability Adjusted Life Years (DALYs)	The sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability (WHO, 2006)
Forced Expiratory Volume in one second (FEV1)	The volume exhaled during the first second of a forced expiratory maneuver stated from the level of total lung capacity. Used for assessing airway obstruction, bronchoconstriction or bronchodilation (GINA, 2002).
Forced Vital Capacity (FVC)	The maximum volume of gas that can be forcefully and rapidly expired after a maximal inspiration (GINA, 2002).
Peak Expiratory Flow Rate (PEFR)	The maximum flow rate attained during the FVC maneuver. It is a good index of the patients' effort and relative strength in forceful exhalation. Also, may have relative meaning in evaluation of the effectiveness of patient's cough (AAAAI, 2006).

Abbreviations:

B-:	Beta
DALYs:	Disability Adjusted Life Years
ER:	Emergency Room
FEV1:	Forced Expiratory Volume in one second
FVC:	Forced Vital Capacity
GASP:	Global Survey of Asthma Practice
GINA:	Global Initiative for Asthma
IUATLD:	International Union Against Tuberculosis and Lung Diseases
MOH:	Ministry Of Health
NAEPP:	National Asthma Education and Prevention Program
NGOs:	Non- Governmental Organizations
NHLBI:	National Heart, Lung, and Blood Institute
PaCO₂:	Partial Pressure of Carbon Dioxide in arterial blood
PaO₂:	Partial Pressure of Oxygen in arterial blood
PEF:	Peak Expiratory Flow
PEFR:	Peak Expiratory Flow Rate
PHC:	Primary Health Center
SaO₂:	Oxygen Saturation
SPSS:	Statistical Package for the Social Sciences
UNRWA:	United Nations Relief and Works Agency
USA:	United States of America

Chapter 1

Background and Significance

1.1 Background

Asthma is a chronic inflammatory disorder of the airways that is characterized by recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning (NHLBI, 1997). It is considered as a major public health issue, and one of the most common chronic diseases worldwide. Globally, the prevalence of asthma continues to escalate with more than 300 million people around the world currently suffering from asthma. There was an increased burden on the health care systems, families, and patients by this disease and its consequences (NHLBI, 2003) with the increasing morbidity and mortality rates worldwide (McFadden and Warren, 1997; Downs and Marks, 2001; Woolcock et al., 2001).

Despite the nature of this disease and its complexity, there is an improvement in understanding its pathophysiology, better diagnosis and more availability of effective anti-inflammatory therapy (Evans et al., 1987; Jackson et al., 1988). However, there is still a gap between the medical knowledge, therapy and its utilization for the benefit of the asthmatic population (ECRHS, 1996). In addition, asthma continues to be under-diagnosed. In terms of its management, both under treatment and over treatment differ from that recommended by national and international guidelines commonly occur (Cerveri et al., 1997; Jansen et al., 1997; Rickard and Stempel, 1999; Lagerlov et al., 2000; Rabe et al., 2004). Thus, these issues represent a great challenge for the primary health care systems, particularly in developing countries such as Palestine (Anis et al., 2001; Piccoro et al., 2001; GINA, 2002).

As any serious health condition, asthma can rapidly deplete the family financially and emotionally. Asthmatic patients usually have diminished employment opportunities, which results in a low socio-economic status to those patients (Mitchell et al., 1989). Thus, reducing and controlling asthma can be conceived as an intervention to strengthen families, and yield not only healthier people but also improved family functioning, workplace productivity, and over all family well-being (Ait-Khaled et al., 2001).

In most countries, especially in developed countries, such as Canada, USA, Australia and England, asthma affects more than 10% of both children and adults, although in developing countries asthma appears to be less prevalent ranging from 9.5% in Uruguay to 5.5% in Iran and 3.8% in Morocco (Beasley, 1998). In the Middle East the mean prevalence of asthma is 5.8% while in North Africa it is 3.9% (Beasley, 1998). The number of disability adjusted life years (DALYs) lost due to asthma worldwide has been estimated to be currently about 15 million per year. Worldwide, asthma accounts for around 1% of all DALYs lost, and accounts for about 1 in every 250 death, and nearly 90% of cases involve avoidable factors (WHO, 2002). In developed countries such as USA, asthma accounts for 5000 deaths annually, and almost 2 million emergency room visits (Weiss et al., 1992). Those discharged from the ER, approximately 10% to 20% will relapse within the subsequent 2 weeks (Camargo, 1998^a ; Camargo, 1998^b). In comparison, in developing countries, statistical data related to costs and numbers of deaths or ER visits due to asthma are shortage. In Egypt, for example; asthma is the most common cause of ER visits and hospital admission for respiratory complaint in adults, and

up to one in four children with asthma is unable to attend school regularly because of asthma. Further, in Mexico, the death rate due to asthma is over 4000 deaths per year (Beasley, 1998).

In the Middle East, the available evidence indicates that the prevalence of asthma has increased over recent decades, but generally low compared to other regions (Ait-Khaled et al., 2001). High rates have been recorded in the Kingdom of Saudi Arabia, Kuwait, Lebanon, and Israel (Goren and Hellmann, 1997; Ait-Khaled et al., 2001; Al Frayh et al., 2001). For example, in Israel, a neighbouring country that shares the Palestinians the same environment, and despite improvements over recent years in the diagnosis and treatment, asthma –related morbidity and mortality also continue to rise (Israel, MOH, 1997). In 1994, the Israel Ministry of health statistics showed that 142 individuals (including both Jewish and Arabs inside Israel) died of asthma in Israel, one in five asthmatic children visits the ER per year, and one in ten asthmatic children is hospitalized in the same period due to severe asthma (Israel, MOH, 1997).

In Palestine, respiratory diseases are one of the main causes of morbidity and mortality in children (Palestine, MOH, 1999). A series of studies on asthma determinant in childhood was carried out between the years 2000-2002 (EL Sharif, 2003) showed that children residing in refugee camps appear to be at greater risk of asthma compared to children from neighbouring villages and cities (EL-Sharif et al., 2002). These studies showed that the prevalence of 12 months wheezing among children aged (5-8) was higher compared to children aged (12-15) years (9.6% and 7.2% , respectively) (EL Sharif, 2003). The 12 months wheezing prevalence rate was 8.8%, which varied among villages, cities and refugee camps (8.2%, 7.2% and 12.6%, respectively).

1.1.1 Hospitalization of asthma patients:

In USA, asthma is one of the major reasons for hospitalization of children and adults (Starfield et al., 1984; Halfon and Newacheck, 1986). It has been estimated that asthma affects approximately 17.3 million Americans, including 5 million children <18 years of age (Mannino et al., 2002). It accounts for an estimated 23% of school absenteeism per year (Weiss et al., 2000; Mannino et al., 2002). Data indicating that the death rate from asthma increased 46% in the period from 1980 to 1989 are even more disturbing (Mannino et al., 2002). The 2001 statistic in USA, showed that approximately 0.5 million patients in the United States are hospitalized because of asthma, nearly 73% of hospitalization could be avoided with proper prior medical care (Asthma in America, 2001).

In the Middle East, the hospital admission rates are in excess of 150-200 per 100,000 per year in some of the high prevalence countries (Goren and Hellmann, 1997; Ait-Khaled et al., 2001; Al Frayh et al., 2001). In Israel (including both Jewish and Arabs inside Israel), one in ten asthmatic children is hospitalized per year due to severe asthma (Israel, MOH, 1997).

1.1.2 Asthma studies in emergency rooms (ERs):

Asthma in ERs was started to be of great interest in the past decade. Several studies in Australia (Wakefield et al., 1997; Robertson et al., 1998), United States (Weiss et al., 1992; Mannino et al., 2002), Europe (Cerveri et al., 1997; Jansen et al., 1997), Canada (Krahn et al., 1996) and other Middle Eastern countries (Goren and Hellmann, 1997; EL

Sharif, 2003), such as Saudi Arabia (AL Frayh et al., 2001), were concerned with asthma morbidity and mortality.

The importance of studying asthma in ERs is that patients with asthma appearing in ERs are those who have sub-optimal treatment and those depending on the local management of patients in the community (Anis et al., 2001; Rabe et al., 2004). To get around this problem these studies proposed a method to assess the extent of the local problem through the cases coming through the local ERs, so as they can devise and assess a tool for use in emergency rooms that will inform the local health services on the need for improving asthma management and identify the targets for improvement.

Poorly controlled asthma is expensive, and emergency care for asthma represents the highest percent spent on this disease (Weiss et al., 1992). The major factors contributing to asthma morbidity and mortality are under-diagnosis and inappropriate treatment (Spitzer et al., 1992; Weiss and Sullivan, 1993). Thus, investment in prevention medication is likely to yield cost savings in emergency care and highlight the need to aggressively manage the disease and its symptoms (Kolbe et al., 1997).

Despite the many international attempts and guidelines; e.g. GINA guidelines (GINA, 2002; NHLBI, 2003), to standardise and improve asthma care, wide gaps still remain between what is known to be effective treatment and what is practised (Cabana et al., 1999). In addition, many barriers are still remain to reduce the burden of asthma, of these; poverty, poor education, under use of self-management, environmental barriers, low public health priority and lack of data on morbidity and mortality from asthma (NHLBI, 2003). Other barriers include; the lack of symptoms-based rather than diseased-based approaches in management of asthma, unsustainable generalizations across cultures, and health care systems which may make management guidelines developed in high-income countries difficult to implement in low and middle-income countries (NHLBI, 2003).

It was chosen to study asthma in ERs as a subject for review and evaluation from various aspects: numbers of patients attending the ER with asthma as a percentage of all patients attending the ER (Andrén and Rosenqvist, 1987; Boulet et al., 1996); investigating the determinants for attendance of asthmatics at the ER (Wakefield et al., 1997; Eroglu et al., 2004); managing of asthmatics at the PHC (Peleg et al., 2002; Raimondi et al., 2005); evaluating of management protocols of asthma in the ER (Emerman et al., 1999); and the utilization of existing health service for assisting the targeting of appropriate future intervention in order to reduce avoidable ER attendance (Zeiger et al., 1991; Schatz et al., 2003). The asthmatic patients attending the ER are those who deserve our efforts to improve their asthma control, so that their quality of life is improved, and asthma –related morbidity and mortality reduced (NHLBI, 1997).

1.2 Problem statement and study justification

Asthma has been considered as an important chronic disease. International and national guidelines have been established in the last decade to manage and control asthma (NHLBI, 1997; GINA, 2002; Abdeen et al., 2003). The reduction in the acute use of health services for asthma was and is still an important goal of asthma management guidelines and remains a target of health policy (NHLBI, 2003). Asthma attacks remain a frequent cause of attendance and presentations to ERs (Adams et al., 1997). Asthmatic patients attending the ERs account for disproportionate amounts of asthma costs, yet these may be minimized

or even prevented if patients with asthma and their healthcare providers managed the disease according to established guidelines (Weiss et al., 1992; Weiss et al., 1993).

Studies have shown that 62% of children and 40% of adults reappear for ER care within one year (Wakefield et al., 1997), others have indicated that most of ER visits for asthmatics could be prevented if patients with asthma and their health care providers managed the disease according to established guidelines (NHLBI, 1997; Dales et al., 1997; Lara et al., 2002). This attendance was found to be affected by the social, economic, and psychological factors (Dianne et al., 2004).

Emergency visits are important events for asthmatics and families and are associated with significant morbidity and occasional mortality (Boulet et al., 1999), and remain a major source of substantial asthma-related costs (Weiss et al., 1992; Weiss et al., 1993; Sullivan et al., 1996). Asthmatic patients attending the ERs account for disproportionate amounts of these costs, yet these may be minimized by good and optimal asthma management (Weiss et al., 1992; Weiss et al., 1993). For these reasons; the assessment and treatment of acute asthma has been the focus of considerable research and efforts to develop clinical practice guidelines and an interventions programs (Boulet et al., 1999).

As asthma patients, especially the most severe and chronic cases, are seeking care at emergency rooms, so we found them a proper target population for the intended intervention program (Joseph et al., 1999). And those seeking emergency care for asthma provide a particular target for interventions to improve medical care, as inadequate primary care may be one of the causes of poorly controlled asthma (Joseph et al., 199; Montealegre et al., 2002). A simple proper intervention program was shown to be effective in reducing the ER attendance and better management and control of asthma (Peleg et al., 2002; Ady et al., 2003). However, effective management and the extent to which intervention program should be applied to control asthma and prevent ER attendance and re-attendance will depend primarily on understanding why this occur (Dales et al., 1995).

An international audit was initiated at the International Union Against Tuberculosis and Lung Diseases (IUATLD) (IUATLD, 2003) in year 2003 meeting. The aim of the audit was to develop, a devise and to assess an audit tool for use in emergency rooms that will inform the local health services on the need for improving asthma management which should identify the targets for improvement. Palestine was registered as a center in this international study (GASP: Global Survey of Asthma Practice). The pilot study in which we piloted 56 patients visited ER of Ramallah hospital, with age range 3-85 years, we found that 3 (5%) had intermittent asthma and 53 (95%) had persistent asthma, of those with persistent asthma 17 (32%) were mild, 30 (57%) were moderate, and only 6 (11%) were having severe persistent asthma. Of patients with persistent asthma ; 24 (45%) only had regular care, 44 (83%) were insured ones, 52 (98%) were having prescribed steroids, and only 26 (49%) reported good compliance to their asthma medications, of those who had prescribed steroids 43 (81%) had an adequate dose. This preliminary study showed the lack of health care characteristic of those patients, in that only 45% had regular care and those are mainly the insured ones, also only 49% reported good compliance to their asthma medications, while only 11% were having severe asthma suggesting that disease severity could not be always considered as the only risk factor for ER attendance of asthmatics (El_Sharif N, September 2004, private communication; Burney et al., 2004, Unpublished).

The attendance of asthmatic patients at the ERs with different levels of severity and the risk factors for this attendance are still a widespread problem in most countries despite the available effective international and national guidelines (Dianne et al., 2004). In order to assess the extent of the problem it would be necessary to undertake a study in the ER that investigate the risk factors that lead to re-attendance of the asthmatics at the ERs.

In Palestine, the extent of this problem is not well-known. In order to develop a proper intervention study, we selected Alia governmental hospital ER, as it serves the population in the most populated district of the West Bank; i.e. Hebron district. This will give us the opportunity to have patients from a various socio-economic backgrounds and geographic areas. This study is based on the principles guiding development of complex interventions. Therefore, the aim of the present study was to determine the risk factors for frequent attendance at ER of Alia governmental hospital in order to set an intervention program for proper asthma management and reduce avoidable ER attendance.

1.3 Aim of the study

To determine the risk factors for frequent attendance of asthma patients at ER of Alia governmental hospital in order to set an educational intervention program for proper asthma management and reduce avoidable ER attendance.

1.4 Objectives of the study

1.4.1 General objectives:

1. To investigate the determinants for frequent attendance and asthma severity of asthma patients attending ER of Alia hospital.
2. To evaluate the reported utilization of health services, quality of care, and medications by asthmatic patients attending ER of Alia hospital.

2.4.2 Specific objectives:

1. To assess the relationship between frequent ER attendance and asthma severity for asthma patients attending ER of Alia hospital.
2. To determine the relationship between socio-demographic variables of asthma patients attending ER of Alia hospital and both their frequent ER attendance and asthma severity.
3. To identify the relationship between health services utilization of asthma patients and both their frequent ER attendance and asthma severity at ER of Alia hospital.
4. To evaluate the relationship between asthma medications intake for asthma patients and both their frequent ER attendance and asthma severity at ER of Alia hospital.
5. To investigate the treatment adequacy of persistent asthmatics by inhaled beclomethasone for asthma patients attending ER of Alia hospital.
6. To recommend an appropriate future educational intervention program that might enhance asthma management and reduce avoidable ERs attendance for asthmatics in Palestine.

1.5 Research questions

1. Why asthma patients recurrently seek emergency care for asthma despite available effective treatment?
2. Where are we from the considerable international efforts to manage and reduce ER related morbidity and mortality of asthma?

1.6 Study hypotheses

This study was designed to test the hypotheses that;

1. The more asthma is severe the more asthma patient attend ERs.
2. The bad quality of healthcare the more asthma patients attend ERs.
3. Under treatment by inhaled steroids (beclomethasone) increased the number of severe asthmatics to attend ER.

1.7 Thesis chapter's description

This thesis consists of six chapters:

Chapter 1: it deals with the study background, significance, aim, objectives, hypotheses and limitations. Further at the end of this chapter, we described the health services and demography of Hebron district and West Bank in general. We focused on Alia governmental hospital and its emergency department as the study setting.

Chapter 2: review for literature and previous studies' findings that are related to the determinants for ER attendance, asthma morbidity, and the possible interventions to reduce this.

Chapter 3: Conceptual frame work, including asthma definition, its natural history. However, asthma chronic and acute classifications were prescribed and management of acute attack in ER was also highlighted according to GINA 2002 guidelines (GINA, 2002).

Chapter 4: Describes the methodology followed, including study design, sample size, data collection and analysis.

Chapter 5: Presents the main results. The result were mainly divided into three parts, i.e. socio-demographic, health services provided for asthma patients at the health care system, and medications intake. Variables statistical differences between the study outcomes (one-time vs. frequent ER attendees and mild vs. moderate/severe asthma) were calculated using Chi-square in univariate analysis. However, in multivariate analysis, two logistic regression models were developed, i.e. one for ER attendance frequency, and the second for asthma severity. Adjusted odds ratios with their 95% confidence intervals were estimated in each model.

Chapter 6: Discusses the main study results including socio-demographic, health services utilization, and medications intake. The consistency and contradictory of the study results with previous studies are discussed. At the end of the chapter, the main conclusions, recommendations, and area for future research are stated.

1.8 Demography of Hebron District

1.8.1 Demographic trends:

Palestine comprises two separated geographic areas; i.e. the West Bank and the Gaza Strip. The West Bank is divided into 9 districts (see map) of which Hebron district is considered the biggest southern district. The population in Palestine is estimated 3.7 million at the end of 2003, out of them 2.3 million (63.3%) in West Bank and 1.4 million (36.7%) in Gaza Strip (MOH, 2005).

Hebron district is located among hills in the southern part of the West Bank, 36 kilometres (Km) south of Jerusalem city. It was built 5500 BC. There are 153 Palestinian built up areas in the district including two refugee camps, Al Fawwar and Al Aroub camps. According to the distribution of the population by Governorates, Hebron governorate has the highest rate of population of the total population in 2003. The population of the governorate is 546,495 according to the Palestinian's 2004 estimates. This population is distributed among cities (65%), villages (32.2%) and refugee camps (2.8%). The population density of Hebron district is 522 individuals/ km² (51.1% males and 48.9% females). The district population is considered a young population since 50% is less than 15 years of age while the above 65 years represents 2.9 % (MOH, 2005).

The illiteracy percent in Hebron is 10.1% among males (13.9% in West Bank) and 22.9% among females (7.7% in West Bank). Life expectancy in the West Bank was 71.2 years for males and 74.3 years for females in 2003. The improved health situation and the gradual decline in the infant and child mortality rate contributed to longer life expectancy (MOH, 2005).

1.8.2 Mortality trends:

In 2003, the 10 leading causes of death in Palestine were (in rank order) heart diseases (20.1%), cerebrovascular disease (11.1%), conditions in perinatal period (9.7%), malignant neoplasm (9%), accidents (8.8%), senility (5.7%), hypertension (4.9%), pneumonia and other respiratory disorders (4.8%), diabetes mellitus (4.1%) and renal failure (3.4%). In 2003, these diseases are responsible for 81.6% of the total deaths in Palestine (MOH, 2005). In the West Bank, 41 male and 32 female died of pulmonary –heart disease of all age in 2002. Moreover, 234 male and 144 female died due to respiratory system disease in 2002, including acute upper and lower respiratory infection, influenza, pneumonia, chronic lower respiratory disease (Palestine, MOH, 2003).

However, in Hebron district the leading causes of death, according to the Palestinian Ministry of Health statistics 2003, are heart diseases, accidents, neoplasm, and the cardiovascular diseases (MOH, 2005). The Infant mortality rate in Hebron was 20/1000 in 2003, and the main leading causes of these deaths are prematurely (40%), congenital malformation (10%), respiratory diseases (8%), infectious diseases (8%), and the sudden infant death syndrome (SIDS) (4.9%) (MOH, 2005).

1.8.3 Socio-economic status:

The economy of the Hebron revolves around farming and agriculture (particularly the cultivation of grapes). Tourism and industries like the manufacture of leather, shoes, pottery and glassware also play a role in its economy. The town has large and busy central. Labor indicators in Hebron showed that; 5.7% are job owners, 67.7% are employed, 18.3% works in private sector, and 8.3% are members of families without salaries. Those inside labor force are 46%, outside labor force are 53.7% (MOH, 2005).

In 2003 in Palestine, the gross national production (GNP) was 3,705 million US\$, while per capita it was 1,020 US\$. The gross domestic production (GDP) was 3,257 million US\$ in 2003, while per capita it was 896 US\$ (MOH, 2005). The dependency ratio in West Bank is high (declined from 94.7 in 1997 to 91.3 in 2003). In 2003, the Palestinian National Authority reported that the unemployment rate reached 31% in Palestine with constant fluctuation during the last five years due to political situation, and the occupation's practices including closure of Palestinian regions and cities (MOH, 2005).

1.8.4 Health services:

The Palestinian Ministry of Health (PMOH) is the main health provider in Palestine, which is responsible of supervision, regulation, licensure and control for whole health services. Other health providers include; the United Nations Relief and Works Agency (UNRWA), Medical Services for Police and general security (MSP), national and international Non- Governmental Organizations (NGOs), and private health sector for profit (MOH, 2005).

1.8.4.1 Primary health care services:

Over the past years, the Palestinian health care system has developed side by side along with the development of Palestinian society in general. The total number of PHC centers in Palestine in 2003 was 619 (103 in Gaza Strip and 516 in West bank). Distribution by provider showed that there were 391 centers owned and supervised by the Palestinian ministry of health (63.2%), 51 centers by UNRWA (8.2%) and NGOs have 177 centers (28.6%) (MOH, 2005).

In Palestine the PHC centres per 10,000 population is 1.7 (MOH, 2005). In the West Bank, the ratio of persons per center is 4,09; with the highest ratio in Bethlehem 6,0 persons per centre and the lowest ratio in Jericho with a ratio of 1,68 persons per center. These results should be taken with caution, especially in relation to wide areas and scattered population in West Bank (MOH, 2005).

In Hebron there were 158 PHC centers and the ratio of persons per centre was 18146 in 2003. The Palestinian ministry of health owned and operated 111 (73 village health room, 31 maternal and child health clinic and 7 as general clinics), while NGOs 40 and 7 by the UNRWA (Palestine, MOH, 2003).

1.8.4.2 Secondary health care services:

The secondary health care system is a mixture of a public, non-governmental, UNRWA and private sectors with a developing governmental insurance. MOH is responsible for a

significant portion of the secondary healthcare system and some of the tertiary care. In Palestine, there were 78 hospitals with 4,679 beds in 2003. The ratio of persons per hospital was 47,921 while the ratio of beds per 10,000 populations was 12.52 (MOH, 2005). In Hebron district there are 9 hospitals, with hospital and beds ratio per 100,000 populations 9.1% and 1.7%; respectively (MOH, 2005). Table (1.1) below shows the hospitals in Hebron district by specialty, sector and total beds, in 2002.

Table 1.1: Hospitals in Hebron district by specialty, sector and total beds, in 2002.

Hospital	Sector	No. of beds	Speciality
Hebron (Alia)	MOH	147	general
AL Ahli	NGO	103	general
AL-Meizan	NGO	60	general
Red crescent	NGO	60	general
Yatta	private	12	maternity
Za'tari	private	12	maternity
Shaherah	private	10	maternity
Hamdan	private	10	maternity
Mohammad Ali Muhtaseb*	NGO	30	paediatrics

Source: Palestinian's MOH report 2002 (Palestine, MOH, 2003).

* Added by the researcher as it was not found in MOH report 2002.

The total hospitalization days in MOH hospitals were 683,348 days in 2003 with an increasing of 42.6% in comparison with 2000. The total number of admissions was 255,811 in 2003 which increased by 41% in comparison with 2000. However, the bed occupancy rate was 82.4%, and the average length of stay was 2.7 days in 2003. This increase in the governmental hospitals' services indicates the impacts of the current political situation on all health sectors in general and on hospitals in particular (MOH, 2005).

The MOH hospitals provide services for non-admitted patients through their outpatient department, emergency departments (EDs), and day care units. The total number of beneficiaries from outpatient consultations was 1,286,530, nearly 61.4% of consultations were offered through MOH hospitals in Gaza Strip and 23.2 % in West Bank through both specialized and general practice clinics in 2002. In year 2003, the emergency departments in MOH hospitals received 849,357 care beneficiaries; the number is steadily increased since 1999 due to emergency conditions during Al Aqsa Intifada (Palestine, MOH, 2003). The day care beds cover a large area of services; including hemodialysis, chronic ambulatory peritoneal dialysis, oncology and blood diseases (Palestine, MOH, 2003).

1.8.4.3 Human resources:

The population per general practitioner in Palestine was 2111 in 2003 estimates. However, in MOH the population per physician, specialist, and nurse was 2171, 5613, and 1394; respectively (MOH, 2005). In Hebron district, the population per MOH general practitioner was 1477, while per nurse was 781. However, per paramedical the population was 93 (MOH, 2005). Further, in Hebron there are two governmental PHC centers for chest and allergy diseases the major one is located in Hebron city while the other in Dora city.

1.8.4.4 Governmental health insurance (GHI):

In Palestine, MOH provided free of charge health insurance to about 189,934 family in 2001, to 207,434 in 2002, and to 95,449 in 2003 (MOH, 2005). The enrolment in GHI grew from 50 % in 1998, to 53.2% in 1999. However, it declined to 34% in 2000, 31% in 2001, 34.6% in 2002 and 38.6% in 2003 of the total West Bank and Gaza Strip population. The decrease in enrollment in GHI since 2000 was due to the impact of current crisis (AL Aqsa Intifada) on Palestinian community (MOH, 2005). During ALAqsa Intifada most of the Palestinian's workers who used to work in Israel and lost their work got benefit from Al-Aqsa insurance which was established after Al- Aqsa Intifada. In Hebron district, 70% of the population has GHI (Head of health insurance department-Hebron, October 2005, private communication).

Every Palestinian with a governmental health insurance can get treatment, vaccination, surgical operation, and the other health services in any of the ministry of health hospitals, centers and clinics (general and specialized) on free of charge, but for each medication bottle or box he/she has to pay three Shekels if he/she is more than 3 years old, and one Shekel if he/she is less than 3 years (Head of health insurance department-Hebron, October 2005, Private communication). Insured patients can also get benefit from treatment abroad (out side Palestine) if his/her treatment and the required health are not found in Palestine.

Types of participation in the GHI include (MOH, 2005);

1. Compulsory: the families' participation from this group was about 28.2% of the total insurance Participation in 2003. It constituted 56.6% of the total governmental insurance revenues in 2003.
2. Voluntary: since the year 1995, there was a gradual decline in the number of insured families in the voluntary type. This was due to deterioration in Palestinian economy. It constituted 2% of the total governmental insurance revenues in 2003.
3. Workers in Israel: this group showed the highest decline in the percentage of its revenues from 40.6% in 1995 to 9.8% in 2003. This was mainly affected by the Israeli's closures and ALAqsa Intifada.
4. Contracts: this group represented 5.6% of the total participants in 2003. The revenue collected from this group was 11.3% in 2003.
5. Social welfare: this group represented 19.2% of the total participants in 2003. The Ministry of Social Welfare paid 19.5% in 2003 of the total insurance revenue.
6. Prisoners affairs: this group represented 0.6% of the total participants in 2003, and the revenue was about 0.8% of the total insurance revenue.

1.8.4.5 Alia governmental hospital in Hebron:

Alia hospital was built in 1959, it is a general governmental hospital located in Faisal Street in the middle of Hebron city in the southern part of the West Bank (Fig.1.1).



Figure 1.1: Entrance of Alia hospital.

The hospital includes two buildings which are; the central (middle) building: it includes the following departments (surgical department, internal department, intensive care unit (ICU), coronary care unit (CCU), pre-mature unit, maternity department, theatre room sterilization unit, laboratory and blood bank, radiation unit, pharmacy and medical stores, physiotherapy unit, and the adult emergency department; i.e. >14 years old). The out-patient clinics: include surgery, bone, internal, ENT (Ear Nose and Throat), pediatric, and maternity clinics. The western building: it includes the following departments (kidney unit, central maintenance unit, pediatric departments including the pediatric emergency department; i.e. ≤ 14 years old) (Fig. 1.2) (Alia hospital management supervisor, November 2005, private communication).



Figure 1.2: Alia hospital pediatric emergency room.

The adult's emergency department of Alia hospital consists of three rooms with 6 beds. The main room; which has three beds, and a surface area of 30 m² (meter square), it is where the emergency cases are treated and it includes the main required machines like monitors, defibrillator, nebulizers, it has also the essential emergency drugs. It receives cases of nearly all disorders including the asthmatic cases (Fig.1.3). But most of those attend Alia emergency department are insured ones and they pay only 3 Shekels for each treatment unit (injection, nebulizer, other medications) and 2 Shekels for each X-ray (Alia hospital management supervisor, November 2005, private communication).



Figure 1.3: Photos from the Alia hospital first adult's emergency room.

The second room; surface area 24 m² (meter square) , has two beds, it is where treated emergency cases are put under observation and wait until they recover so they will be discharged home. It includes also the emergency registration (Fig. 1.4) (Alia hospital management supervisor, November 2005, private communication).



Figure 1.4: Photos from Alia hospital second adult's emergency room.

The third room; surface area 12 m², and has one bed. It receives fracture cases. Alia emergency department receive an average of 200 cases each day, 100-150 are urgent and emergency cases, 40 are wounded and post-operation cases, 5-10 are fracture cases (Fig. 1.5) (Alia hospital management supervisor, November 2005, private communication).



Figure 1.5: Emergency cases attending Alia hospital emergency departments.

With the 6 beds in the adult emergency department, this gives a total of 147 beds in Alia hospital and 8 beds for hemodialysis in kidney unit (Alia hospital management supervisor, November 2005, private communication). Approximately, 70% of the population in Hebron district have medical insurance and usually seek medical care in this hospital. Alia governmental hospital has the major ER in Hebron district. Therefore, we assume that patients from various socioeconomic, demography and communities (urban, suburban, and rural) have access to this hospital. (Head of health insurance department-Hebron, October 2005, Private communication).

Chapter 2

Literature review

2.1 Introduction

Asthma in ERs was started to be of great interest in the past decade. Several studies in Australia (Wakefield et al., 1997; Robertson et al., 1998), United States (Weiss et al., 1992; Mannino et al., 2002), Europe (Cerveri et al., 1997; Jansen et al., 1997), Canada (Krahn et al., 1996) and other Middle Eastern countries (Goren and Hellmann, 1997; EL Sharif, 2003), such as Saudi Arabia (AL Frayh et al., 2001), were concerned with asthma morbidity and mortality.

The importance of studying asthma in ERs is that patients with asthma appearing in ERs are those who have sub-optimal treatment and those depending on the local management of patients in the community (Anis et al., 2001; Rabe et al., 2004). To get around this problem these studies proposed a method to assess the extent of the local problem through the cases coming through the local ERs, so as they can devise and assess a tool for use in emergency rooms that will inform the local health services on the need for improving asthma management and identify the targets for improvement.

The major health effort in ameliorating the severity of asthma, preventing exacerbations or attacks, and reducing the risk of death or permanent disability is clinical management. The availability of well-trained staff, adequate medications, and the presence of self-management and monitoring tools will make asthma a straightforward manageable disorder (NSW Department of Health, 1997).

2.2 Determinants for ER attendance

The determinants for the attendance of asthmatic patients at the ERs and the possible effective interventions are one of the most observed public health problems in the world today. By detecting those attended the ERs for asthma and related specific risk factors, we can ensure a good management and intervention programs for an appropriate managed asthma (Ait-Khaled et al., 2001; Ford et al., 2001; Douglass et al., 2004).

Risk factors found in literature that contribute to ER attendance for asthmatic patients usually include one or more of the followings reasons:

2.2.1 Poor doctor-patient relationship:

Poor therapeutic partnership between patient and his doctor has been indicated as inadequate health services that lead to ER visits for asthma. Individuals attending to ER for asthma don't have a good doctor-patient relationship or may not even have a doctor for asthma care (Marks et al., 2003). A study found that (Douglass et al., 2004) of 62 asthmatic patients attending the ER, 2/3 reported a good relationship with their doctor, one-third reported a poor relationship or no regular doctor.

Another study concluded that doctors need to explore and acknowledge their patients personal disease experience and opinions and to respect a patients' interpretation of their symptoms (Clark and Gong, 2000). It was also found that ER visits for asthma are

associated with lack of access to regular medical care (Oster and Bindman, 2003) and several studies indicated that increase access to primary health care results in fewer ER visits and hospitalizations for asthma (Greinder et al., 1995; Stewart et al., 1999; Falik et al., 2001).

2.2.2 Health insurance:

Studies demonstrated that uninsured patients have higher rates of preventable ER visits because they are less likely to have follow up and regular medical care (Oster and Bindman, 2003). Other studies in USA found that of 3612 patients attending the ERs for asthma, 96.3% were insured ones (Ponda et al., February 2005), while a recent study in Argentina indicated no health insurance coverage was available to 75.5% of asthmatic patients attending the ERs (Raimondi et al., 2005). It was also reported that only 56% were covered by medical insurance of those attending the ER for asthma (Eroglu G, Tugaeon A et al., 2004). In Ramallah, in year 2002 a study of 56 asthmatic patients attending the ER for acute asthma attack, 83% reported to have health insurance (El_Sharif N, September 2004, private communication).

2.2.3 Lack of specialty care:

Lack of access to specialist care for asthma may be a common risk factor for ER attendance and re-attendance (Dianne et al., 2004). Studies have indicated that general practitioners underestimate the severity of asthma and as a result preventive therapy is underused (Gellert et al., 1990).

A number of cohort studies have suggested that allergy specialist care reduces asthma ER visits and hospitalizations or both (Zeiger et al., 1991; Zeiger and Schatz, 2000). The studies indicated that those with allergy or pulmonary specialty care received more dispensations of inhaled corticosteroids per year than those without such care. They concluded that allergy or pulmonary care provide patients with education, environmental control, use of other medications which contribute to reduced ER visits (Schatz et al., 2003; Allen-Ramey et al., 2004). Moreover, those attending ER for having their regular care, have an opportunity to introduce inhaled corticosteroids to their therapy since they don't have an established source of primary health care (Singh A, Woodruff P et al., 1999).

In a study in Turkey, 2004 (Eroglu G, Sulun F et al., February 2004), of 151 ER attended pediatric asthmatic patients, asthma specialist followed only 25, while 50 were followed by pediatricians or primary health physician, and the remaining half were used ER as their routine care. Other study in Argentina found that 26% of ER attended asthmatic patients use ER as their routine care (Raimondi et al., 2005). Thus lack of access to asthma specialty care may be a significant risk factor for ER attendance and under treatment of asthma as well as failure to have a regular follow up care (Dianne et al., 2004).

2.2.4 Under-use of anti-inflammatory and overuse of B2-agonists:

Inhaled corticosteroids are the only treatment for asthma that has consistently been shown to reduce the morbidity and mortality of asthma (Suissa and Ernst, 2001). However, many studies have reported under treatment by inhaled corticosteroids and over use of inhaled B2-agonists which cause a worsening of asthma control leading to increased risk of ER visits (Taylor et al., 1990; Anis et al., 2001).

The use of inhaled corticosteroids in some studies for patients attending the ER was reported to range from 20-26 %, whereas according to GINA it should be 100% (Dales et al., 1995; Rabe et al., 2000; Bergquist and Crompton, 2001).

Over reliance on B2-agonists was reported to be high compared to inhaled corticosteroids in patients attending the ER. One study in USA, showed that (Eroglu G, Tugaeon A et al., 2004), 63% of patients just relied on B2-agonists, while only 24% reported using inhaled corticosteroids. This study concluded that marked under use of anti-inflammatory drugs are important risk factor for ER attendance and repeat attendance and there is a need to institute aggressive interventions to improve the quality of care for asthma.

A large scale international survey found that the use of anti-inflammatory medication even in patients with severe persistent asthma was low, ranging from 26% in Western Europe, to 9% in Japan, and there was a significant increase in the use of quick relief over preventive medication in all countries (Rabe et al., 2004). Although this study was not carried out in ERs, it reflects the suboptimal management of asthma worldwide that lead at the end to increased ER attendance for asthma. Meanwhile, it is consistent with other studies carried in the ERs (Spitzer et al., 1992; Dales et al., 1995; Kolbe et al., 1997).

In a study carried out in Turkey in 2004, only 51.7% of 151 pediatric asthmatic patients attending the ER for asthma were treated with inhaled anti-inflammatory despite their moderate to severe asthma, while the other majority was relied on inhaled B2-agonists also despite their moderate to severe asthma (Eroglu G, Sulun F et al., February 2004).

Another multinational study by Burney et al. 2004 (Burney et al., 2004, Unpublished) found that only 36% of 1062 patients of asthma in the ERs with persistent asthma had been prescribed an adequate dose of steroids according to GINA guidelines (GINA, 2002) and those are mainly with regular healthcare and insured ones.

2.2.5 Poor self-management and absence of asthma action plan:

Under treatment doesn't explain all cases of frequent ER attendance for asthma. It was found that patients with frequent ER visits showed significantly lesser knowledge of asthma control criteria, as well as over all trend toward reduced asthma management knowledge and skills (Boulet et al., 1996). Other studies found that the lack of proper use of inhalers was related to ER attendance, the lack of asthma knowledge is a modifiable reason for ER attendance and repeat attendance and that psychological factors like avoidance coping and attitudes to self-management were also related to acute use of health services for asthma (Peleg et al., 2002; Dianne et al., 2004).

Studies indicated that, optimal self-management including a written asthma plan and regular medical review led to a reduced number of ER visits (Gibson, 2000; Sulaimana et al., 2004). A study carried out in USA, found that only 48% of those attended the ER for asthma had an action plan (Kelly et al., 2004). Another study in Argentina reported that 43% had been provided by management plan by their physicians (Raimondi et al., 2005). Studies showed that, the reasons for those not possessing a plan for asthma were they had not been given it by their doctors (Douglass et al., 2002).

2.2.6 Previous ER visits and hospitalization:

Many studies indicated an association between current ER attendance and the presence of previous ER visits or hospitalization. A study in USA found that out of 1027 patients, 27% reported five or more ER visits in the past year (Kelly et al., 2004). Another study in USA reported that about 60% visited the ER (1-4) times, 30% (5-9) times, 7% (10-14) times and 3% (15-19) times in the past year (Eroglu G, Tugaeon A et al., 2004). A study in the ER for asthma in Australia found that 58% of asthmatics attending the ER were hospitalized (3-5) times in previous year (Dianne et al., 2002).

The 8 weeks period studies in the ERs in USA, showed that having 3 or more visits to ER within previous 3 months is a significant predictors of ER relapse (Newcomb and Akhter, 1986; Emerman and Cydulka, 1995; Ducharme and Kramer, 1996; Carren, 1998;). The researchers examined 293 patients with moderate to severe asthma attending the ER, found that 16% had two or more hospital admissions and 32% had two or more visits to ER in the past year (Adams et al., 2000).

2.2.7 Therapeutic non-adherence:

One of the major problems in asthmatic patients attending the ERs is compliance (Milgrom et al., 1996). Studies showed that as many as one half of asthma patients fail to adhere to daily treatment regimens either intentionally, unintentionally, or unknowingly (Sherman et al., 2000). Yet, long term adherence to appropriate medications is the necessary link between effective asthma therapy and well controlled asthma (Dianne et al., 2002). Studies showed that even with optimal patient follow up, adherence to prophylactic treatment was only 77% (Jonasson et al., 1999).

Reasons for non-compliance to medications including; poor understanding, fear of steroids side effects, adolescence, low socio-economic status, and psychological factors as a wish to be just like every one else (Balfour, 1999; Sherman et al., 2000). A study in ER in Australia in year 2000, found that medication cost was of concern to nearly 63% of the patients and 70% had co-morbidities and require multiple medications, thus they either didn't buy or lowering the doses of their medications to prolong their use (Dianne et al., 2002). Burney et al. 2004 indicated that 74% of those have health insurance covered some of their asthma medications, reported good compliance with treatment compared to uninsured patients (Burney et al., 2004, Unpublished). In Ramallah ER pilot survey, of 56 patients only 49% reported to be adherent to treatment (El_Sharif N, September 2004, private communication).

2.2.8 Low socio-economic status:

The gap in asthma care outcomes and ER visits associated with socio-economic disparities was reported by many studies (Kolbe et al., 1997; Apter et al., 1998; Lara et al., 1999).

Studies found that socio-economic indicators such as not finishing high school, being a member of a minority ethnic (Apter et al., 1998) or a single-parent family (Kolbe et al., 1997) have all been independently associated with asthma ER attendance and poor medication adherence. Low socio-economic status are usually associated with greater exposure to causes and trigger factors arising from poor housing or financial barriers to quality of health services and medications for asthma (Dianne et al., 2002). Studies also

showed that women were on greater risk for ER attendance for asthma, and in one study they were in a ratio of nearly 2:1 (Singh A, Cydulka R et al., 1999; Douglass et al., 2002).

2.2.9 Asthma severity:

Severe chronic asthma was shown to be associated with ER attendance for asthmatics. In Australia, a study found that of 62 patients attended the ER, 2/3 had severe chronic asthma, and patients reporting for their current attendance to ER was, 59% due to respiratory tract infection, 19% due to sudden shortness of breath, other reasons include medication use, costs, and concerns. This study concluded that disease severity is one of the risk factors for ER attendance for asthmatics (Dianne et al., 2004).

Another study in Australia indicated that chronic asthma severity in patients attended the ER was, 52% had severe asthma, 23% had moderate, and 26% had mild asthma (Dianne et al., 2002). A study in ER in USA, found that of 1027 patients, 67% were persistent asthmatics (Kelly et al., 2004), while Burney et al. 2004 indicated that of 1062 patients attended the ERs in a multinational study, 78% had persistent asthma, of those; 30% had severe persistent asthma, 27% had mild asthma (Burney et al., 2004, Unpublished).

2.2.10 Ambient air pollution:

Ambient air pollution as a risk factor for ER attendance for asthmatics is significantly related and mentioned in previous studies (Tob?A et al., 1999; Fauroux et al., 2000; Wilson et al., 2005). A time series study in France found a positive statistical association between daily asthma ER visits and daily variations of ozone and nitrogen dioxide levels after controlling for weekly and monthly variations (Fauroux et al., 2000). Another recent study in England (Wilson et al., 2005) also revealed that on daily basis, elevated sulfur dioxide and ozone have a significant impact on ER visits for asthma.

2.3 Summary of ER attendance determinants

In brief summary, it was found in USA that lack of access to regular medical care, absence of health insurance (Oster and Bindman, 2003), lack of specialist care (Zeiger et al., 1991), under use of anti-inflammatory and over use of short B-agonist (Eroglu G, Tugaeon A et al., 2004), poor self management (Boulet et al., 1996), absence of action plan for asthma, asthma severity (Kelly et al., 2004), and low socio-economic status (Apter et al., 1998) were all associated with ER attendance for asthma. However, in Australia no regular doctor for asthma care (Douglass et al., 2004), previous hospital admissions, therapeutic non adherence, low socio-economic status (Dianne et al., 2002), lack of specialist care for asthma, lack of proper use of inhalers and asthma severity (Dianne et al., 2004) were found to be related.

Further, in England it was concluded that doctors should explore and acknowledge their patients personal disease and opinions (Clark and Gong, 2000) in order to decrease ER attendance. In Turkey, lack of access to specialist care, under treatment by steroids and over use of B-agonist (Eroglu G, Sulun F et al., February 2004), were found to be risk factors for ER attendance for asthmatics. In Canada, under use of steroids and over reliance of reliever therapy was associated (Anis et al., 2001). In Argentina, certain factors were found, like no health insurance coverage, depending on ER for asthma care, and absence of action plan for asthma (Raimondi et al., 2005). In Western Europe and Japan Rabe et al.

(2004) reported under use of anti-inflammatory. Meanwhile, in Israel, Peleg et al. 2002 reported lack of proper use of inhalers, and general poor self management among asthmatics (Peleg et al., 2002).

In a multinational study, included several countries in the world (England, France, Chile, Algeria, Tunisia, Sudan, Kuwait, Palestine, Syria, Bosnia, and Canada) Burney et al. 2004 reported under treatment and under use of anti-inflammatory among patients attending ER for asthma care (Burney et al., 2004, Unpublished).

2.4 Determinants of asthma morbidity

Although disease severity and socio-economic factors are well known contributors to asthma morbidity (NHLBI, 2003), the influence of personal psycho-social factors play also a role (Dales et al., 1995; Kolbe et al., 1997). Other factors include under-diagnosis and under-treatment (Woolcock et al., 1989; NHLBI, 1991; GINA, 1995), non-compliance with prescribed medical regimens (Birkhead et al., 1989; Brooks et al., 1994; Rand and Wise, 1994), inability to use medications properly, especially inhaled medication (Bailey et al., 1990; Belda, 1995), under-treatment with anti-inflammatory medication, and overuse of beta adrenergic bronchodilators (Woolcock et al., 1989; Spitzer et al., 1992). Other factors such as poor understanding of the disease process or lack of disease management have been identified as a major problem for patients with asthma (NHLBI, 1991; Dales et al., 1995; Kolbe et al., 1997).

The cost of having medical care could be also considered as one of the determinants of asthma morbidity. Asthma costs are substantial (Weiss et al., 1992) and this relates both to treatment costs and the use of health services consequent on poor disease control (Weiss and Sullivan, 1993). Asthmatic patients attending the emergency rooms account for disproportionate amounts of the costs (Weiss and Sullivan, 1993).

The economic cost of asthma is considerable both in terms of direct medical costs (such as hospital admissions and cost of pharmaceuticals) and indirect medical costs (such as time lost from work and premature deaths) (Weiss et al., 1992; Krahn et al., 1996). In the USA, the direct cost of asthma was estimated to be 6.2 billions per year, and the indirect cost related to reduced productivity caused by absenteeism at school or work was calculated to be 1 billion per year (Weiss et al., 1992). Moreover, hospital care costs for asthma account for nearly 50% of the direct cost spent on this disease (Weiss et al., 1992), and in Canada, the cost reached \$600 million (Krahn et al., 1996). In Australia, the direct and indirect costs for asthma in 1994 estimates ranged from (US\$586-US\$718) million/ year (NACA, 2002).

Although morbidity and mortality from asthma are significant problems, a substantial proportion of the problems caused by asthma could be averted if patients with asthma and their health care providers managed the disease according to established guidelines (Smaha, 2001). Implementation of any intervention is also critical for its impact and any successful interventions will not only improve quality of life for patients with asthma, but also likely produce significance cost savings among health insures (Smaha, 2001).

2.5 Interventions to reduce ER attendance

Studies have shown that interventions that address all or some different aspects of asthma care leading to reduction in ER attendance for asthmatics. These aspects include;

2.5.1 Patients education and self-management:

In patients making frequent visits to ER, studies showed that, asthma control can possibly be improved by patient participation in an asthma education program that addresses the deficiencies observed (Jones et al., 1987; Mayo et al., 1990). Other study found that use of an action plan for asthma and measurements of PEF are potential tools for improving patients' self-management skills and reducing ER attendance (Beasley et al., 1989). It was concluded that, an ER based education program for patients, concentrated on patients self-management of their asthma, providing instructions for proper inhaler technique would probably result in decreased numbers of ER visit (Mayo et al., 1990; Bolton et al., 1991; Newhouse, 1994; Greineder et al., 1995). Another study showed that, an educational program for patients in outpatient clinic contains video cassette, brochure, education seminars, proper inhalation device usage, telephone lines helping, produced significant improvement in clinical and functional measures of asthma with a reduction in ER usage (Marabini et al., 2002; Yilmaz et al., 2002).

In Israel, an intervention program in PHC clinics in Muslim Bedouin sector in Negav, concentrated on patients education including improved hygiene, use of asthma medications and equipment, allergens avoidance, and health fair, resulted in reduced referrals to ER from 22.8% (61 patients) to 2.2% (6 patients) after the program (Peleg et al., 2002).

In France, a recent study concluded that framing the controller medications use by patients and educating families about how to manage the disease and to improve their domestic environment, would result in reduced ER visits (Ploin et al., 2005).

2.5.2 Educating health care professionals:

An organized disease intervention program for primary care physicians increased adherence to asthma management guidelines for anti-inflammatory use. This adherence reduced ER visits and hospitalization for asthma. In USA, it was found that after the intervention program, anti-inflammatory therapy increased from 38% to 96% and ER visits decreased by 27% (Cloutier et al., 2005).

Despite the fact that, ERs are often busy facilities, they can provide a vital link for the patient to other healthcare setting. Studies showed that ER initiated referral is relatively low complexity interventions, as discharge instructions care are already a routine part of ER discharge care, and such an intervention seems to improve compliance with the recommendations of early post-ER primary healthcare utilization or referral (Smaha, 2001). ER-based physicians education and ER-Feedback, specially for those who use ER as their routine source of care and don't have an established PHC to prescribe inhaled steroids for them, would probably result in improved quality of care in the ER and decreased ER visits.

It was found that such a system increased proper use of inhalers from 18% to 60%, assessing asthma severity increased from 44% to 95%, a written asthma action plan

improved from 50% to 85%, and steroids use from 64% to 81% over a year. (Singh A, Woodruff P et al., 1999; Walsh-Kelly et al., 2005). Studies in USA indicated that implementation of non-medication aspects of asthma care by physicians and nurses, specifically the provision of an action plans, may reduce the ER use for asthmatics (Jackson R et al., 1988; Smaha et al., 2001). It was indicated that following the recommendations of surveillance and medical follow up care in ERs, would be important in any interventions to reduce ER attendance for asthma (Smaha et al., 2001).

2.5.3 Reducing economic barriers:

Exploring the barriers to financing and treatment could further stratify targeted interventions in reducing the ER attendance for asthmatics, and would increase patients compliance and adherence to prescribed medications, specially in low socio-economic status patients (Dianne et al., 2004).

2.5.4 Evaluation of patients psychosocial factors:

Andrrn and Rosenqvist (Andrrn and Rosenqvist, 1987) concluded that, psychosocial factors related to ER visits for asthma should be evaluated and addressed for future interventions to reduce ER attendance. They reported that living alone, perceived loneliness were predictive factors for frequent ER visits for asthma, and these factors may influence compliance with treatment leading to poor asthma control and increased ER visits (Andrrn and Rosenqvist, 1987; Barton et al., 2005). Other studies found that patients' attitudes and coping styles to using asthma medications, fears of steroids, culture aspects of inhalers use, will be important in any interventions to reduce ER visits (Dianne et al., 2002).

2.5.5 Recognize asthma as a public health priority:

Effective interventions to control and reduce ER visits for asthma depend on the recognition of asthma as a major public health problem at the national and international levels. Also, the requirement of respiratory specialist and related organizations at the national level is important for optimal asthma management and reducing ER visit (Dianne et al., 2004). Adaptation of asthma international and national guidelines with adequate governmental resources for healthcare including asthma is also necessary (GINA, 2002).

As with other multidimensional public health problem, asthma effective solutions depend on the extent to which policy makers can design and implement multiphased policy reforms that go beyond medical care and reach the broader physical and social environment in which asthmatic patients live. Not only the quality and accessibility of medical care, but fundamentally, the social determinants of health (GINA, 2002; NHLBI, 2003).

2.6 Summary

The literature shows that risk factors for frequent ER attendance and asthma severity could be either non-preventable (non-modifiable risk factors) which could not be changed and preventable (modifiable risk factors) which could be changed by proper interventions.

In general, non-preventable risk factors for frequent ER attendance and asthma severity are uncountable in comparison to preventable ones. Of these non-preventable are; age, sex (female), race, and low socio-economic status in general. Further, for those patients a proper education and availability of less constable and proper prescribed medications might decrease their frequent ER attendance and asthma severity and also increase their compliance and adherence to prescribed medications.

However, preventable risk factors are greatly contributing to frequent ER attendance and asthma severity. These factors could be changed and result in a good asthma management, low or absence of ER attendance and in a prevention or decrease in asthma severity. Of these preventable (modifiable) risk factors are; under-treatment by inhaled anti-inflammatory, over-use of B2-agonists, poor self-management, absence of action plan, therapeutic non-adherence, lack of specialist care, improper use of inhalers, poor understanding of the disease process, poor doctor-patient relationship and bad quality of care in general. Meanwhile, interventions to reduce these modifiable factors include; patients education and self-management, educating health care professionals, improvement in recording system for asthmatics, proper pharmacotherapy, good doctor-patient relationship and by enhancement of health care quality and access.

The literature review shows that ER attendance for asthma is a widespread health problem, and mostly a modifiable problem which needs considerable attentions to reduce it to the lowest possible level. This can be achieved by continuous efforts of those who appreciate the value of mankind. What is clear from above, in spite of the limited resources, that the implementation of an intervention program based on principles is needed. What is discussed above can result in favorable asthma outcomes in local community.

However, an ER visit within the past month for asthma, and 3 or more ER visits for asthma in the past year, is both risk factors for death from asthma (NHLBI, 1997). Preventing ER attendance for asthmatic patients by adequate management and proper healthcare resources can possibly prevent this death, and not only produce a healthier people but also improved family functioning, workplace productivity, and overall family well being (Ait-Khaled et al., 2001).

For these reasons, future considerable research should concentrate on the assessment and treatment of asthma to develop clinical practiced guidelines and interventions programs to minimize these factors especially the preventable ones (NHLBI, 1997; Boulet et al., 1999).

Chapter 3

Conceptual framework

3.1 Definition of asthma

Working definitions of asthma emerged from two Ciba Foundation symposia in 1959 and 1971, which stated that asthma was predominantly a disease of airway smooth muscle, which was altered so that it contracted too easily and too much (Nadel and Busse, 1998).

The NHLBI, 1997 (NHLBI, 1997) defined asthma as:

“ A chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T-lymphocytes, macrophages, neutrophils, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial hyper- responsiveness to a variety of stimuli ”.

3.2 Natural history of asthma

Several studies (Platt-Mills et al., 2001; De Marco et al., 2002) showed that, in respect to its natural history, asthma presents two different forms;

1. Early-onset asthma: occurs early in childhood, affects mainly boys, and has a good prognosis.
2. Late-onset asthma: occurs during or after puberty, affects mainly women, and has a poor prognosis.

Airflow obstruction or limitation in asthma is caused by bronchoconstriction, mucous plugs, swelling, and increased inflammation. The inflammatory process can cause permanent changes in the airways. Long term changes include increased smooth muscle, increase in bronchial blood vessels, thickening of collagen layers, and loss of normal distensibility of the airway (Corrigan and Kay, 1991).

The mechanism by which acute episodes are initiated and sustained are for the most part unknown (McFadden and Hejal, 2000). However, cell activation with production of potent mediators of inflammation is believed to be central to the pathophysiology of asthma. Almost all the inflammatory cells present in the bronchial wall and lumen have been implicated in the pathogenesis of mucosal inflammation in asthma (Fig.3.1) (Holgate, 1997).

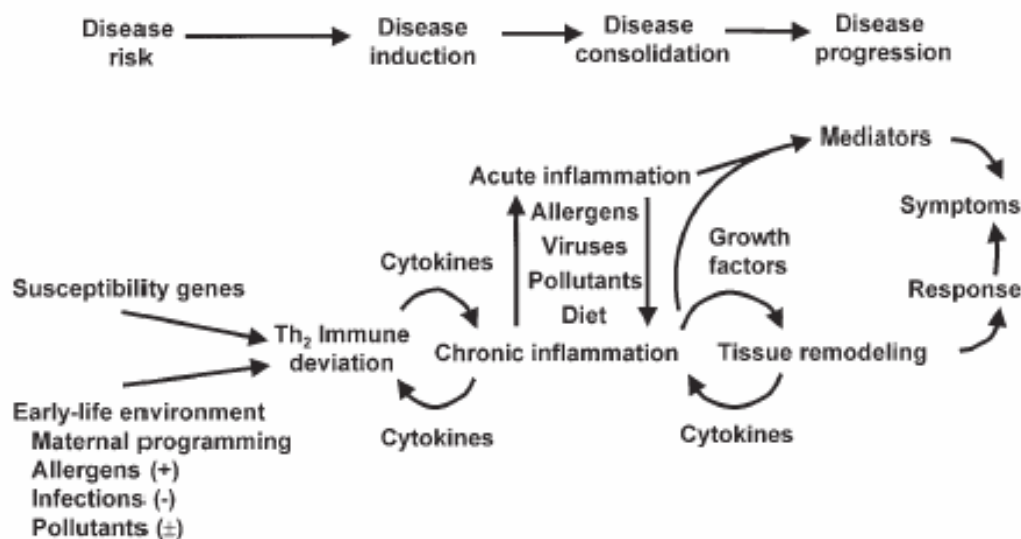


Figure 3.1: Natural history of asthma. Schematic of the natural history of asthma demonstrates several possible features of the disease. Adapted from Holgate ST, 1997.

Many factors have been implicated in the induction and exacerbations of asthma (GINA, 2002). Remissions and relapses may occur and, in those in whom the asthma disease persists, outcomes vary from mild to severe effects on lifestyle with occasional deaths attributable. Moreover, there is a latency period from exposure to actual sensitization and it can range from months to years (Holgate, 1997).

This complexity of the natural history of asthma influences the approach to its prevention (NSW Department of Health, 1997). The determinants which have been implicated in the induction and exacerbations of asthma include; allergy, atopy and/or family history of asthma, respiratory (viral) infections, occupational, socio-economic, environmental (indoor and outdoor pollution), weather changes, exercise, psychological, and some drugs (GINA, 2002). Atopy is the foremost predisposing factor for the development of asthma (Holgate, 1997; De Marco et al., 2002). Allergic asthma occurs when individuals become sensitized to allergens such as animals' dander, grass pollens, tree pollens, house dust mites, and flour or grain dust (Corrigan and Key, 1991). For instance, Environmental tobacco smoke (ETS) can induce and exacerbate asthma (Holgate, 1997). Therefore, infants with a family history or atopy, have to be avoided from exposure to passive smoking, domestic dust mite, cat, and cockroach allergens that might help preventing the initial development of asthma. For adults, avoiding exposure to smoke and to chemical sensitizers in the workplace might be helpful in avoiding the appearance or exacerbation of asthma and its symptoms (NHLBI, 2003; Australia, NACA, 2002). Occupational exposures can induce asthma in a previously healthy person, whereas non-allergic type environmental agents such as ozone (O₃) and sulfur dioxide (SO₂) can exacerbate pre-existing asthma (NHLBI, 2003).

3.3 Asthma medications

There are separate types of medications for the management of asthma, and usually in different pharmaceutical forms range from tablets, SR-tablets (Sustained-release), syrups, inhalers, nebulizers, and parenteral. These medications are divided into three basic types and usually recommended by severity level and age (Katzung et al., 1997; Australia,

NACA, 2002; GINA, 2002): (1) Type 1, controller (Preventer or Anti-inflammatory) which is a medication that keeps symptoms and attack from starting. They include; steroids, Na+-cromoglycate, nedocromil, long acting B2-agonists, SR-theophylline (Sustained-release), and anti-leukotrienes; (2) Type 2: Reliever (Bronchodilator) which works quickly to treat attacks or relief symptoms. They include; short acting B2-agonists, anti-cholinergic, short acting theophylline, and adrenaline injection; (3) Other Medications include antibiotic for respiratory infections, anti-histamines for treatment allergy symptoms, and complementary medicines which are plant or herbal products, but should be used with caution and care to ensure safety and efficacy.

3.4 Classification of chronic asthma severity

There are different guidelines for classification of asthma severity. But they usually follow the American NAEPP guidelines, 1997 (NHLBI, 1997), or GINA guidelines, 2002 (GINA, 2002), or the Australian guidelines, 2002 (Australia, NACA, 2002). The NAEPP and GINA guidelines use four basic levels of severity (mild intermittent, mild persistent, moderate persistent and severe persistent) and their classification usually based on day/night time symptoms, physical activity, and FEV1 (% predicted). The NAEPP and GINA guidelines are nearly close to each other. However, the Australian guidelines use only three basic levels of severity (mild, moderate, and severe asthma) and their classification usually based on day/night time symptoms, FEV1 (% predicted), previous ER attendance and hospital admissions in past year, and frequency use of bronchodilator. The GINA 2002 guidelines classify asthma into four levels of severity in which the presence of one of the features of severity is sufficient to place a patient in that category and these are:

1. Mild intermittent: asthma is intermittent when FEV1 (% predicted) $\geq 80\%$, daytime symptoms < 1 per week, and nocturnal symptoms ≤ 2 per month.
2. Mild persistent: asthma is mild persistent when FEV1 (% predicted) $\geq 80\%$, daytime symptoms > 1 per week with < 1 per day, and/or nocturnal symptoms > 2 per month but < 1 per week, and /or attacks may affect activity.
3. Moderate persistent: asthma is moderate persistent when FEV1 (% predicted) $\geq 60\%$ to $< 80\%$, or daytime symptoms daily, or nocturnal symptoms > 1 per week, and/or attacks affect activity.
4. Severe persistent: asthma is severe persistent when FEV1 (% predicted) $< 60\%$, and daytime symptoms continuous, and/or nocturnal symptoms frequent, and/or limited physical activity exist.

3.5 Asthma worldwide

ER usage due to asthma attacks is highly common and represents an important place where specialized health care delivery is needed (Lagerlov et al., 2000). ER visits for asthma in most countries account for the largest consumption of direct health care spent on asthma and are vulnerable point in the illness to both patients and families (Smaha, 2001).

In USA, prevention of asthma exacerbations is the primary goal of asthma care (NHLBI, 1997). However; one third of children with asthma require ER care (Mannino et al., 2002), hospital care costs account for nearly 50% of the direct cost spent on asthma each year (Weiss et al., 1992) and asthma is the leading cause of ER admissions (Weiss et al., 1992) where there are almost 2 million ER visits per year of acute asthma (Weiss et al., 1992), of

those nearly 75% discharged home approximately 10% to 20% will relapse within 2 weeks (Camargo, 1998-^a). In Canada, 25% of \$ 600 million were expended on ER visits and hospitalization of asthma care (Krahn et al., 1996). In the Middle East, no scientific statistical data are available, but the hospital admission rates are in excess of 150-200 per 100,000 per year in some of high prevalence countries (Goren and Hellmann, 1997; Ait-Khaled et al., 2001; AL Frayh et al., 2001), for example; in Israel, one in five asthmatic children visits the ER per year (Israel, MOH, 1997).

3.5.1 Classification of acute asthma severity in ER:

The features of classification vary from a guideline to another, but the most widely accepted and practiced is the GINA classification (GINA, 2002). According to GINA guidelines 2002, the presence of several parameters but not necessarily all, indicate the general classification of the attack (GINA, 2002).

1. Mild attack: the patient can lie down, talk in sentences, but may be agitated. Respiratory rate increased, accessory muscles usually not used, wheezing only end expiratory, pulse /minute < 100, PEF or FEV1 (%predicted) over 80%, PaO₂ < 45 mmHg, and SaO₂ > 95%.
2. Moderate attack: the patient can talk in phrases and usually agitated. Respiratory rate increased, accessory muscles usually used, wheezing is loud, pulse/minute 100-120, PEF or FEV1 (%predicted) 60-80%, PaO₂ >60 mmHg and/or PaCO₂< 45 mmHg, and SaO₂ 91-95%.
3. Severe attack: the patient can talk in words only and usually agitated. Respiratory rate often > 30/minute, accessory muscles usually used, wheezing is usually loud, pulse/minute > 120, PEF or FEV1 (%predicted) < 60%, PaO₂ < 60 mmHg and/or PaCO₂ > 45mmHg.
4. Respiratory arrest imminent: the patient is drowsy or confused. Respiratory rate paradoxical, accessory muscles with paradoxical movement, wheezing is absence, and bradycardia exist.

3.5.2 Assessment of acute asthma in ER:

Physiologic outcomes are the most standardized procedures in assessing clinical outcomes in asthmatics patients at the ER (Crim, 2000). However, pulmonary function testing (spirometry and peak flow meter) is used primarily to gauge the severity of the patients' asthma and monitor response to therapy (GINA, 2002).

1. History and physical examination

Asthma attack may be difficult to be diagnosed and misdiagnosis could happen with other disorders like, chronic obstructive pulmonary disease, bronchitis, and congestive heart failure. As a result it may be possible that the patient is suffering from another condition with similar symptoms. For example, if the patient has productive cough every day with little change from one day to the next, it is more likely to be bronchitis, while if he experiences breathlessness after exercise which worsen over time, chronic obstructive disease should be considered (Ait-Khaled and Enarson, 2005). However, chest pain and tightness may be more related to ischemic heart disease (Ait-Khaled and Enarson, 2005). Thus assessing the patient's history, variability of symptoms over time, causal and triggers

to current attack, hospital admissions, home and work environment, family history of atopy, and response to prior treatment should be added in diagnosis (GINA, 2002).

Physical and physiologic examinations (temperature, pulse/minute, respiration, PaO₂, PaCO₂, SaO₂, breath, wheeze, speaking, accessory muscle use, and mental state) are also important in assessing the acute attack of asthma and play a major role in classification the level of acute severity (GINA, 2002).

2. Spirometry

Spirometer is the most common tool used in both clinical practice and research studies to evaluate patients' asthma severity. It is considered as an excellent procedure for documenting changes in asthma because it is easy to perform, but effort dependant, thus patients experience, education, and demonstration are necessary to get best result (Noviski et al., 1991). It is also a sensitive and more objective when compared to patients' clinical symptoms (GINA, 2002).

The main indices from spirometry testing are; FEV₁, FVC, and ratio of FEV₁/FVC. According to GINA (GINA, 2002), FEV₁ (%predicted) > 80% indicate mild attack, ≥ 60% to ≤ 80% indicate moderate attack, and < 60% indicate severe attack. Those attended the ER with asthma, usually have an FEV₁ between 30% to 80% of predicted (NHLBI, 1997; Emerman et al., 1999). A study in Canada found that, 2 hours after initiation of intensive bronchodilator therapy, patients with FEV₁ (% predicted) ≥ 60% had a high likelihood of being discharged home (Schuh et al., 1997).

Studies have indicated under use of spirometry to both in ER and in general practice, and that physicians and patients have been shown to underestimate lung function and rely on signs and symptoms alone. It was found that spirometry is never performed to one-quarter of asthmatics in PHC, while in 60% of cases, spirometry is never done or is performed less than once a year (Lopez-Vina et al., 2003).

3. Peak expiratory flow meter

This apparatus measures the peak expiratory flow rate (PEFR) which is useful in monitoring clinical outcome of asthmatic patients. It is considered a suitable way to measure lung capacity since it easy to use and in contrast to spirometry which allows only infrequent measurements in medical settings. Moreover, it can be used at home, work, and school, but it is very effort dependant and is not a substitute as a diagnostic tool for severity assessment (Jackson A, 1995). During asthma attack and according to GINA (GINA, 2002), PEF (%predicted) > 80% indicate mild attack, 60-80% moderate attack, and < 60% severe attack after initiation of bronchodilator therapy.

3.5.3 Management of asthma attack in ER:

Many studies have been carried out to evaluate and investigate the assessment and management of asthma in ERs in real practice. In one study, it was concluded that, B₂-agonist, ipratropium bromide, and steroids form the cornerstone of acute asthma therapy, while methylxanthines have no proven role (Marik et al., 2002). Moreover, prompt administration of oral prednisone was found to be effective in reducing the need for hospitalization (Scarfone et al., 1993). Other study reported that 32% of patients attended

the ER with life threatening asthma attacks and 40% with severe attacks, didn't receive steroids. This study indicating the underuse of steroids in severe exacerbations despite their beneficial effect and recommended guidelines. The study also found that anti-cholinergics were used in a half the patients irrespective to severity features upon arrival to ER. They found also that, 24% with life threatening attacks were discharged home after clinical improvement at 2 hours despite that half of them had reached a PEF of 50% of predicted (Salmeron et al., 2001).

Another study in ERs, reported that aminophylline was given to small numbers of patients who were already taking oral theophylline, which resulted in over dosage and severe side effects. The study also found that IV (intravenous)-hydrocortisone 200 mg was used in 4% of cases, ipratropium bromide in 7%, oral steroids in 3%, oxygen (O₂) was given in only 3%, duration of attack was usually less than 1 day, and respiratory tract infection was the precipitating factor for current attack in 60% of cases. PEF was recorded in 26% of cases before treatment and in 15% after, but no FEV₁ was recorded. The study concluded lack of knowledge about the use of nebuliser, the current use of IV (intravenous)-aminophylline, and that there is a need for education of all doctors in the management and diagnosis of asthma (Ebden et al., 1988).

GINA recommended several procedures for optimal asthma treatment and management in the ER (GINA, 2002). These guidelines are closely consistent with many other international and national guidelines including the Palestinians guidelines for diagnosis and management of bronchial asthma (NHLBI, 1997; Australia, NACA, 2002; Abdeen et al., 2003).

Step 1) Initial assessment

Include reviewing of the patient's history, vital and physical exams, and PEF or FEV₁ (%predicted).

Step 2) Initial treatment

Nebulised rapid acting B₂-agonist one dose every 20 minute for 1-hour, oxygen (O₂) to achieve $\geq 90\%$ saturation in adults or $\geq 95\%$ in children, systemic corticosteroids should be added if no immediate response.

Step 3) Repeat assessment

Repeat the patient physical exams and PEF or FEV₁ (%predicted) to assess and monitor response to initial therapy. The patient is having moderate episode when PEF or FEV₁ is 60-80% predicted. In this case, inhaled B₂-agonist and anti-cholinergic inhalation every 60 minutes should be added, consider glucocorticosteroids, continue treatment 1-3 hours provided there is improvement. If the patient is having severe episode i.e. PEF or FEV₁ is $<60\%$ predicted, inhaled B₂-agonist and anti-cholinergic inhalation, oxygen, and systemic glucocorticosteroids should be added, consider subcutaneous, intramuscular, or intravenous B₂-agonist, intravenous methylxanthine, and intravenous magnesium. Subcutaneous adrenaline may be indicated for anaphylaxis and angioedema.

Step 4) Good response

If good response sustained 60 minutes, physical exams are normal, PEF or FEV1 > 70% predicted then discharge home.

Step 5) Incomplete response within 1-2 hour

When history indicate a high risk patient, physical exams indicate mild to moderate symptoms, PEF or FEV1 < 70%, and oxygen (O2) saturation not improving, then admit to hospital.

Step 6) Poor response within 1-hour

When history indicate a high risk patient, physical exams indicate severe symptoms, drowsiness, confusion exist, PEF or FEV1 < 30% predicted, PaO2 < 60 mmHg, and PaCO2 > 45 mmHg then patient should be admitted to intensive care unit.

Step 7) Follow up care

Patients, who do not require hospitalization and discharged home, should have the following follow up care (GINA, 2002);

1. Inhaled B2-agonist for symptoms relief.
2. Consideration of oral steroids (0.5-1)mg/Kg until FEV1 is within 80% predicted.
3. Patient education including proper medication use.
4. A written asthma action plan if not already had.
5. Close medical follow up including a letter to the career.
6. Increased usual dose of inhaled steroids until symptoms are resolved.

Patients, who require hospitalization, require the following follow up care (GINA, 2002);

1. An outpatient's appointment.
2. An interim written asthma plan.
3. A letter to their general practitioner.

Chapter 4

Materials and Methods

4.1 Introduction

This study followed the scientific methodology in its design and sample size. Further, ethical consideration was also followed regarding approval of this study, setting of the study and patients participation. Certain criteria were developed for inclusion and exclusion of the participants and a pilot study was carried out before the major one.

Preparation for the field work was done including copies of the questionnaires and availability of other study tools. Data were collected during a two month period which included 121 participants. All data were entered and analyzed using the statistical software package SPSS 12 (SPSS Inc., 2003). Checking and cleaning phase was performed. However, logistic regression models were developed for both study outcomes (ER attendance frequency and chronic asthma severity).

4.2 Study design and sample size

According to the study aim and objectives, a cross sectional study and non-random purposive sample were used to collect information from all asthmatic patients ≥ 5 years old attending the emergency room of Alia governmental hospital in Hebron district through April 2005 to the end of May 2005. The type of sample was chosen due to limited resources and records for asthma patients in our community. However, this kind of sample and study design could enable us to generate hypotheses which would be used for health services description, planning and for intervention programs but not for causal inferences. Similar design was used in similar settings using similar tools in various studies worldwide (Douglass et al., 2004, Dianne et al., 2004). However, other follow up studies used prospective (Emerman et al., 1999; Salmeron et al., 2001) and retrospective designs (Weinmann et al., 2003), and case-control (Belessis et al., 2004) depending on medical records and patients charts which was not possible in the governmental hospitals in Palestine. Therefore, and since it is an audit study, this design was one of the possible designs to be used in this study.

Sample size calculation was used according to table (4.1). The table shows the approximate 95% confidence intervals for an estimate, given prevalence of 5%, 10%, 20% and 50% and sample sizes of 50, 100, 200 and 300 patients. Based on these data, and given that some of the prevalences to be measured are in sub-groups (e.g. by severity) we would guess a sample size of 100 would be adequate (EL-Sharif N, September 2004, private communication). To ensure the accuracy of our sample size we interviewed all the asthmatic patients (121 asthmatic patients) aged 5 years and above who attended at the ER of Alia hospital during the 2 months period.

The study population is all asthmatic patients aged 5 years and above, with final physician-diagnosis of asthma, with or without further complications, who attended the ER of Alia governmental hospital in Hebron district through April 2005 to the end of May 2005. Patients of age less than 5 years were not included in the study to ensure the accuracy of diagnosis, since these patients' symptoms can not be interpreted as "asthma" due to

difficulties and inaccuracy in diagnosis measures for children under 5 (Akinbami et al Schoendorf, 2002).

Table 4.1: The approximate 95% confidence intervals for an estimate of sample size, given prevalence of 5%, 10%, 20% and 50% and sample sizes of 50, 100, 200 and 300 patients.

	95% CI, absolute and percent width of interval			
	SAMPLE SIZE			
True Prevalence (%)	50	100	200	300
5	3.1-6.9 ± 1.9 ± 38%	3.65-6.35 ± 1.35 ± 27%	4.52-5.48 ± 0.48 ± 10%	4.61-5.39 ± 0.39 ± 8%
10	5.8-14.2 ± 4.2 ± 42%	7-13 ± 3 ± 30%	7.88-12.12 ± 2.12 ± 21%	8.3-11.7 ± 1.7 ± 34%
20	14.4-25.6 ± 5.6 ± 28%	16-24 ± 4 ± 20%	17.2-22.8 ± 2.28 ± 11%	17.7-22.3 ± 2.23 ± 11%
50	43-57 ± 7 ± 14%	45-55 ± 5 ± 10%	46.5-53.5 ± 3.5 ± 7%	47.1-52.9 ± 2.9 ± 6%

4.3 Study setting

The study was carried out in the Alia governmental hospital, mainly in the ER. However, fifteen patients had been interviewed either at home or by telephone contact as it was difficult to interview them in the hospital ER.

4.4 Administrative and ethical consideration

1. An official letter to conduct the study in the ER of Alia hospital was sent to the manager of the hospital (Appendix 4.1).
2. A permission letter to conduct the study at the ER of Alia hospital was given from the manager of Alia hospital (Appendix 4.1).
3. The study was approved by the scientific research committee and the school of public health in AL-Quds University
4. Explanatory letter for all participants attached to each questionnaire, which explains the study aim, importance, confidentiality and anonymity of the information with optional participation (Appendix 4.2).
5. Of those who agreed to participate in the study, a written informed consent attached to each questionnaire was obtained from each or from the parents of the child following explaining the aim and importance of the study.
6. No one had been given access to completed questionnaires except the researcher. The researcher kept himself with all processing steps of the samples and records to ensure the privacy and accuracy.

4.5 Patients inclusion and exclusion criteria

Eligible subjects to be included in this study met the following conditions:

1. resident in the area of study (Hebron district).
2. attended the ER of Alia governmental hospital in the study period.
3. had a final physician diagnosis of asthma with or without further complications.
4. aged 5 years and above; and
5. accept to participate in the study.

Asthmatic patients who attend the ER for a reason other than disease were excluded.

4.6 Study tools

1. Questionnaire; The study questionnaire was developed by the International Union Against Tuberculosis and Lung Diseases (IUATLD) using the validated questionnaire that was used by the European Community Respiratory Health Survey Questionnaire (ECRHSQ) (Burney et al., 1994). This questionnaire was adapted to the local Palestinian conditions (Appendix 4.3).

Structured closed and open questions were used in the questionnaire. The questions were divided to:

1. Personal information included socio-demographic information and factors of each participant in terms of place of residence (city, village or refugee camp), name, age in years, sex, marital status, occupation, date and time of arrival and discharge from the hospital, address, home and cellular phone, and the highest level of education in years.
2. Vital symptoms and severity at presentation to the ER, using markers of severity (temperature, pulse, respirations, PaO₂, SaO₂, PaCO₂), pulmonary function measurements before and after salbutamol by measuring the FEV₁ % predicted values best of 3 efforts, with a portable spirometer (Rudolf Riester GmbH and Co. KG, Germany). Acute clinical severity assessment questions consisting of 5- items including breathlessness, wheezing, speaking difficulty, accessory muscle use and mental state, an individual was assigned to the highest score in which any feature occur according to GINA 2002 asthma management pocket (GINA, 2002).
3. Treatment given in the ER and whether or not the patient was admitted to hospital or discharged home, and if he was finally discharged alive or dead, together with the medications he was discharged with.
4. Medications being taken over the previous 3 months, their frequency, compliance with treatment, Co-morbidity and whether the patient was insured or not, and the insurance coverage of the medications (free, partially or full cost).
5. History of individual asthma, asthma management and aspects of previous medical care, source of usual care and health system experiences. In terms of age when first diagnosed with asthma, if he ever had eczema and/or rhinitis, place of first diagnosis of asthma, by whom the patient was first diagnosed whether by a general or specialized doctor and if by a specialist, his field of specialty was identified, frequency of ER attendance and hospital admission in the past year, the mainly responsible for following the patient's asthma and his specialty and work, the time of last professional visits for asthma in past year, health service utilization and medication review in the past year, whether having access to specialist care or not, if he got a regular treatment for asthma or not, followed on regular basis or not.
6. Self-management of asthma including using any remedies to help his asthma other than conventional ones, having a spirometer or peak flow meters at home, if the patient ask

the doctors questions about asthma disease and/or medications, if he understand the difference between the reliever and preventer medications and if he had a home inhalation equipment, how he found the asthma inhalers/devices are to use (easy or difficult), patients reported the reasons for current ER attendance and whether he got benefit from doctor in managing his asthma at home.

7. Severity/Control of asthma over the three months prior to current attack. The chronic clinical status was categorized into four levels of severity, including; intermittent, mild persistent, moderate persistent and severe persistent asthma according to the criteria listed for severity in the GINA 2002 guidelines for asthma management (GINA, 2002). These criteria use daily and nocturnal symptoms, asthma exacerbations, physical activity limitation, and lung function to assign categories. An individual is assigned to the highest grade in which any feature occurs. But for the purpose of our study we didn't use lung function to assign chronic severity but only for acute current episode at the ER.
8. Whether the patient had repeat appearance during the study or not. For those who repeat appearance in our study, only severity items, markers at presentation to the ER, time since current attack began, medications regularly take, receive in hospital, discharged with were recorded and only for the first re-appearance where we neglect other re-appearances, because some patients re-appeared more than one time or even three and four.
9. Follow-up care, in terms of receiving a management plan in the ER or following discharge from the hospital, if he has a follow up; appointment for example after he leaves the ER or hospital, if he received training in inhaler use, whether the patient's usual care was sent a letter or not, and medication discharged with from the ER or hospital specially short acting B2-agonist and anti-inflammatory inhalers.
10. Observations on height and weight for the objective measurement of FEV1 (% predicted).

4.7 Pilot study

A pre-test study was conducted as a small scale-version for the modified version of the questionnaire that has been used before in a study that had been carried out in Ramallah hospital (El_Sharif N, September 2004, private communication). Ten patients attending the ER were asked to have an interview. Their results were not included in the study population. As a result of the pre-test some changes were performed including minor adjustments that were made to improve clarity of the questions but no major changes were judged necessary. The pre-test facilitate the orientation and adjustment to the sequence of the procedures and standardization of questions delivery to the patients by the researcher in the major study. This was done on 10 pre-test participants.

4.8 Field work

After having the approval to conduct the study in Alia hospital, the researcher had an initial visit to the hospital ER and other departments. In order to facilitate communication of the researcher with the ER and other departments' staffs, the ER-department manager introduced the researcher to the hospital staffs explaining his mission at the ER. The researcher was shown the steps and procedures that usually followed in the ER, like registration, admission, discharge forms, archive and filing system.

Patients attending the ER in the study period with asthma symptoms were invited to participate. Patients were informed about the study objectives and were encouraged to participate by the ER staff. Interview for the entire study sample was conducted in the ER, except for eleven participants where the interview was conducted by telephone and four in their homes face to face.

4.9 Methods of data collection

1. ER registration file: We reviewed all the emergency registration file, from April to the end of May 2005, to collect information about the number of patients attending the ER, gender, and age distribution in the study period. We also tried to get the patients' vital characteristics, medications discharged with, and follow up care from the file.
2. We used the study questionnaire through interviewing, face to face interview.
3. Observations on height and weight were recorded for all participants during the study period. The researcher took the measurements by using one constant standard scale. Height was measured to the nearest centimeter without shoes on using height scale (Gold, Power Tape Professional). Weight was measured with the patients' clothes on, but without footwear to the nearest 1 Kg.
4. Pulmonary function and patients lung capacity before and after taken salbutamol was assessed by measuring FEV1 % predicted. The best of the three efforts with a portable spirometer (Rudolf Riester GmbH and Co. KG, Germany) was used. Patients were given the proper instructions how to use the spirometer and to breathe out continuously for 4-5 seconds in order to give best results, the highest measurement from 3 trials was taken for each patient. For some patients, it was difficult to take the measurement before and/or after salbutamol, either because of the severity of the patient's status at the time of arrival to the ER or because of poor familiarity of those patients with lung function instruments and tests. FEV1 (% predicted) was calculated according to the patients' age, height, weight and sex using Hankinson's et al equation (Radeos et al., 2004). FEV1 > 80% (predicted) indicated mild attack, 60-80 % (predicted) moderate, and < 60% (predicted) indicated severe attack.

Data collection started in the first day of April through to the end of May 2005 (2 months period). The researcher was always on time at the ER to record the patients' status upon arrival at the ER and for interviewing them. Patients who were included in the study were interviewed in the ER immediately after discharge or at the bed after admission procedures. Only 15 patients were interviewed out of the ER; 4 were interviewed at home after discharge and 11 were conducted by telephone as it was difficult to interview them in the ER.

The researcher collected all data by himself to ensure accuracy (validity), ethical, cultural aspects of the research and participants. The average number of patients seen each day was two patients. The average time for filling in a questionnaire was 20 minutes. In the 15 participants were they either interviewed at home or conducted by telephone, the nurse staff at the ER took on his responsibility to record the patients status upon arrival at the ER, and took the lung function measurements before and after salbutamol, after they had been given instructions and training by the researcher on how to use and record the results of the spirometer. The nurse staff also took the patient address and telephone number after explaining to him the nature and aim of the study for the researcher to contact them later on.

4.10 Methods of data analysis

All data were entered and analyzed using the statistical software package SPSS 12 (SPSS Inc., 2003). Checking and cleaning phase was performed.

The classification of the two outcome variables, i.e. ER attendance and asthma severity was done as follows. ER attendance: one time ER attendees were those attending the ER only one time in the past year including the study attendance time, and frequent ER attendees were those attending the ER two or more times in the past year including the study attendance time. Classification of asthma severity in the previous three months was determined by self-reported day/night time symptoms according to GINA 2002 guidelines (GINA, 2002). We classified patients into mild intermittent, mild persistent, moderate persistent and severe persistent. In the analysis we merged mild intermittent with mild persistent (mild asthma), and moderate persistent with severe persistent asthma (moderate/severe asthma). We did such combinations because our sample size is only 121 patients and the number of mild intermittent and severe persistent was small (less than 10 patients). Also studies showed that classification of asthma severity varies by the reported history of daytime and/or nighttime symptoms, in particular between mild intermittent and mild persistent symptoms (Ford et al., 2001). Analysis has been made as follows;

1. Univariate analysis: frequencies of the study variables have been made. The relation between the variables and ER attendance outcome, and asthma severity outcome has been checked by stratifying them according to frequent attendees and one-time attendees (for ER attendance outcomes), and according to moderate/severe asthma and mild asthma (for chronic asthma severity outcomes). The association between the two study outcomes (ER attendance and asthma chronic severity) has been also studied. The Chi-Square test has been used to check for the significance of the association and $P < 0.05$ was regarded as significant.
2. Multivariate analysis: logistic regression models for both ER attendance and chronic asthma severity outcome variables have been developed. In ER attendance model, variables that were found to be <0.05 significant in univariate analysis have been entered. While in asthma severity model those found to be ≤ 0.1 significant in univariate analysis have been entered in the model. Crude odds ratio have been calculated for variables <0.05 significant in univariate analysis for both study outcomes whether they entered in the models or not.

4.11 Constrains and limitations of the study

The limitations of the study include the following:

1. The patients included in this study do not represent all patients with asthma in the local community. Therefore, we can not generalize the study results on the community. However, they do represent a highly informative group of treatment failures (Joseph et al., 1999; Montealegre et al., 2002) and in a disease with wide spectrum of severity like asthma, this group represents the most costly group in terms of both financial and economic burden (Weiss et al., 1992; Weiss et al., 1993; Sullivan et al., 1996).
2. The study setup, governmental hospital, does not represent services at other private or non-governmental hospitals.
3. This study is a recall and self-reported study, therefore the bias of recalling might have an affect on the outcome. However, some studies showed that self-reporting is an

accurate method of identifying asthma hospital ER-visits, outcomes, and the occurrence or absence of relevant clinical event (Ruffin et al., 1998). Others showed that; the attack of asthma, which is a crucial experience for a patient and his family, is less likely to be influenced by recall bias (NHLBI, 1997; Boulet et al., 1999).

4. Chronic asthma severity was classified according to day/night time self-reported symptoms according to GINA 2002 guidelines (GINA, 2002). However, this way of classification has been used by similar studies (Ford et al., 2001; Burney et al., 2004, unpublished).
5. This study is also limited by time of data collection (two month period) and sample size (121 participants). Further, this led to some wide confidence intervals when developing the regression models.
6. We were not able to record some vital characteristics (temperature, pulse, respirations, PaO₂, SaO₂, and PaCO₂) of the patients upon their arrival at the ER, because they were not measured by the ER-staff. Thus, we could not use it when applying the GINA definition.
7. Due to the situation of the patients at the ER, many refused to cooperate to do spirometry which lead to lose of data at these variables.

4.12 Summary

Our study took two month period in order to collect the data in the questionnaire form. According to study aim and objectives a non random purposive sample was used to collect information from 121 patients aged ≥ 5 years who attended the ER of Alia hospital. Nearly all asthma patients of similar age (≥ 5 years) who attended the ER met the inclusion criteria.

The pilot study enabled us to better understand the setting of the study and the sequence of delivering the questions in the questionnaire. Further, the ethical consideration followed in this study enabled us to look for the required information in the patients' medical files and records. The patients participated in this study understood the study and there was an encouragement from them as well as the hospital administration and ER staff.

Most of the patients in this study had poor familiarity with the spirometer and we faced problems in performing the tests although close information were given on how to use it properly. Data were analyzed using the statistical software package SPSS 12 (SPSS Inc., 2003) in away to met the study objectives using Chi-square, crude odds ratio and logistic regression models. However, some wide confidence intervals were observed regarding some variables due to low number of patients in these variables.

Chapter 5

Results

5.1 Introduction

The results of this study were divided into two parts: univariate results, and multivariate results.

We divided the univariate results analysis into three parts; (1) a description of study population (asthma patients); (2) services provided for patients at the health care system; (3) protocols of asthma treatment in the previous three months and after ER discharge. In each part we stratified study variables by frequency of attending the emergency rooms (ER attendance times: one time ER attendees and frequent ER attendees in the past year), and by asthma severity in the previous three months (mild asthma and moderate/severe asthma).

In the multivariate analysis we developed two logistic regression models for ER attendance and chronic asthma severity outcomes.

5.2 Univariate analysis

5.2.1 Study population characteristics:

The study population is all asthmatic patients ≥ 5 years of age attending the ER of Alia governmental hospital in Hebron district from April 2005 to the end of May 2005. In total we investigated 121 asthmatic patients during the study period, of which 73.5% (n=89) used to attend ER frequently (two or more times in the past year). Asthma severity was as follows: 54.5% of the patients had mild asthma (n=66: 9 mild intermittent and 57 mild persistent), while 45.5% of the patients had moderate/severe asthma (n=55: 42 moderate persistent and 13 severe persistent).

As shown in Table (5.1) 11,448 patients of all age groups attended the ER in the study period, but only 1786 patients (15.6%) had respiratory disorders. Patients ≥ 5 years of age were only included in the study (n=912) of whom 121 patients (13.3%) had asthma symptoms as diagnosed by the physicians in the ER (Table 5.1).

Table 5.1: Total number of patients seen in Alia ER by sex and respiratory disorders during the period of the study by age groups in Alia governmental hospital.

Age (years)	Male	Female	Total	Those with respiratory disorders		
				Male	Female	Total
(0- 4)	1974	1224	3198	514	360	874
(5-19)	2390	1152	3542	206	138	344
(20-49)	1598	1296	2894	162	180	342
(50-64)	504	470	974	26	78	104
(>64)	510	330	840	52	70	122
Total	6976	4472	11448	960	826	1786

Out the 121 patients with asthma symptoms 53% were males and 47% were females (Fig. 5.1) and 63% were city residents (Fig. 5.2). Three quarter (77%) were married (Fig. 5.3). The patients' mean age was 47 years (5 to 83 years, standard deviation 18.5 years, and median 48 years), of which 44% in the age group 20-49 years (Fig. 5.4). The majority (50.4%) had 0-6 years of education but only 9% had > 12 years of education (Fig. 5.5). However, 17% were unemployed (Fig. 5.6).

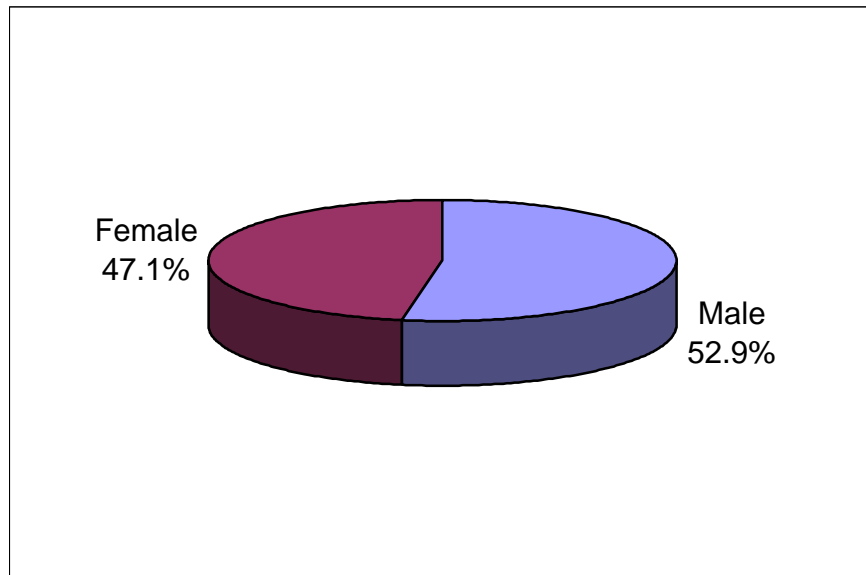


Figure 5.1: Distribution of study population by sex.

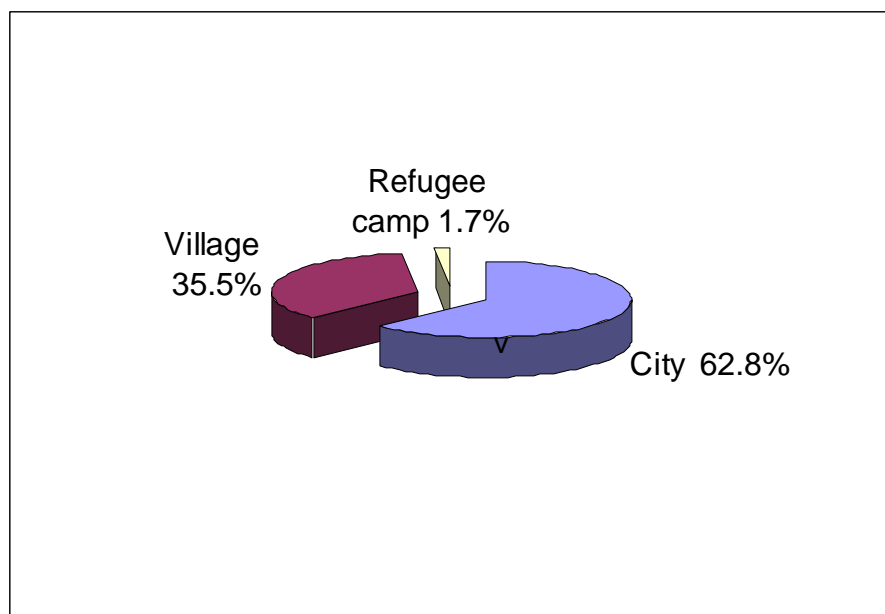


Figure 5.2: Distribution of study populationon by place of residence.

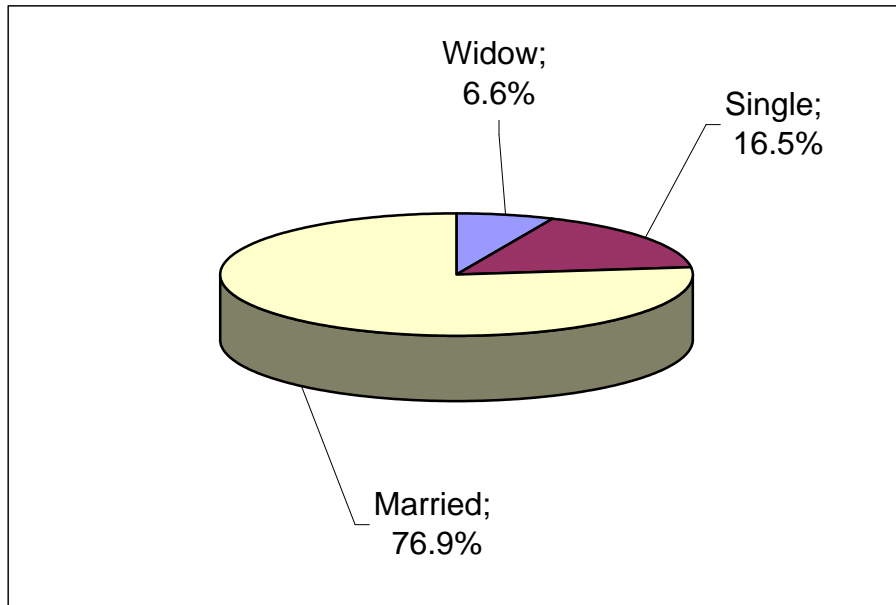


Figure 5.3: Distribution of study population by marital status.

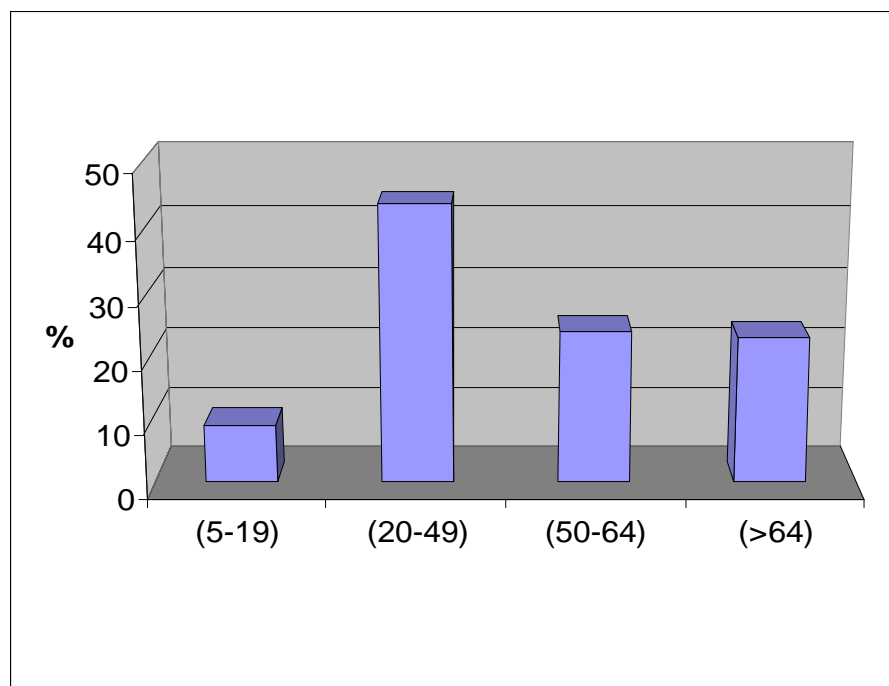


Figure 5.4: Distribution of study population by age groups (years).

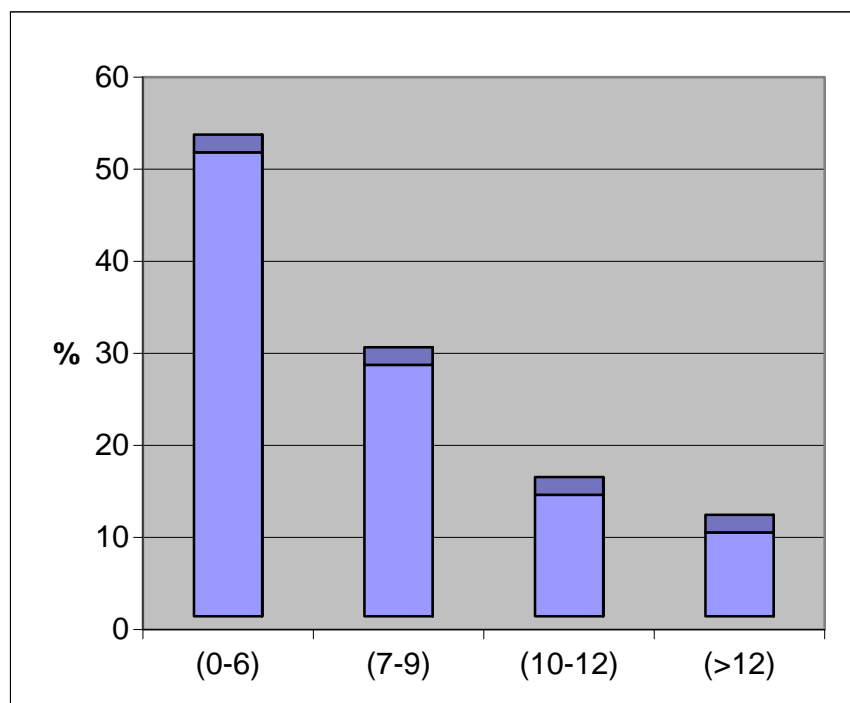


Figure 5.5: Distribution of study population by level of education (years of schooling).

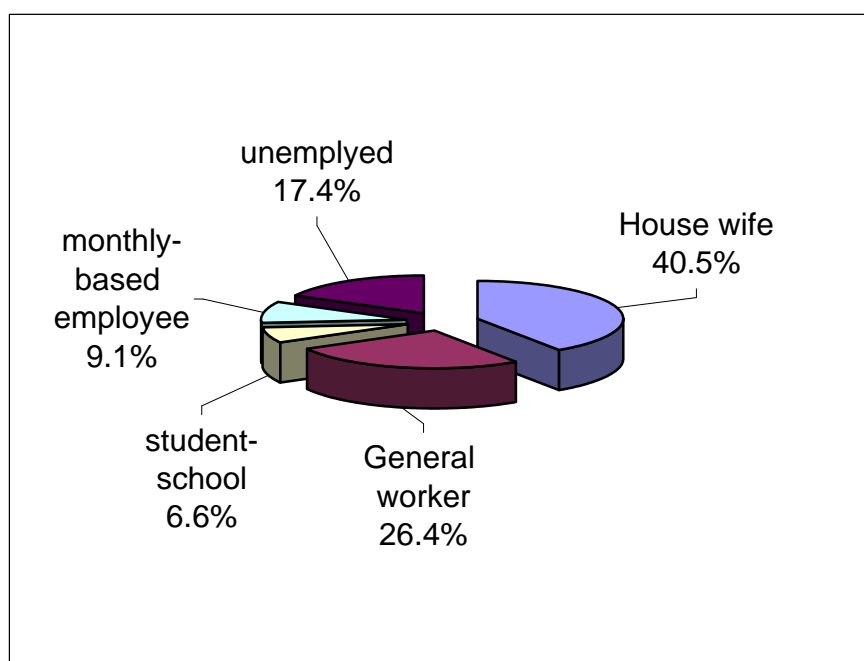


Figure 5.6: Distribution of study population by occupation.

Table (5.2) shows the characteristics of ER attendees and asthma severity. Of the 121 patients, 73.6% (n=89) were frequent ER attendees compared to 26.4% (n= 32) one-time ER attendees (the mean for frequent ER attendees was 6.7 visits, standard deviation=7, median= 4). No statistical difference was found by age of the patients, gender, level of education, marital status and occupation, but place of residence showed that patients living

in cities were shown to visit ER more frequently compared to villages and rarely by those living in refugee camps ($p < 0.05$) (Table 5.2).

Mild asthma was seen in 54.5% of patients ($n=66$) and 45.5% of patients ($n=55$) had moderate/severe asthma. No difference was found between the 2 genders or between the cities, villages or refugee camps residence. However, single patients were more likely to have mild asthma, but no difference was seen for married ($p < 0.05$). This association between marital status and asthma severity might be due to age as a confounder. Younger patients were more likely to have mild asthma compared to older patients ($p < 0.05$).

Table 5.2: Distribution of ER attendees in the past year and asthma severity by socio-demographic characteristics in Alia governmental hospital.

Socio-demographic characteristics	Total N=121	ER attendees			Asthma severity *		P value
		One time N=32	Frequent N=89	P value	Mild N=66	Moderate/ Severe N=55	
	n(%)	n(%)	n(%)		n(%)	n(%)	
Sex							
• Male	64 (52.9)	19 (59.4)	45 (50.6)	0.392	39 (59.1)	25 (45.5)	0.135
• Female	57 (47.1)	13 (40.6)	44 (49.4)		27 (40.9)	30 (54.5)	
Place of residence							
• City	76 (62.8)	17 (53.1)	59 (66.3)	0.038	45 (68.2)	31 (56.4)	0.123
• Village	43 (35.5)	13 (40.6)	30 (33.7)		19 (28.8)	24 (43.6)	
• Refugee camp	2 (1.7)	2 (6.3)	0		2 (3)	0	
Marital status							
• Single	20 (16.5)	6 (18.8)	14 (15.7)	0.679	16 (24.2)	4 (7.3)	0.032
• Married	93 (76.9)	23 (71.9)	70 (78.7)		45 (68.2)	48 (87.3)	
• Widow	8 (6.6)	3 (9.4)	5 (5.6)		5 (7.6)	3 (5.4)	
Age (years)							
• 5-19	11 (9.1)	3 (9.3)	8 (9)	0.160	10 (15.2)	1 (1.8)	0.000
• 20-49	53 (43.8)	19 (59.3)	34 (38.2)		36 (54.5)	17 (30.9)	
• 50-64	29 (24)	4 (12.5)	25 (28.1)		11 (16.7)	18 (32.7)	
• >64	28 (23.1)	6 (18.7)	22 (24.7)		9 (13.6)	19 (34.5)	
Level of education(years)							
• 0-6	61 (50.4)	12 (37.5)	49 (55)	0.270	27 (40.9)	34 (61.8)	0.035
• 7-9	33 (27.3)	10 (31.2)	23 (25.8)		18 (27.3)	15 (27.3)	
• 10-12	16 (13.2)	5 (15.6)	11 (12.4)		12 (18.2)	4 (7.3)	
• >12	11 (9.1)	5 (15.6)	6 (6.8)		9 (13.6)	2 (3.6)	
Occupation							
• House wife	49 (40.5)	11 (34.4)	38 (42.7)	0.156	23 (34.8)	26 (47.3)	0.032
• General worker	32 (26.4)	10 (31.2)	22 (24.7)		19 (28.8)	13 (23.6)	
• Student-school	8 (6.6)	1 (3.1)	7 (7.9)		7 (10.6)	1 (1.8)	
• Monthly based employee	11 (9.1)	6 (18.8)	5 (5.6)		9 (13.6)	2 (3.6)	
• Unemployed	21 (17.4)	4 (12.5)	17 (19.1)		8 (12.1)	13 (23.6)	

* Classification according to day/night time symptoms in GINA 2002 guidelines.

5.2.2 The association between ER attendees and asthma severity:

When checking the association between ER attendees and asthma severity, we found that 54.5% of the study patients had mild asthma (Table 5.3), of which 59% were frequent ER attendees. The more severe asthmatic patients were visiting ER much more frequently (91%), the crude odds ratio (COR) for moderate/severe asthma compared to mild asthma and 95% confidence interval (CI) are; (COR, 6.92; 95% CI, 2.44 to 19.62; $p < 0.05$). In further analysis, we found that the mean number of ER visits in the past year among patients with mild asthma was 2.1 visits and for moderate/severe asthmatic patients was 6.7 visits. While the mean number of visits among mild intermittent asthmatic patients was 1.8 visits, mild persistent was 2.1 visits, moderate persistent was 6.3 visits, and for severe persistent was 8.2 visits.

Table 5.3: Distribution of ER attendees groups in the past year by asthma severity in Alia governmental hospital.

Chronic asthma severity*	Total	One time ER attendees	Frequent ER attendees	P value
	N= 121	N=32	N=89	
	n (%)	n (%)	n (%)	
Mild asthma	66 (54.5)	27 (41)	39 (59)	0.000
Moderate/Severe asthma	55 (45.5)	5 (9)	50 (91)	

* Classification according to day/night time symptoms in GINA 2002 guidelines.

5.2.3 Repeat appearance:

Of the 121 patients, 29 patients re-appeared more than one time at the ER in the two months study period. Out of them 25.8% were a frequent attendee at the ER in the past year and 18.8% were not used to attend ER frequently. The appearance in the ER was not associated by the type of asthma they had, i.e. 25.5% of the patients had moderate/severe and 22.8% had mild asthma.

5.2.4 Services provided for patients at the health care system:

In this part of the results, data related to health insurance services utilization, source of care, compliance with treatment, and career services and follow up will be presented.

5.2.4.1 Health insurance and services utilization:

As shown in Table (5.4), 96.7% (n=117) of the patients had health insurance, which was significantly higher among frequent attendees compared to one-time attendees (98.9% and 90.6%, respectively, $p < 0.05$), but was not significantly different for asthma severity. Health insurance was reported to cover asthma drugs by 14%, with no significant difference by ER attendance frequency nor for asthma severity. Patients with moderate and severe asthma reported going for the same facility always for follow up and getting more regularly their treatment compared to mild asthma ($p < 0.05$) (Table 5.4).

Table 5.4: Distribution of ER attendees groups in the past year and asthma severity by health care services utilization in Alia governmental hospital (percentages are yes answers).

	Total N= 121 n (%)	ER attendees			Asthma severity *		
		One time N=32 n (%)	Frequent ER N=89 n (%)	P value	Mild N= 66 n (%)	Moderate/ Severe N=55 n (%)	P value
Health insurance	117 (96.7)	29 (90.6)	88 (98.9)	0.025	63 (95.5)	54 (98.2)	0.403
Insurance covers asthma drugs	17 (14)	4 (12.5)	13 (14.6)	0.769	12 (18.2)	5 (9.1)	0.152
Access to specialist care	77 (63.6)	20 (62.5)	57 (64)	0.876	40 (60.6)	37 (67.3)	0.448
Go to same facility always	56 (46.3)	14 (43.8)	42 (47.2)	0.738	25 (37.9)	31 (56.4)	0.042
Regular treatment	52 (43)	10 (31.3)	42 (47.2)	0.118	16 (24.2)	36 (65.5)	0.000
Medication review in past year	17 (14)	2 (6.2)	15 (16.9)	0.139	7 (10.6)	10 (18.2)	0.232

* Classification according to day/night time symptoms in GINA 2002 guidelines.

5.2.4.2 Services, diagnosis and paying for medications:

This study shows that 52.9% of the patients were first diagnosed with asthma between the age 20-49 years, of which 51.7% were frequent ER attendees. The difference between the two study groups was not significant ($p > 0.05$). In this study, it was more likely that there is no difference between frequent and one-time ER attendees regarding age when first diagnosed of asthma. The majority of patients (52.9%) of study population have been first diagnosed at the clinic. There was no significant difference by first diagnosis by a specialist or by a general physician on the attendance of ER. Patients (45%) reported using always same facilitate when having asthma attacks, with no difference between one-time ER attendee compared to frequent ER attendee. Only 14% of the patients reported having their medications for free and 74% reported that it was covered partially. Paying fully for medications was shown to be higher among one-time attendees compared to others ($p < 0.05$) (Table 5.5).

5.2.4.3 Compliance with treatment:

Concerning compliance with asthma treatment, 43% of the total study population reported their inability to afford or obtain medications, with no significant difference by frequency of ER attendees ($p > 0.05$). However, for asthma severity there was a significant statistical difference between mild asthma compared to moderate/severe asthma by affording, obtaining, and needing them ($P < 0.05$) (Table 5.5).

Table 5.5: Distribution of ER attendees in the past year and asthma severity by health care utilization and treatment coverage in Alia governmental hospital.

	ER attendees				Asthma severity*		
	Total	One time	Frequent	P value	Mild	Moderate Severe	P value
	N= 121	N=32	N=89		N= 66	N=55	
	n (%)	n (%)	N (%)		n (%)	n (%)	
Age when first diagnosed of asthma							
0-4 yrs	5 (4.1)	3 (9.4)	2 (2.2)	0.289	4 (6)	1 (1.8)	0.201
5-19 yrs	19 (15.7)	4 (12.5)	15 (16.9)		13 (19.7)	6 (10.9)	
20-49 yrs	64 (52.9)	18 (56.3)	46 (51.7)		36 (54.5)	28 (50.9)	
50-64 yrs	22 (18.2)	6 (18.8)	16 (17.9)		9 (13.6)	13 (23.6)	
> 64 yrs	11 (9.1)	1 (3.1)	10 (11.2)		4 (6)	7 (12.7)	
Center where first diagnosed of asthma at							
Clinic	64 (52.9)	20 (62.5)	44 (49.4)	0.229	36 (54.5)	28 (50.9)	0.128
Hospital clinic	18 (14.9)	2 (6.3)	16 (17.9)		6 (9.1)	12 (21.8)	
Hospital ER	39 (32.2)	10 (31.3)	29 (32.6)		24 (36.4)	15 (27.3)	
Professional by whom first diagnosed							
General doctor	52 (43)	18 (56.3)	34 (38.2)	0.077	31 (47)	21 (38.2)	0.331
Specialized doctor	69 (57)	14 (43.8)	55 (61.8)		35 (53)	34 (61.8)	
Go to same facility always (yes)							
Private clinic	20 (16.5)	5 (15.6)	15 (16.9)	0.984	9 (13.6)	11 (20)	0.058
Public clinic	8 (6.6)	2 (6.3)	6 (6.7)		6 (9.1)	2 (3.6)	
Out-patient clinic	6 (5)	2 (6.3)	4 (4.5)		1 (1.5)	5 (9.1)	
Primary health care	22 (18.2)	5 (15.6)	17 (19.1)		9 (13.6)	13 (23.6)	
Use same facilitate when has attacks							
Always	55 (45.5)	15 (46.9)	40 (44.9)	0.009	31 (47)	24 (43.6)	0.344
Often	27 (22.3)	2 (6.3)	25 (28)		13 (19.7)	14 (25.5)	
Sometimes	16 (13.2)	3 (9.4)	13 (14.6)		6 (9.1)	10 (18.2)	
Rarely	13 (10.7)	7 (21.9)	6 (6.7)		9 (13.6)	4 (7.3)	
Never	10 (8.3)	5 (15.6)	5 (5.6)		7 (10.6)	3 (5.5)	
Pay for medicines							
Free	17 (14.0)	4 (12.5)	13 (14.6)	0.041	12 (18.2)	5 (9.1)	0.071
Partially covered	89 (73.6)	20 (62.5)	69 (77.5)		43 (65.1)	46 (83.6)	
Full cost	15 (12.4)	8 (25.0)	7 (7.9)		11 (16.7)	4 (7.3)	
Reasons for not taking all medications							
Don't need	37 (30.6)	13 (40.6)	24 (27.0)	0.124	27 (40.9)	10 (18.2)	0.001
Can't afford	31 (25.6)	5 (15.5)	26 (29.2)		12 (18.2)	19 (34.5)	
Can't obtain	21 (17.4)	3 (9.4)	18 (20.2)		6 (9.1)	15 (27.3)	
Don't want	32 (26.4)	11 (34.4)	21 (23.6)		21 (31.8)	11 (20.1)	

* Classification according to day/night time symptoms in GINA 2002 guidelines.

5.2.4.4 Specialty visiting and admission to a hospital:

Table (5.6) describes the characteristics and frequency use of asthma care provider by study population. The results show 11% of our sample did not see a professional for asthma in the past year. The frequent attendees of the ER were those who reported seeing a professional more than twice a year compared to one-time attendees ($p<0.05$). Similar results were seen by severity of the disease, i.e. patients with more severe asthma where used to see a professional more times a year compared to mild asthmatic patients ($p<0.05$). Concerning the last time seeing this professional, 63% of our sample visited a professional in less than a month from attending ER, of whom 53.2% had moderate/severe asthma. Only 21% of 54 specialists followed asthma patients were specialized in chest diseases or asthma (Table 5.6).

Most patients (87 out of 121 patients) were admitted to the hospital, and 40% of the study population was admitted in the past year. The admission was among the frequent attendees of the ER, and was among the severe asthmatic patients ($p<0.05$). The number of

admissions to the hospital was also higher among frequent ER attendees and among severe asthmatics ($p<0.05$) (Table 5.6).

Table 5.6: Distribution of ER attendees groups in the past year by attending ER, seeing or follow up by a specialist and type of specialty.

	Total	ER attendees			Asthma Severity *		
	N=121	One time N=32	Frequent N=89	P value	Mild N= 66	Moderate/ Severe N=55	P value
	n(%)	n(%)	n(%)		n(%)	n(%)	
Times attended ER in the past year							
One time	32 (26.4)	32 (100)	0	0.000	27 (40.9)	5 (9.1)	0.000
2-3 times	39 (32.2)	0	39 (43.8)		19 (28.8)	20 (36.4)	
4-5 times	19 (15.7)	0	19 (21.3)		10 (15.2)	9 (16.4)	
>5 times	31 (25.6)	0	31 (34.8)		10 (15.2)	21 (38.2)	
Times visited a professional in past year							
zero	14 (11.6)	8 (25)	6 (6.7)	0.001	13 (19.7)	1 (1.8)	0.001
1-2	30 (24.8)	13 (40.6)	17 (19.1)		21 (31.8)	9 (16.4)	
3-4	29 (24)	4 (12.5)	25 (28.1)		13 (19.7)	16 (29)	
5-6	11 (9.1)	3 (9.4)	8 (9)		7 (10.6)	4 (7.3)	
> 6	37 (30.6)	4 (12.5)	33 (37.1)		12 (18.2)	25(45.5)	
Last time seen by a professional							
< 1 wk	26 (21.5)	10 (31.3)	16 (18)	0.035	13 (19.7)	13 (23.6)	0.042
1 wk- 1 mnt	51 (42.1)	9 (28.1)	42 (47.2)		23 (34.8)	28 (50.9)	
>1mnt-6 mnt	20 (16.5)	3 (9.4)	17 (19.1)		11 (16.7)	9 (16.4)	
>6 mnt- 1 yr	11 (9.1)	3 (9.4)	8 (9)		7 (10.6)	4 (7.3)	
> 1 yr	13 (10.7)	7 (21.9)	6 (6.7)		12 (18.2)	1 (1.8)	
Specialist field of specialty							
Internal and cardiology	24 (19.8)	7 (21.9)	17 (19.1)	0.177	11 (16.7)	13 (23.6)	0.242
Allergy/asthma and chest	26 (21.5)	3 (9.4)	23 (25.8)		11 (16.7)	15 (27.3)	
Neurologist	3 (2.5)	1 (3.1)	2 (2.2)		1 (1.5)	2 (3.6)	
ENT	1 (0.8)	1 (3.1)	0		1 (1.5)	0	
Admitted to hospital with asthma							
Yes<1 yr	48 (39.7)	0	48 (53.9)	0.000	17 (25.8)	31 (56.4)	0.001
Yes, >1 yr	39 (32.2)	11 (34.4)	28 (31.5)		23 (34.8)	16 (29.1)	
Times admitted to hospital in the past year							
zero	73 (60.3)	32 (100)	41 (46)	0.000	49 (74.2)	24 (43.6)	0.008
1-2	29 (24)	0	29 (32.6)		11 (16.7)	18 (32.7)	
3-4	13 (10.7)	0	13 (14.6)		4 (6)	9 (16.4)	
> 4	6 (5)	0	6 (6.8)		2 (3)	4 (7.3)	

* Classification according to day/night time symptoms in GINA 2002 guidelines.

5.2.4.5 Follow up criteria:

Follow up was done for 43% ($n=52$) of these patients by a specialist and 23% by the ER doctor, even 79% reported seeing a professional within the past 6 months of the study. Most patients (83%) were not followed up regularly, who mainly visited ER very frequent, i.e. 18 out of 21 patients followed on regular basis and who were mostly severe patients (14 out of 21 patients) ($p<0.05$) (Table 5.7).

Half of the patients attending ER reported having follow up, with no difference by frequency of visiting ER or asthma severity. But those patients were rarely having a management plan (9%) and quarter had a letter to their carer. The management plans and the letter were mostly given to the frequent ER visitors and those with severe asthma (Table 5.7).

In table (5.8), patients reported visiting ER majorly happened due to shortness of breathe (95%). However, we did not see any significant difference by frequency of ER attendance nor by asthma condition.

Table 5.7: Distribution of ER attendees groups in the past year and asthma severity by Follow up criteria.

	Total	ER attendees			Asthma severity *		
	N= 121	One time N=32	Frequent N=89	P value	Mild N= 66	Moderate/ Severe N=55	P value
	n(%)	n(%)	n(%)		n(%)	n(%)	
Following up patient's asthma							
Specialist	52 (43)	11 (34.4)	41 (46)	0.479	23 (34.8)	29 (52.7)	0.200
ER doctor	28 (23.1)	7 (21.9)	21 (23.6)		19 (28.8)	9 (16.4)	
GP	29 (24)	9 (28.1)	20 (22.5)		17 (25.8)	12 (21.8)	
Nurse	1 (0.8)	0	1 (1.1)		0	1 (1.8)	
Others	11 (9.1)	5 (15.6)	6 (6.7)		7 (10.6)	4 (7.3)	
Followed on regular basis	21(17.4)	3 (9.4)	18 (20.2)	0.165	7 (10.6)	14 (25.5)	0.032
Follow up after ER	63(52.1)	16 (50)	47 (52.8)	0.785	33 (50)	30 (54.5)	0.618
Management plan	11 (9.1)	1 (3.1)	10 (11.2)	0.171	4 (6)	7 (12.7)	0.204
Carer sent a letter	31(25.6)	3 (9.4)	28 (31.5)	0.014	12 (18.2)	19 (34.5)	0.04

*Classification according to day/night time symptoms in GINA 2002 guidelines.

Table 5.8: Distribution of ER attendees in the past year and asthma severity by reported reasons for current ER attendance (percentages are for yes answer).

	Total	ER attendees			Asthma severity*		
	N= 121	One time N=32	Frequent N=89	P value	Mild N= 66	Moderate/ Severe N=55	P value
	n(%)	n(%)	n(%)		n(%)	n(%)	
Respiratory infection	25 (20.7)	6 (18.8)	19 (21.3)	0.756	16 (24.2)	9 (16.4)	0.286
Shortness of breath	115 (95)	29 (90.6)	86 (96.6)	0.180	61 (92.4)	54 (98.2)	0.146
Less medication cost	17 (14)	5 (15.6)	12 (13.5)	0.765	12 (18.2)	5 (9.1)	0.152
Misuse of asthma medication	11 (9.1)	3 (9.4)	8 (9)	0.948	7 (10.6)	4 (7.3)	0.525
Worried about asthma symptoms	34 (28.1)	13 (40.6)	21 (23.6)	0.066	20 (30.3)	14 (25.5)	0.555

* Classification according to day/night time symptoms in GINA 2002 guidelines.

5.2.4.6 Educating asthmatic patients about asthma and its medications:

As shown in Table (5.9), 34.7% of the patients (n=42) reported having training on using inhalers, with no significant difference by frequency of ER attendance or by asthma severity ($p>0.05$). Also, written/oral information about asthma was given to less than 20% of the patients. Only 44.6% of the sample reported beneficial results from the doctor in managing their asthma at home, this was significantly different among one- time and frequent attendees for ER, and among mild and moderate/severe asthmatics ($p<0.05$) (Table 5.9). Most patients preferred to have more information to understand their disease and the use of its medication. This by itself could be related to the low compliance of taking medications among the study population (21%), of whom more severe asthmatic patients were more complied compared to mild asthmatic patients ($p<0.05$). Home inhalers equipment or devices were used by only 25% of the study population and nearly

44% found them not easy to be used. And this was significantly different among ER attendees groups ($p<0.05$). These devices were used more among severe asthmatic patients compared to patients with mild asthma (35% and 18%, respectively; $p<0.05$) (Table 5.9).

Using remedies was very popular among the study population (76%), and was used by 90% of the severe asthma patients compared to 63% of mild asthmatics ($p<0.05$) (Table 5.9).

Table 5.9: Distribution of ER attendees groups in the past year and asthma severity by patient's education about asthma and its medications.

	ER attendees				Asthma severity *		
	Total	One time	Frequent	P value	Mild	Moderate/ Severe	P value
	N= 121 n(%)	N=32 n(%)	N=89 n(%)		N= 66 n(%)	N=55 n(%)	
Training in inhalers use	42 (34.7)	9 (28.1)	33 (37)	0.362	25 (37.9)	17 (30.9)	0.423
Given oral/written information	22 (18.2)	4 (12.5)	18 (20.2)	0.331	11 (16.7)	11 (20)	0.636
Understand relievers/preventers's work	28 (23.1)	7 (21.9)	21 (23.6)	0.843	17 (25.8)	11 (20)	0.455
Ask doctor about asthma drugs	48 (39.7)	14 (43.8)	34 (38.2)	0.582	24 (36.4)	24 (43.6)	0.415
Benefit from doctor in asthma management at home	54 (44.6)	21 (65.6)	33 (37)	0.005	39 (59.1)	15 (27.3)	0.000
Like more information on asthma disease	100(82.6)	27 (84.4)	73 (82)	0.763	57 (86.4)	43 (78.2)	0.237
Like more information on asthma drugs	93 (76.9)	26 (81.3)	67 (75.3)	0.492	53 (80.3)	40 (72.7)	0.325
Home inhalation equipment	31 (25.6)	7 (21.9)	24 (27)	0.572	12 (18.2)	19 (34.5)	0.04
Take all your medicines	26 (21.5)	5 (15.6)	21 (23.6)	0.346	8 (12.1)	18 (32.7)	0.006
Other remedies use (non conventional)	92 (76)	22 (68.8)	70 (78.7)	0.260	42 (63.6)	50 (90.9)	0.000
Find inhalers/devices to use							
1. Easy	68 (56.2)	23 (71.9)	45 (50.6)	0.037	41 (62.1)	27 (49.9)	0.150
2. Difficult	53 (43.8)	9 (28.1)	44 (49.4)		25 (37.9)	28 (50.9)	

* Classification according to day/night time symptoms in GINA 2002 guidelines.

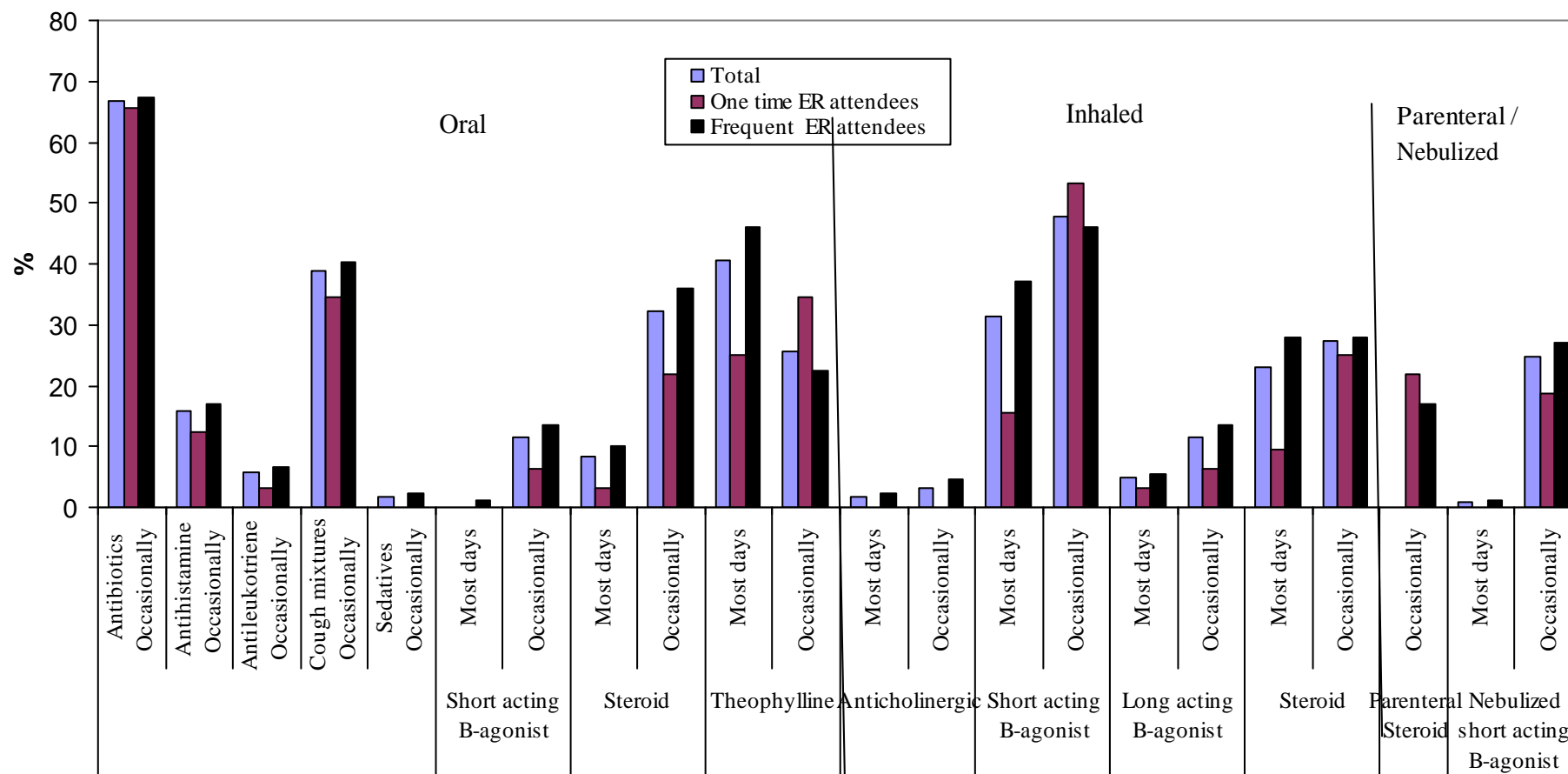
5.2.5 Asthma treatment protocol:

5.2.5.1 Medications regularly taken in past three months:

As shown in Fig. (5.7), 66.9% of the patients reported using oral antibiotics occasionally, with no difference by frequency of ER attendance, cough mixtures by 39%, but anti-histamine was used by 15% of the patients. Theophylline was used by 66% of the patients, which was more frequent among the frequent ER attendees ($p>0.05$). Inhaled Short B-agonist with more prescribed compared to oral, and the frequent ER attendees take the inhaled short B-agonist most days compared to one time attendees ($p<0.05$). Inhaled steroids were taken by 50% of the patients and was taken more by the frequent ER attendees compared to one-time attendees ($p=0.05$). Nebulized short B-agonist with taken occasionally by 24% of the patients.

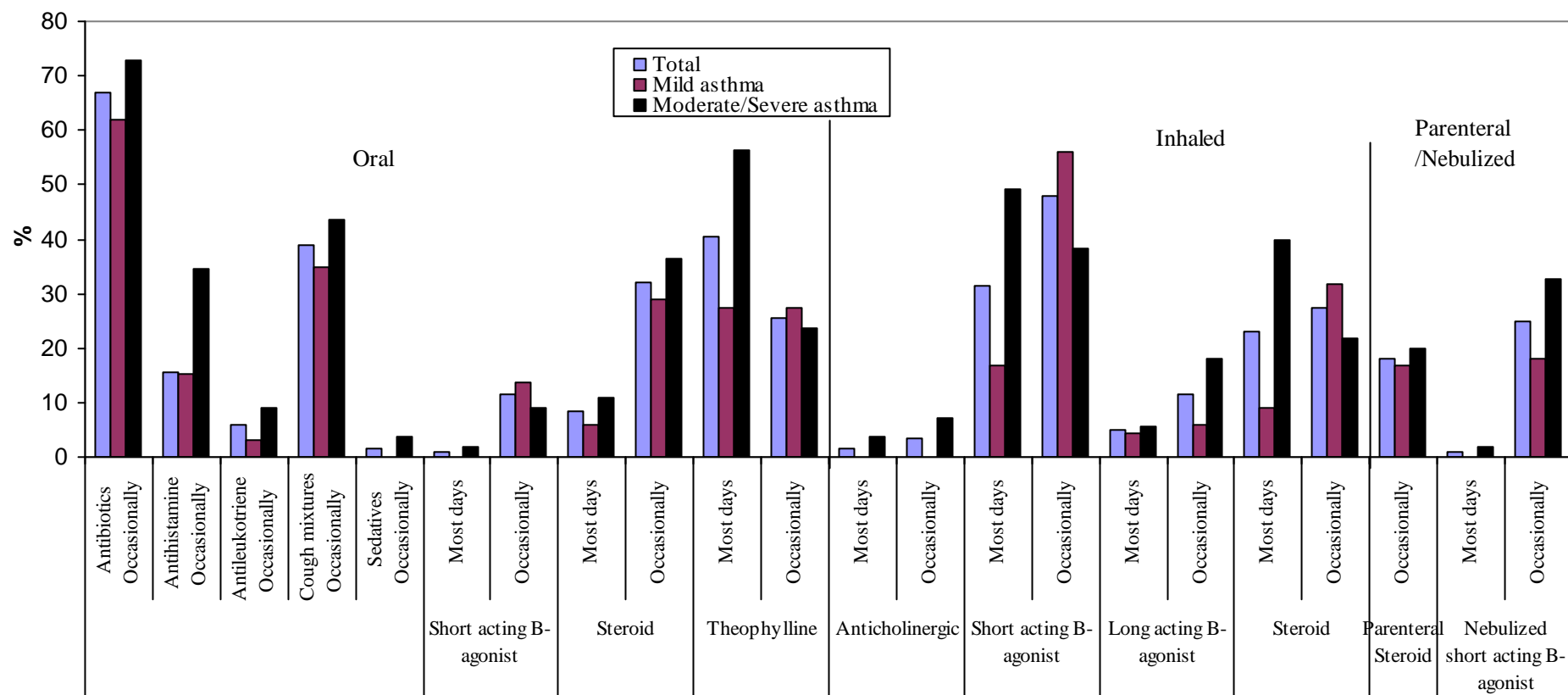
In Fig. (5.8), 80% of moderate/severe patients used oral theophylline compared to 54% of mild asthmatics ($p<0.05$). For inhaled B-short agonist, 50% of moderate/severe used most days compared to 17% of mild asthmatics ($p<0.05$). Similarly, inhaled steroids was used

by 60% of the moderate/severe asthmatics (40% most days) compared to mild asthmatics (9% most days) ($p<0.05$). Nebulized short acting B-agonist was used occasionally by 32% of moderate/severe asthmatics compared to 18% of mild asthmatics ($p>0.05$).



Values are given as total (%) and percentages of each group, the non-presented data=none.

Figure 5.7: Distribution of ER attendees groups in the past year by medication regularly taken in the past 3 months.



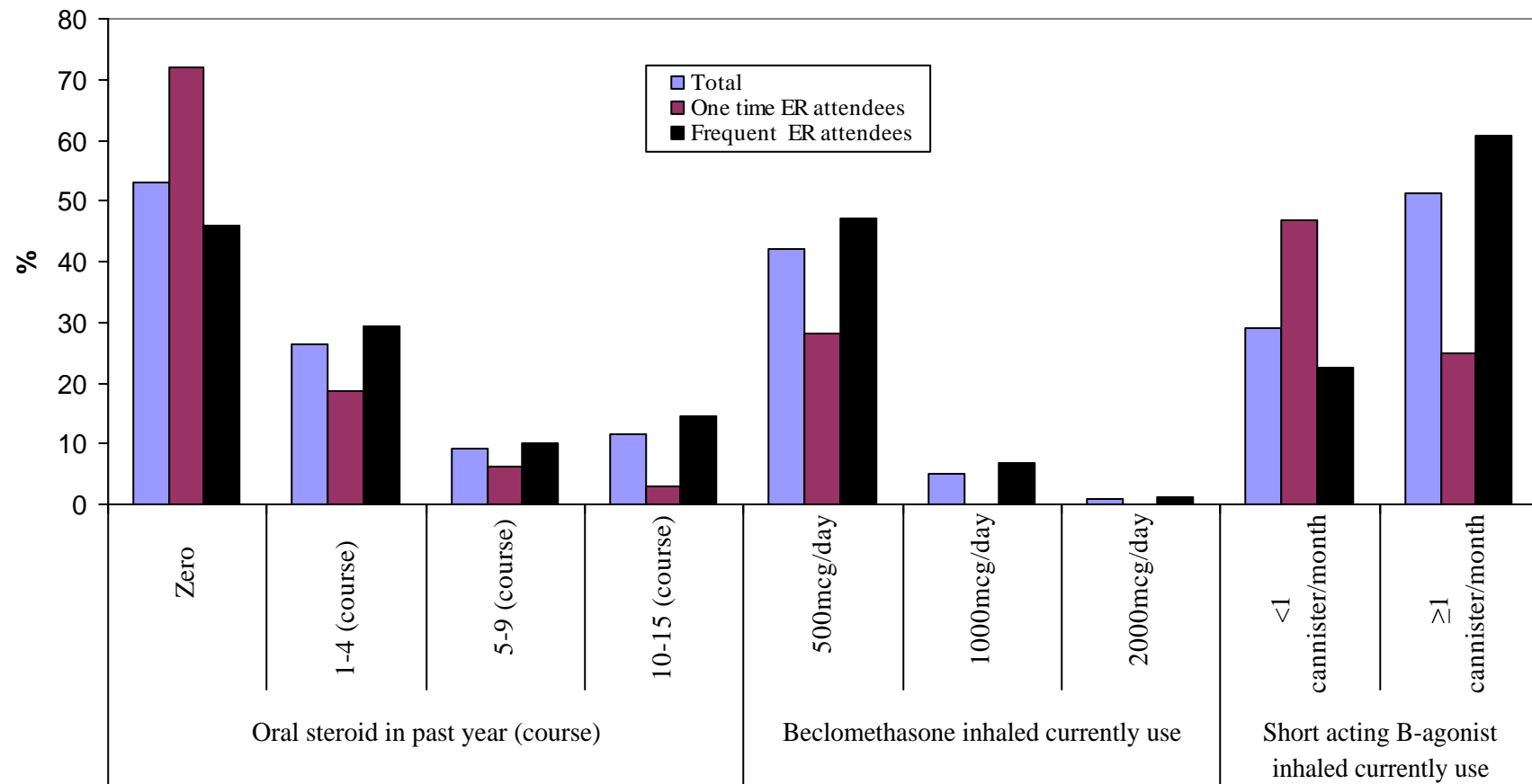
Values are given as total (%) and percentages of each group. The non-presented data=none.

Figure 5.8: Distribution of chronic asthma severity in past 3 months by medication regularly taken in the past 3 months.

5.2.5.2 Oral steroid and currently use of essential inhaled medications in the past year:

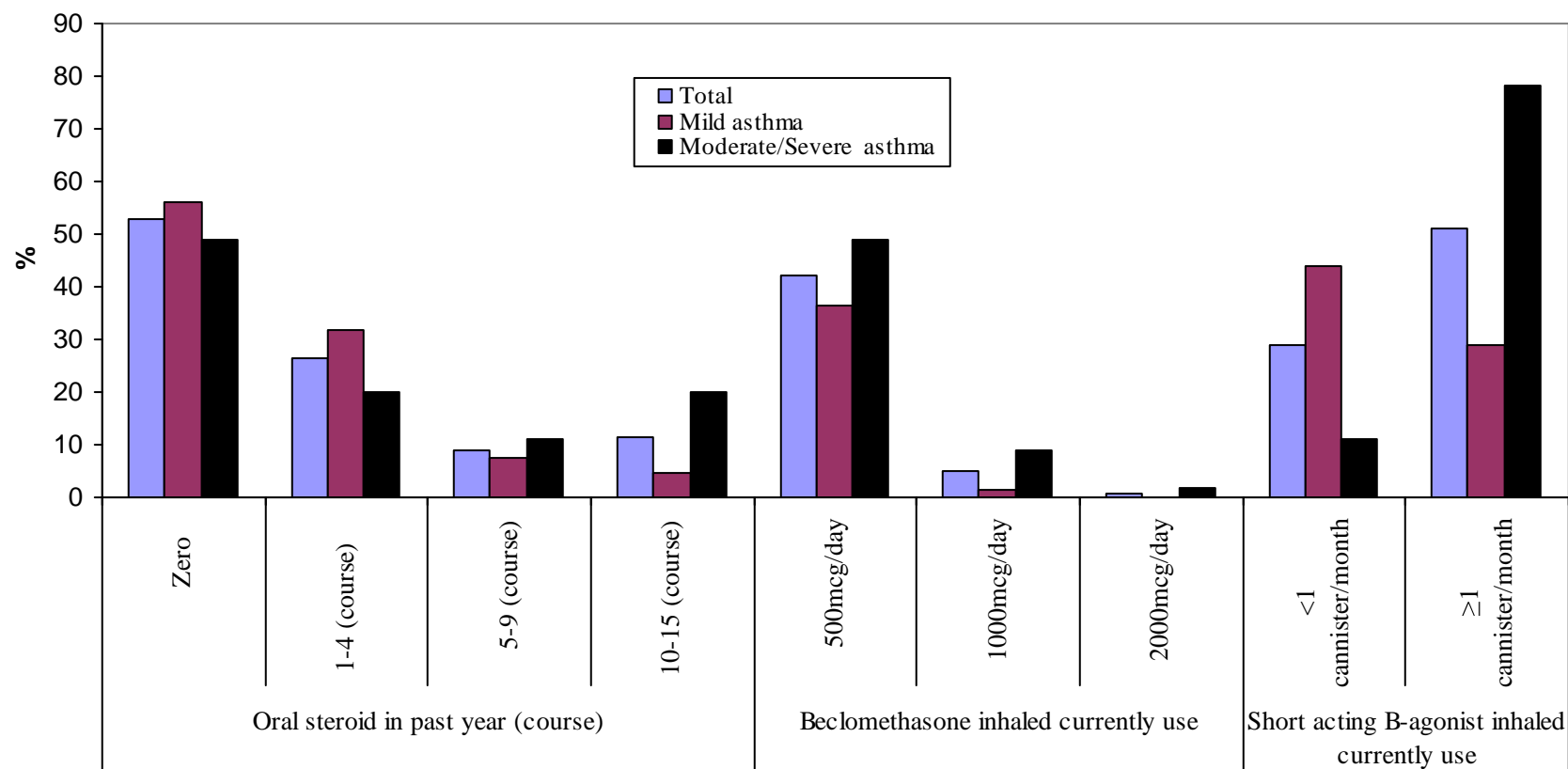
Fig. (5.9) shows that 47% of the patients used oral steroids in the past year (26% used 1-4 courses /year) and inhaled Beclomethasone (42% used the 500mcg/day), and inhaled short B-agonist by 80% (51% used ≥ 1 cannister/month). No significant difference was seen between frequent ER attendees and one-time attendees in the use oral steroids courses ($p>0.05$). But frequent ER attendees used inhaled Beclomethasone much more frequently compared to one time attendees ($p=0.05$), similarly used inhaled short B-agonist ($p<0.05$).

In Fig. (5.10), moderate/severe asthmatics (30%) used oral steroids more frequently than mild asthmatics (12%) (≥ 5 courses/year), but 31% of mild asthmatics used 1-4 courses a year compared to 20% of moderate/severe asthmatics ($p<0.05$). The moderate/severe patients used inhaled Beclomethasone and inhaled short B-agonist more frequently and in higher concentrations (78% used ≥ 1 cannister/month) compared by mild asthmatics (29% used ≥ 1 cannister/month, $p<0.05$).



Values are given as total (%) and percentages of each group. The non-presented data=none.

Figure 5.9: Distribution of ER attendees groups in the past year by essential (basic) asthma medications.



Values are given as total (%) and percentages of each group. The non-presented data=none.

Figure 5.10: Distribution of chronic asthma severity in past 3 months by essential (basic) asthma medications.

5.2.5.3 Treatment failure by inhaled beclomethasone:

Based on GINA guidelines 2002 (GINA, 2002), the International Union Against Tuberculosis and Lung Disease 2005 (Ait-Khaled and Enarson, 2005) recommended 4 step approach for asthma treatment by beclomethasone. According to this recommendation, mild persistent asthma patients should be at least on 500mcg/day inhaled beclomethasone, moderate persistent at least on 1000mcg/day, and severe persistent at least on 2000mcg/day.

Table (5.10) shows the distribution of inhaled beclomethasone doses by persistent asthma severity in our study. Only 21 (36.8%) out of 57 (100%) of mild persistent were adequately treated, 4 out of 42 patients (9.5%) of moderate persistent were adequately treated, and none of the severe persistent had been adequately treated in regard to inhaled beclomethasone. Of the total patients with persistent asthma (112) only 22.3 % (n=25) were adequately treated and the other 77.7 % (87) were under-treated by inhaled beclomethasone.

As Table (5.11) shows, of those who were adequately treated, 22.3% (7.3% moderate/severe persistent and 36.8% mild persistent), with a significant difference between the two groups regarding treatment adequacy ($p < 0.05$). The crude odds ratio (COR) and 95% confidence interval (CI) for under-treated compared to adequately-treated in moderate/severe persistent asthma are; COR, 7.4; 95% CI, 2.3 to 23.5. This means that moderate/severe persistent asthmatics are more likely to be under-treated than mild persistent asthma in regard to inhaled anti-inflammatory beclomethasone.

Table 5.10: Distribution of persistent asthma severity* in past 3 months by Beclomethasone inhaled currently use doses.

Beclomethasone inhaled currently use	Mild persistent n=57	Moderate persistent n=42	Severe persistent n=13
	n(%)	n(%)	n(%)
• 500mcg/day	20 (35)	22 (52.4)	5 (38.5)
• 1000mcg/day	1 (1.8)	3 (7.1)	2 (15.4)
• 2000mcg/day	0	1 (2.4)	0
• None	36 (63.2)	16 (38)	6 (46.2)

* Classification according to day/night time symptoms in GINA 2002 guidelines.

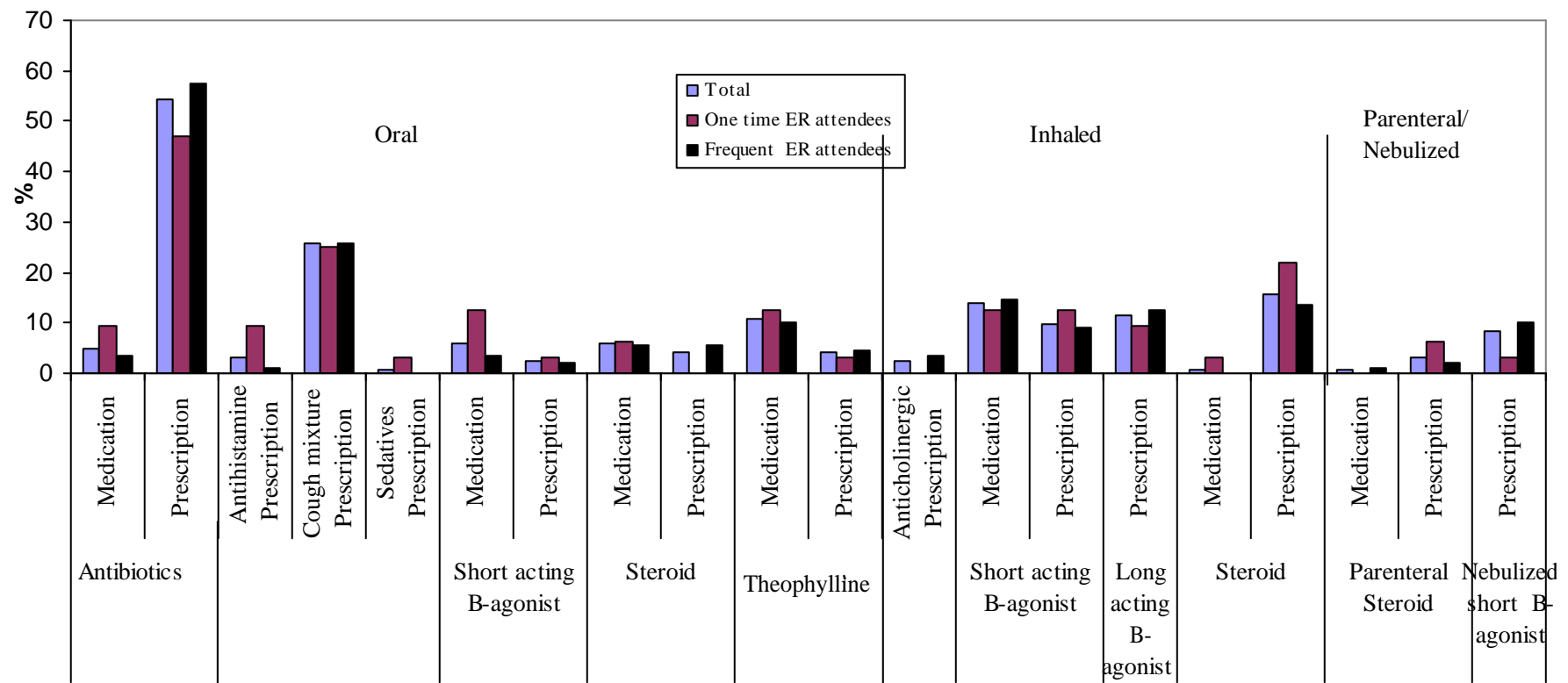
Table 5.11: Distribution of treatment adequacy by persistent asthma severity* in past 3 months.

Treatment adequacy	Total n= 112	Mild persistent N= 57	Moderate/Severe persistent N=55	P value
	n (%)	n (%)	n (%)	
• Adequately-treated	25 (22.3)	21 (36.8)	4 (7.3)	0.000
• Under-treated	87 (77.7)	36 (63.2)	51 (92.7)	

*Classification according to day/night time symptoms in GINA 2002 guidelines.

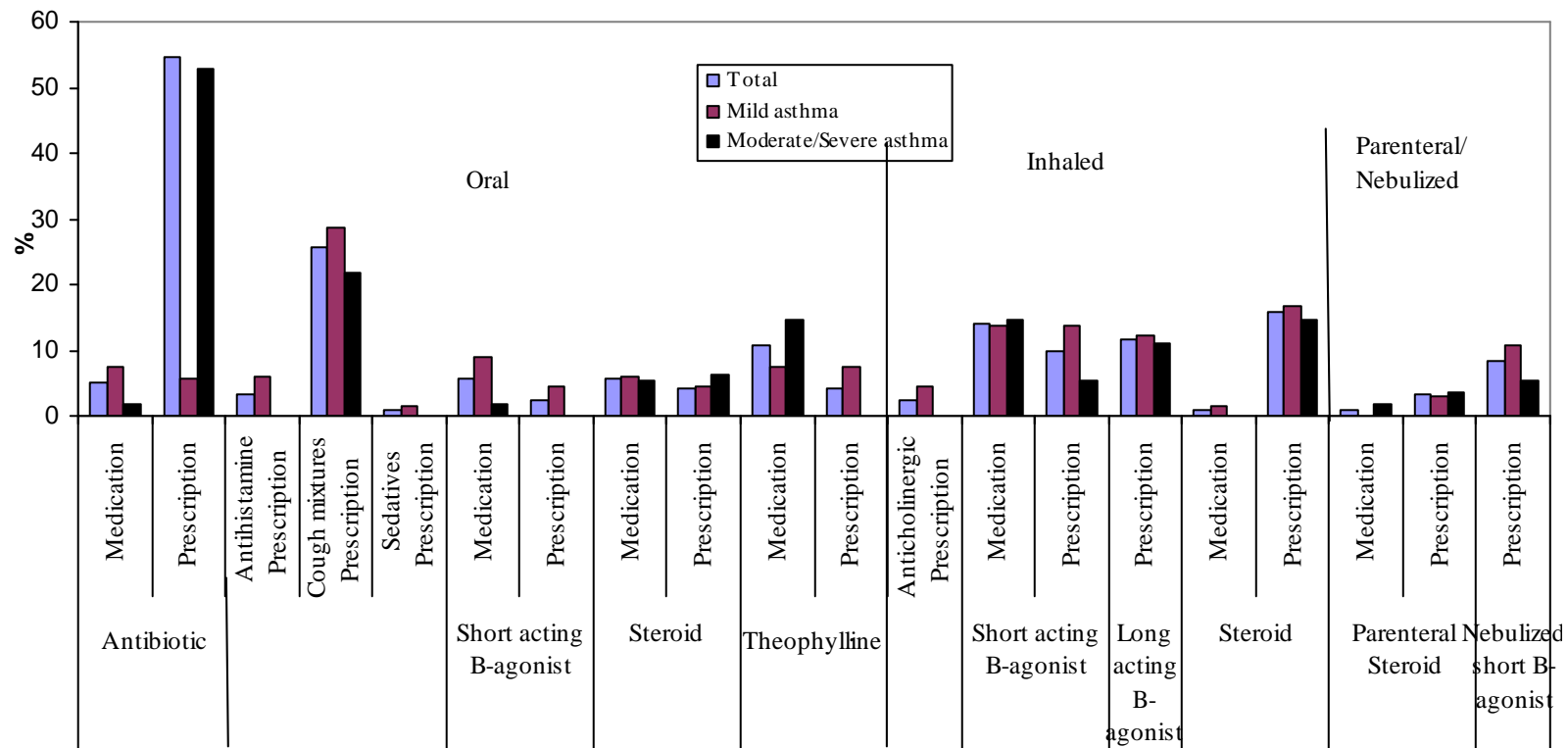
5.2.5.4 Medications discharged with:

In general prescription of medications did not exceed for 15% of the patients, since most patients came with their medications. But, 50% of the patients were prescribed antibiotics and 25% cough mixtures when discharged from the ER. Results did not show any significant difference in prescribing medications between one-time attendees and the frequent ER attendees (Fig. 5.11). This was also seen when comparing mild asthmatic and moderate/sever asthmatics prescribed medications when leaving the ER (Fig. 5.12).



Values are given as total (%) and percentages of each group. The non-presented data=none.

Figure 5.11: Distribution of ER attendees groups in the past year by medication discharged with.



Values are given as total (%) and percentages of each group The non-presented data=None.

Figure 5.12: Distribution of chronic asthma severity in past 3 months by medication discharged with.

5.3 Multivariate logistic regression analysis

To investigate which variables could determine the ER attendance and asthma severity, two multivariate models were developed, i.e. a model for ER frequency attendance in the past year as the outcome variable, and the other for asthma severity in the past three months as an outcome.

5.3.1 ER attendance model:

Variables with a significant level less than 0.05 in the univariate analysis were included in the model. However, some of these variables could not be added due to the fact that the number of patients in some of the categories were less than 10, so the Pearson could be calculated accurately. Therefore, we merged some of the categories into two categories, and those continued having a p value <0.05 in the univariate analysis we still added them to the model. When re-categorize place of residence into city/refugee, and village it was no more <0.05 significant but we still add it in the model, so to adjust for it. City is considered as an urban area and refugee camps as a semi-urban so we added them in one category as villages are considered as rural areas.

Table (5.12) shows the multivariate logistic regression model for ER attendance times. As shown in the Table (5.12), any past admission to hospital due to asthma remains a significant risk factor for the attendance to ER (OR, 17; 95% CI, 2.15 to 147). Moreover, patients reporting getting a benefit from their doctor in managing their asthma at home were significantly inversely associated with frequent ER attendances compared to those reporting no benefit (OR, 0.07; 95% CI, 0.008 to 0.64). Meanwhile, reporting difficulty in using asthma inhalers/devices remains significantly a risk factor for frequent ER attendances compared to those reporting an easy use. An often use of the same facilitate when has asthma attacks also found to be significantly more associated with frequent attendees to ER compared to never use (Table 5.12).

Moderate/severe asthma was more associated with frequent attendance compared with mild asthma but this was not significant (OR, 3.33; 95% CI, 0.35 to 31.17, $p>0.05$).

Frequent attendees were 4.1 times more to be given a letter to their carer upon ER discharge compared to not given a letter (95% CI, 0.3 to 55.12; $p>0.05$). Paying partially or full cost were also inversely related to frequent attendees compared to paying free of charge, but the relations were not significant.

Any time visit to a professional in the past year was also positively associated with frequent attendees compared to zero visit, but again the association failed to be significant.

An occasional and/or most days regular use of inhaled short B-agonist were positively associated with frequent attendances to ER compared to none regular use, but with no statistical significance relations. The contrary was observed regarding an occasional and/or most days regular use of inhaled steroid, where an inverse association was observed with frequent ER attendances compared to none regular use, but here also no significance in the association is observed (Table 5.12).

Table 5.12: Multivariate logistic regression analysis model for factors associated with frequent ER attendees.

<u>Socio-demographic</u>	COR†	AOR‡	95% CI	P value
Place of residency *				
City and refugee camps	0.74	6.77	0.88-51	0.06
Village	1.00	1.00	-	-
<u>Asthma severity</u>				
Moderate/severe	6.92	3.33	0.35-31	0.29
Mild asthma	1.00	1.00	-	-
<u>Health services utilization</u>				
Has health insurance				
Yes	9.10	0.30	0.002-50	0.64
No	1.00	1.00	-	-
Pay for medicine				
Partially covered	1.06	0.11	0.005-2.45	0.16
Full cost	0.26	0.16	0.003-9.92	0.38
Free	1.00	1.00	-	-
Times visited a professional in past year				
1-2	1.74	2.46	0.003- 2257	0.79
3-4	8.33	23	0.01-42323	0.40
5-6	3.55	2.23	0.001-5152	0.83
>6	11.0	6.75	0.005-9290	0.60
Zero	1.00	1.00	-	-
Last time seen by a professional				
< 1 wk	1.86	0.01	0.000-21	0.26
1 wk-1mnt	5.44	0.66	0.000-888	0.91
>1mnt-6 mnt	6.61	1.63	0.001-1898	0.89
>6 mnt-1 year	3.11	4.12	0.003-6561	0.70
> 1 year	1.00	1.00	-	-
Use same facilitate when has attack				
Always	2.66	28	0.37-2229	0.13
Often	12	709	6.73-74754	0.006
Sometimes	4.33	20	0.40-1059	0.13
Rarely	0.85	15	0.21-1162	0.21
Never	1.00	1.00	-	-
Ever admitted to hospital with asthma**				
Yes	11.16	17	2.15-147	0.008
No	1.00	1.00	-	-

Table 5.12: continued

Usual carer sent a letter				
Yes	4.43	4.10	0.30-55	0.28
No	1.00	1.00	-	-
Benefit from doctor in asthma management at home				
Yes	0.30	0.07	0.008-0.64	0.01
No	1.00	1.00	-	-
<u>Medications</u>				
Find inhalers/devices use				
Difficult	2.49	83.36	3.89-1782	0.005
Easy	1.00	1.00	-	-
Inhaled short B-agonist regularly take				
Occasionally	1.60	516	0.02-9672165	0.21
Most days	4.40	127	0.008-2123886	0.32
None	1.00	1.00	-	-
Inhaled steroid regularly take				
Occasionally	1.68	0.007	0.00-3.64	0.12
Most days	4.48	0.02	0.00-4.16	0.15
None	1.00	1.00	-	-
Beclomethasone inhaled currently use#				
Yes	3.13	118	0.38-35933	0.10
No	1.00	1.00	-	-
Short B-agonist inhaled currently use				
<1 cannister/month	0.80	0.004	0.00-91	0.28
≥1 cannister/month	4.05	0.04	0.00-639	0.51
None	1.00	1.00	-	-

† COR: Significant crude odds ratio are bolded. ‡ AOR: Adjusted odds ratio. *Place of residency variable was re-categorized into city and refugee camp, and village since 2 cases were residing in refugee camps among study population (see Table 5.2). **Ever admitted to hospital with asthma variable was re-categorized into yes and no since no case reported an admission in a period of less than a year and was attending the ER once in that period (see Table 5.6). # Beclomethasone currently inhaled use was re-categorized into yes and no answer since very few used concentrations (n=7) >500 mcg/day (see Fig. 5.9).

Note: (1) times admitted to hospital with asthma in past year was not included in the model since no case was admitted ≥1 time among one-time attendees (see Table 5.6). (2) Oral antihistamine discharged with variable not entered because only one case among frequent attendees discharged with it (see Fig. 5.11).

5.3.2 Asthma severity model:

Variables with ≤ 0.1 significance in univariate analysis were entered in the model. However, some of these variables could not be added due to the fact that the number of patients in some of the categories were less than 10, so the Pearson could not be calculated accurately (Table 5.13, below). We did not merge any variable in this model into two categories as they failed to be ≤ 0.1 significant or they included a few number of patients which made them statistically unacceptable in the model. Variables that did not enter in the model but showed <0.05 significance in univariate analysis were calculated for crude odds ratio as shown in Table (5.13) below.

Table (5.13) shows the multivariate logistic regression model for asthma severity. As shown in the Table (5.13) patients with moderate/severe asthma were significantly more likely to get regular treatment (OR, 38; 95% CI, 2.19 to 682; $p<0.05$). Moreover, using other remedies (non conventional ones), and given a letter to usual carer were both significantly more likely to be associated with moderate/severe asthma patients compared to none use and not given a letter, respectively (OR, 24; 95% CI, 1.28 to 477.89; $p<0.05$ and 21; 2.02 to 237; $p<0.05$; respectively). However, reporting benefit from their doctor in managing asthma at home was significantly inversely associated with moderate/severe asthma compared to no benefit (OR, 0.01; 95% CI, 0.001 to 0.31; $p<0.05$).

Similarly moderate/severe asthmatics reported their inability in obtaining their asthma medicines compared to not needing them as the reason for not taking all their asthma medicines (OR, 26.82; 95% CI, 1.33 to 539; $p<0.05$).

Most days regular take of oral theophylline was significantly more likely to be related to moderate/severe asthma compared to none use (OR, 27; 95% CI, 1.2 to 630; $p<0.05$). However, an occasional regular intake of inhaled steroid in past three months was significantly inversely associated with moderate/severe asthma compared to none use (OR, 0.007; 95% CI, 0.00 to 0.42; $p<0.05$).

Married patients were nearly 16 times more related to moderate/severe compared to single patients (OR: 16, 95% CI, 0.84 to 1.10, $p>0.05$) while higher levels of education were inversely associated with moderate/severe asthma compared to lower level (0-6 years of schooling). However, age and occupation could be confounders for some of variables thus affected some of these associations as we did not adjust for them in the model. On the contrary, reporting to be followed on regular basis, having home inhalation equipment, and taking all asthma medicines were positively associated with moderate/severe asthma compared to negative answers with no significances in the associations. Furthermore, paying partially and/or full cost for asthma medicines were positively related to moderate/severe asthmatics compared to free of charge payment but failed to be significant (ORs, 2.86 and 12; respectively).

As expected, moderate/severe asthma patients reported using currently ≥ 1 canister/month of inhaled short B-agonist by 4.61 times more compared to none use, but statistically significant association was not observed (Table 5.13). Variables that did not stay in the model but had significant odds ratios are in Table (5.14).

Table 5.13: Multivariate logistic regression analysis model for factors associated with moderate/severe asthma.

<u>Socio-demographic</u>	COR[†]	AOR[‡]	95% C.I	P value
Marital status				
Married	4.26	15.99	0.84- 1.10	0.06
Widow	2.40	0.18	0.003 – 9	0.40
Single	1.00	1.00	-	-
Highest level of education				
(7-9) years of schooling	0.66	0.44	0.05 - 3.99	0.47
(10-12) years of schooling	0.26	0.05	0.02-1.79	0.10
> 12 years of schooling	0.17	0.59	0.02 – 15	0.75
(0-6) years of schooling)	1.00	1.00	-	-
<u>Health services utilization</u>				
Get regular treatment				
Yes	5.92	38	2.19 - 682	0.01
No	1.00	1.00	-	-
Followed on regular basis				
Yes	2.87	1.73	0.13 - 22	0.67
No	1.00	1.00	-	-
Benefit from doctor in asthma management at home				
Yes	0.26	0.01	0.001 – 0.31	0.007
No	1.00	1.00	-	-
Patient's usual carer sent a letter				
Yes	2.37	21.89	2.02 - 237	0.01
No	1.00	1.00	-	-
Pay for asthma medicines				
Partially covered	2.56	2.86	0.13 – 62	0.50
Full cost	0.87	12.50	0.33 - 472	0.17
Free	1.00	1.00	-	-
Times visited ER in the past year				
1-2	5.68	4.40	0.24 – 78	0.31
3-4	4.86	1.06	0.01 – 74	0.97
> 4	11.34	1.34	0.04 – 44	0.86
Never	1.00	1.00	-	-
Ever admitted to hospital with asthma				
Yes, < a year ago	5.92	2.20	0.02 - 246	0.74
Yes, > a year ago	2.26	4.34	0.27 – 68	0.29
No	1.00	1.00	-	-
Times of hospital admission in past year				
1-2	3.34	0.19	0.001 - 26	0.51
3-4	4.59	2.04	0.04 - 103	0.72
Zero	1.00	1.00	-	-
<u>Medications</u>				
Have home inhalation equipment				
Yes	2.37	1.85	0.14 - 23	0.63
No	1.00	1.00	-	-
Take all asthma medicines				
Yes	3.52	1.71	0.21 - 13	0.61
No	1.00	1.00	-	-
Reasons for not using all asthma medicines				
Can't afford them	4.27	2.05	0.12 - 34	0.61
Can't obtain them	6.75	26	1.33 - 539	0.03
Don't want them	1.41	12	0.78 - 206	0.07
Don't need them	1.00	1.00	-	-

Table 5.13: continued

Use other remedies currently (nonconventional ones)				
Yes	5.71	24.80	1.28 - 477	0.03
No	1.00	1.00	-	-
Oral theophylline regularly take				
Occasionally	1.97	2.28	0.18 – 27	0.51
Most days	4.69	27.59	1.20 - 630	0.03
None	1.00	1.00	-	-
Inhaled steroid regularly take				
Occasionally	1.06	0.007	0.00– 0.42	0.01
Most days	6.81	4.98	0.33 – 73	0.24
None	1.00	1.00	-	-
Inhaled short B-agonist currently use				
< 1 cannister / month	0.62	1.23	0.07 – 21	0.88
≥ 1 cannister / month	6.78	4.61	0.31 – 66	0.26
None	1.00	1.00	-	-
Oral theophylline discharged with				
Medication	1.9	2.99	0.07 - 113	0.55
None	1.00	1.00	-	-

†COR: Significant crude odds ratio are bolded. ‡AOR: Adjusted odds ratio.

Table 5.14: Variables not in asthma severity model and their crude odds ratio (COR), 95% confidence interval (CI), and p values.

Age (years)	COR[†]	95% CI	P value
5-19	1.00	-	-
20-49	4.72	0.55-39	0.15
50-64	16	1.83-145	0.01
>64	21	2.33-191	0.007
Occupation			
House wives	0.69	0.24-1.97	0.49
General workers	0.42	0.13-1.30	0.13
Students-school	0.08	0.009-0.85	0.03
Monthly based employee	0.13	0.02-0.80	0.02
Unemployed	1.00	-	-
Go to same facility always			
Yes	2.11	1.02-4.39	0.04
No	1.00	-	-
Times visited a professional in past year			
Zero	1.00	-	-
1-2	5.57	0.63-49	0.12
3-4	16	1.84-138	0.01
5-6	7.42	0.69-79	0.09
>6	27	3.61-231	0.003
Last time seen by a professional			
< 1 wk	12	1.35-106	0.02
1 wk-1mnt	14	1.76-120	0.01
>1mnt-6 mnt	9.81	1.06-90	0.04
>6 mnt-1 year	6.85	0.63-74	0.11
> 1 year	1.00	-	-
inhaled short B-agonist regularly take			
Occasionally	1.45	0.52-4.06	0.46
Most days	6.31	2.06-19.33	0.001
None	1.00	-	-
Oral steroid in past year (courses)			
1-4	0.71	0.29-1.73	0.46
5-9	1.64	0.45-5.95	0.44
10-15	5.02	1.27-19.76	0.02
Zero	1.00	-	-

Table 5.14: continued

Beclomethasone inhaled currently use*			
Yes	2.46	1.18-5.12	0.01
No	1.00	-	-

†COR: Significant crude odds ratio are bolded. * Beclomethasone currently inhaled use was re-categorized into yes and no answer since very few used concentrations (n=7) >500 mcg/day (see Fig. 5.9).

5.4 Summary

In this chapter, univariate analysis was performed to describe the study population characteristics, health services utilization, and medications prescribed to the patients which were stratified by both study outcomes (ER frequency and asthma severity). The results were represented in tables and figures. However, variables found to be significant in this part of analysis were entered in logistic regression analysis and two models were developed, i.e. one for ER attendance frequency and the other for asthma severity in a two separated tables.

The main results showed that asthma severity, and reporting difficulty in asthma inhalers/devices use were more likely to be associated with the frequent attendance at the ER. Further, most days regular intake of inhaled short B-agonist was more likely to be associated with frequent attendees and moderate/severe asthma compared to none regular use. For asthma severity, a hospital admission in less than a year ago was a strong risk factor. Under-treatment with inhaled beclomethasone, inability to obtain asthma medicines, most day regular intake of oral theophylline, and using 10-15 courses per year of oral steroids were more likely to be associated with moderate/severe asthmatics.

Some variables showed to be significant in univariate analysis and still in multivariate. Meanwhile, others were not found to be significant in univariate nor in multivariate. The main results represented in this chapter are discussed in the coming chapter (chapter 6: discussion) and their consistency or contradictory to other studies results and findings were discussed.

Chapter 6

Discussion and conclusion

6.1 Introduction

The present study is the first study in Palestine that is concerned with asthmatic patients in emergency rooms (ERs). In Alia governmental hospital's ER in Hebron district we investigated the determinants that might be associated with frequent ER attendance in the past year and with asthma severity in the past three months. Furthermore, we evaluated the treatment adequacy of persistent asthmatics according to GINA 2002 guidelines (Ait-Khaled and Enarson, 2005).

6.2 Main results

We found that asthma severity, indicators of severity (ever been admitted to hospital with asthma) and reporting difficulty in asthma inhalers/devices use are more likely to be associated with the frequent ER attendees. We also found in univariate analysis that most days regular intake of inhaled short B-agonist (reliever therapy) was significantly more likely to be associated with frequent attendees and moderate/severe asthma compared to none regular use.

For asthma severity, hospital admissions in less than a year ago and number of admissions (1-2 times or 3-4 times compared to no admission) were strong risk factors. In univariate analysis, having 3-4 visits or more than 6 visits to a professional in the past year showed a significant association with frequent ER attendance, similarly for asthma severity. Having the last visit to a professional in the period one week to six months prior to current ER attendance was a significant predictor of frequent attendance to ER. However, for asthma severity, having this last visit in the period six months or less prior to current ER attendance was a predictor of moderate/severe asthma.

Another main findings are; under-treatment with inhaled beclomethasone, get regular treatment, follow up with patient carer, inability to obtain asthma medicines, using other remedies for asthma, most day regular intake of oral theophylline, report having home inhalation equipment, report taking all their asthma medicines, and using 10-15 courses per year of oral steroids were all more likely to be associated with moderate/severe asthmatics. On the other hand, reporting beneficial results from doctor in managing asthma at home, and an occasional regular intake of inhaled steroid were less likely to be associated with moderate/severe asthmatics.

In multivariate analysis, patients living in cities and refugee camps showed six fold risk to be frequent ER attendees compared to villages. Further, married and older ages (≥ 50 years) patients were more likely to have moderate/severe asthma compared to single and younger ages (5-19 years) patients; respectively. Meanwhile, higher levels of schooling (≥ 10 years) and being on a monthly-based salary employee or school-students were less likely to have moderate/severe asthma compared to lower level of schooling (0-6 years) and being unemployed; respectively.

6.3 Asthma severity

One of the main findings of this study was that the severity of asthma is a strong determinant for the frequent ER attendance in the univariate analysis. However, after adjustment for place of residence, health services utilization variables, and medications intake, it did not remain a significant factor (3 folds compared to mild asthma). Also ever been admitted to hospital in the past was also a strong factor for frequent ER attendance (17 folds compared to one time attendance). However, for asthma severity, hospital admissions in less than a year ago and number of admissions (1-2 times or 3-4 times compared to no admission) were strong risk factors.

Our results are consistent with other studies that identified disease severity as a predictor of frequent ER attendance and repeated relapse (Dales et al., 1995; Wakefield et al., 1997; Adams et al., 2000; Dianne et al., 2004). Our finding is also similar to studies that showed previous hospital admissions as a strong predictor for asthma severity, ER attendance and relapse (Emerman and Cydulka, 1995; Carren et al., 1998; Adams et al., 2000; Ford et al., 2001). As Ford et al. (Ford et al., 2001) concluded, “our results point to consider frequent ER attendees a group of asthma patients who have more severe, poorly controlled and managed asthma”.

Furthermore, mild asthma was seen in 54.5% of patients (n=66) and 45.5% of patients (n=55) had moderate/severe asthma. In our study persistent asthmatics were 92%. Burney et al. (2004, unpublished) found that 78% of the patients attended ER for asthma had persistent asthma; another recent study in USA found that they were 67% (Kelly et al., 2004). But these studies investigated higher number of patients; i.e. >1000. Furthermore, Classification of asthma severity in the previous three months was determined by self-reported day/night time symptoms according to GINA 2002 guidelines (GINA, 2002) which varies by the reported history of daytime and/or nighttime symptoms (Ford et al., 2001).

6.4 Health services utilization

In this study risk factors related to health services utilization at the health care system for asthma patients were identified. In the univariate analysis, the number of times in attending ER the past year was more likely to be associated with moderate/severe asthma. Hospital admissions in less than a year ago and number of admissions (1-2 times or 3-4 times compared to no admission) were also significant predictors of moderate/severe asthma. Meanwhile, 1-2 times or 3-4 times of hospital admissions compared to no admission were also significant predictors of frequent ER attendance. These factors were shown in the univariate analysis as possible indicators for managing and controlling asthma severity. However, after adjustment these factors did not remain significant.

Our findings are consistent with other similar studies (Emerman and Cydulka, 1995; Carren et al., 1998; Adams et al., 2000; Ford et al., 2001) that showed asthma severity, previous hospital admissions in the past year and two or more admissions as strong predictors for frequent ER attendance and relapse. Moreover, Adams et al. (Adam et al., 2000) examined 293 patients with moderate to severe asthma attending the ER, found that 16% had two or more hospital admissions and 32% had two or more visits to ER in the past year

6.4.1 Professional visiting:

In univariate analysis, having 3-4 visits or more than 6 visits to a professional in the past year showed a significant association with frequent ER attendance, similarly for asthma severity. Having the last visit to a professional in the period one week to six months prior to current ER attendance was a significant predictor of frequent attendance to ER. For asthma severity, having this last visit in the period six months or less prior to current ER attendance was a predictor of moderate/severe asthma.

Our findings are consistent with Ford et al. study (Ford et al., 2001) that showed a strong relation between scheduled visits to a physician's office in the previous year for asthma and frequency of ER attendance, since it might be as indicators of severity. Ford et al. (2001) repeated the analysis controlling for asthma severity and here again he had the same conclusion. However, when we controlled for asthma severity and other variables visiting a professional did not remain a significant predictor for frequent ER attendance.

Interestingly, about 42% of the patients had their last visit to professional one week to one month before current ER attendance. The professionals' inability to prevent this current attack to those patients might be questionable. A possible explanation is that disease severity and/or patient's poor self-management of their asthma led to current attack. Another explanation is that, professionals themselves might fail to properly managing those patients's asthma. Dependently, further analysis to this group of patients might be required to find out the proper explanation.

6.4.2 Follow up, and health insurance:

One of the main findings of our study is that given a letter to the usual carer is a predictor factor for frequent attendance at the ER compared to not given this letter. Although this factor did not remain significant after adjustment but it still shows four times fold increased risk for frequent ER attendance. Meanwhile, given a letter to usual carer it self remains a significant predictor of moderate/severe asthma after adjusting. Similarly, moderate/severe asthmatics were shown to get regular treatment for asthma compared to mild asthmatic after adjustment. Moreover, moderate/severe asthma were more likely to be followed on regular basis in univariate analysis.

Using same facility for following up their asthma, patient having asthma severe level reported going to same facility more frequently compared to less severe asthmatics.

In GINA guidelines (GINA, 2002) it is recommend for asthmatic patients at ER to have a close medical follow up including a letter to the career, and a written asthma action plan. Management plan was given to only 9% of the attendees in our study. A study in United States of America (USA) found that only 48% of those attended the ER for asthma had an action plan (Kelly et al., 2004). Another study in Argentina reported that 43% asthmatic patients were provided by management plan by their physicians (Raimondi et al., 2005). This rises up questions regarding the management plans and guidelines that are used at the Palestinian ERs for having a follow up of asthma patients. A more possible explanation, and since 96.7% of our study participants had health insurance, patients get their regular treatment at the ER which means that their regular carer was at the ER and thus no need for a letter for follow up. Our data concerning health insurance might contradicts other studies findings (Oster and Bindman, 2003; Raimondi et al., 2005) that reported higher rates of

ER attendances among uninsured patients because they are less likely to have follow up and regular medical care.

However, our findings were consistent with other studies in USA that found of 3612 patients attending the ERs for asthma, 96.3% were insured ones (Ponda et al., February 2005). We believed that health insurance is varied from one country to another as a risk factor or predictor factor to frequent ER attendance and that having access to health services does not necessarily ensure a good quality of care. This might be true because 64% of our respondents reported to have access to specialist care and only 14% had medication review in past year and their insurance covers asthma drugs. Moreover, this might be influenced by the settings where the study was carried out, whether public or private hospitals and insurance coverage. For example; in Hebron district 70% of the population is covered by health insurance (Head of health insurance department-Hebron, October 2005, Private communication).

In Palestine and especially after the current crisis (AL Aqsa Intifada) an overload on the governmental health services occurred. Thus patients have access to health services but the quality of these services is likely to be poor. Another possible explanation to our result is that insured patients might just find it an easy way to go to the hospital ER rather than taking, buying their medicines, avoiding trigger's factors, and other self-management procedures. Thus addressing the psychological factors may be needed to be investigated in a future study (Peleg et al., 2002; Dianne et al., 2004).

Studies indicated that regular medical review led to a reduced number of ER visits (Gibson, 2000; Sulaimana et al., 2004) and as only 14% of our participants had medication review in past year, and 17% were followed on regular basis who were mainly moderate/severe asthmatics, this might be addressed in any future intervention program to reduce or even prevent ER attendance in Palestine.

The findings of this study revealed that frequent ER attendees are more likely to use same facilitate often when have asthma attack than one-time attendees. This again implies that frequent attendees who were mainly insured ones simply prefer to rely often on the same hospital ER when have asthma attacks. Studies showed that those whom source of care is ER don't have an established source of primary health care (PHC) but only ER physicians who only care for emergencies (Singh A, Woodruff P et al., 1999). In our study only 18% of our participants always use the PHC facilities and 28% go either to private, public and/or out-patient clinic. This raises a question of whether the remaining 54% don't have a PHC or they just prefer the hospital ER for usual care (Ford et al., 2001). Another study in Argentina found that 26% of ER attended asthmatic patients use ER as their routine care (Raimondi et al., 2005).

Paying fully for medications was also shown to be inversely associated (not significant) with frequent and moderate/severe attendees to ER. This was most probably the case, since frequent attendees to ER were mainly the severe cases. Consequently, the severe cases were found to be more likely to get regular treatment. Accordingly, they might have a more chance to take their medications either on free of charge or on partial payment by their insurance. However, this by itself does not insure a proper treatment for those patients (Burney et al., 2004, unpublished).

6.4.3 Patients' education and specialist care:

The results of our study show that only 44.6% of the sample population reported beneficial results from the doctor in managing their asthma at home. Reporting such beneficial results was significantly inversely associated with frequent attendees to ER. Similar results were shown with asthma severity even after adjustment. Additionally, using inhalers and/or devices were reported to be difficult to be used by 44% of the study population. Frequent attendees were significantly more likely to report such difficulty after adjustment.

Our findings are similar to other studies (Bailey et al., 1990; Belda, 1995; Peleg et al., 2002; Dianne et al., 2004,) that indicated inability and lack of proper use of inhalers medication are significant predictors for frequent ER attendance. In this part of finding we were able to identify a modifiable reason for frequent ER attendance and that patient's education about asthma medication usage especially inhaled medications could be essential in any future intervention to reduce or prevent frequent attendance to ER (Boulet et al., 1996; Peleg et al., 2002; Dianne et al., 2004). Another study concluded that doctors need to explore and acknowledge their patients personal disease experience and opinions and to respect a patients' interpretation of their symptoms (Clark and Gong, 2000).

Regardless of ER frequency attendance and/or asthma severity, only 35% of our ER attendees received training in inhalers use, 18% were given oral/written information about asthma, 23% reported to understand the difference between relievers/preventers medication, and 40% reported to ask doctor about asthma drugs.

From our study results we could also conclude that patients attending ER showed lesser knowledge of asthma control criteria, as well as over all trend toward reduced asthma management knowledge and skills (Boulet et al., 1996). But they were like to have more information about asthma and its medications. Similar to other studies we could conclude also that poor understanding of the disease process or medication's work and lack of disease management are a major problem for patients with asthma attending the ER (NHLBI, 1991; Dales et al., 1995; Kolbe et al., 1997).

Only 25% of the study population reported to have home inhalation equipment. This was not significant regarding frequent and one-time ER attendees, while a significant association was observed in univariate analysis regarding asthma severity, i.e. moderate/severe asthmatics were significantly more likely to report having home inhalation equipment compared not to have it. A possible explanation is that either doctors prescribed this inhalation equipment to them and/or disease severity encourages those patients to buy this inhalation equipment. However, further analysis to this group of patients may be required to see whether they failed to use this equipment properly in order to prevent their current attack or they had more severe disease that could not be controlled by this inhalation equipment and/or they just relied on ER care without trying any home management procedures for asthma.

We found also that 43% of the total was followed by a specialist, and only 21% of our participants were followed by an allergy/asthma and chest specialist, nearly 23% were relied on ER doctor, and 24% on general practitioner as their usual source of care. We did not find a significant association between either specialist or by field of specialty and ER frequency attendance nor asthma severity. Although this contradicts other studies that

reported lack of asthma or allergy care specialist as a predictor to ER attendance and re-attendance (Zeiger et al., 1991; Zeiger and Schatz, 2000; Dianne et al., 2004).

6.4.4 Compliance with medications:

Compliance and adherence to asthma medications was found to be a problem of concern for asthma patients attending ER in our study. Only 21% of our participants reported that they take all their asthma medicines. Moderate/severe was significantly more likely to report taking all their asthma medicines. However, 76% of our participants reported to use other remedies in order to help their asthma, and this was significantly more likely to be associated with moderate/severe asthmatics even after adjustment.

Another main finding in our study regarding asthma medicines compliance is that 43% of the total study population reported their inability to afford or obtain asthma medicines. While there was no significant difference by frequency of ER attendees, reporting not to be able to afford or obtain asthma medicines were shown to be significantly associated with moderate/severe asthma compared to not needing them. After adjusting, reporting not to be able to obtain these medicines remains a significant predictor of moderate/severe asthmatics. However, reporting not to be able to afford them showed nearly a two fold risk association but with no significance.

A possible explanation for these findings could be related to the patients' attempts to compensate their asthma medicines by other remedies as they failed to afford or obtain all their medicines or they might lose the hope in the prescribed medications. However, further investigation might be required to determine the types of these remedies especially the herbal ones as they might worsen asthma symptoms leading to exacerbations of asthma thus increase morbidity especially if they were not scientifically approved for asthma (GINA, 2002).

Studies showed that as many as one half of asthma patients fail to adhere to daily treatment regimens either intentionally, unintentionally, or unknowingly (Sherman et al., 2000). Reasons for non-compliance to medications including; poor understanding, fear of steroids side effects, adolescence, low socio-economic status (Kolbe et al., 1997; Apter et al., 1998), and psychological factors as a wish to be just like every one else (Balfour, 1999; Sherman et al., 2000).

Many other studies indicated that non-compliance with prescribed medical regimens is contributing to asthma morbidity (Birkhead et al., 1989; Brooks et al., 1994; Rand and Wise, 1994; Milgrom et al., 1996). Our findings also represent this major problem in asthmatic patients attending the ERs. The more severe asthmatics are those who required the more medications combination and have more loss of work thus contributing to low economic status of those patients and as a result, not to be able to buy their medications (Weiss et al., 1992; Krahm et al., 1996; Burney et al., 2004, Unpublished). Our findings concerning medications compliance should be considered in any future interventions to reduce ER attendance for asthma.

6.5 Socio-demographic factors

Of the 121 patients, 73.6% (n=89) were frequent ER attendees compared to 26.4% (n= 32) one-time ER attendees. In multivariate analysis, patients living in cities and refugee camps

showed six fold risk to be frequent ER attendees compared to villages, and no significant differences by sex, age, marital status, level of education, and occupation.

Our findings might contradict other similar studies that indicated an association between attendance and low socio-demographic and economic status (Kolbe et al., 1997; Apter et al., 1998; Lara et al., 1999). A possible explanation to our result is that Alia hospital is located in the center of the city so most city patients find it easy to reach, while patients resident in villages might find it easier to go to primary healthcare centers distributed in their area. Additionally, no difference in the socio-economic status might be present between cities, villages and refugee camps in Palestine.

Studies showed that women were on greater risk for ER attendance than men for asthma (Douglass et al., 2002) and in another study they were in a ratio of nearly 2:1 (Singh A, Cydulka R et al., 1999). In our study we had nearly equal percentages of both male and female (52.9% vs. 47.1%; respectively) with no significant differences in ER attendance frequency. Undefined confounders, or small sample size, and/or because we carried our study in one setting (governmental hospital) might contribute to inability to detect the differences between ER attendees groups regarding socio-demographic factors. However, the population structure in Hebron district is unique in that it constitutes nearly equal percentages of males and females, i.e. 51.1% males and 48.9% females (MOH, 2005).

In univariate analysis, married and older ages (≥ 50 years) patients were more likely to have moderate/severe asthma compared to single and younger ages (5-19 years) patients; respectively. Meanwhile, higher levels of schooling (≥ 10 years) and being on a monthly-based salary employee or school-students were less likely to have moderate/severe asthma compared to lower level of schooling (0-6 years) and being unemployed; respectively. However, this association might be a due to temporal relationship because of the study design and age as confounder as we did not adjust for it in univariate analysis.

Our finding is in concordance with other studies (Apter et al., 1998; Ford et al., 2001; Dianne et al., 2002) that indicated low socio-economic status, married females and older patients are usually associated with greater exposure to causes and trigger factors arising from poor housing or financial barriers to quality of health services and medications for asthma thus contributing to asthma severity and morbidity. Interestingly enough, 61% of the patients in our study were having 0-6 years of education which might indicate poor knowledge of asthma and its medication.

6.6 Asthma treatment protocol

In this study we examined the association between asthma medications intake and frequent attendance at ER. Also we evaluate the association between these medications and asthma severity in the previous three months. However, special analysis has been done regarding treatment adequacy of persistent asthma by anti-inflammatory inhaled beclomethasone.

6.6.1 Medications regularly taken in the past three months:

6.6.1.1 Inhaled steroids:

Our findings revealed that 89% of ER attendees relied on short B-agonist, while only 23% of them had taken inhaled steroids most days, and 27% occasionally in the previous three

months. Among frequent ER attendees, only 28% used inhaled steroids most days, 28% used them occasionally, and nearly 44% of them did not use inhaled steroids at all.

In the univariate analysis we found that most days regular intake of inhaled short B-agonist and inhaled steroids were significantly more likely to be associated with frequent attendees and moderate/severe asthma compared to none regular use. However, in multivariate analysis we found that only an occasional regular intake of inhaled steroids was significantly inversely associated with moderate/severe compared to none use. Although the same association has been noticed for frequent attendees at ER regarding an occasional and most days regular intake of inhaled steroids the associations were not significant.

Our finding is in concordance with previous studies that demonstrated a protective effect of inhaled steroids against asthma severity and morbidity (Taylor et al., 1990; Anis et al., 2001; Suissa and Ernst, 2001). Therefore, our findings indicated the inhaled B-agonists as a predictor factor for frequent ER attendance, which is similar to other studies findings (Taylor et al., 1990; Dales et al., 1995; Anis et al., 2001; Eroglu G, Tugaeon A et al., 2004), but not other (Dales et al., 1995; Eroglu G, Sulun F et al., 2004; Eroglu G, Tugaeon A et al., 2004;). This finding was not significant in the multivariate analysis.

Moreover, only 23% used the inhaled steroids most days, and 27% occasionally, which was also in concordance with other studies that showed a range of 20-26% of patients attending the ER using it (Dales et al., 1995; Rabe et al., 2000; Bergquist and Crompton, 2001; Eroglu G, Tugaeon A et al., 2004). However, only 60% of the moderate/severe asthmatics used it most days or occasionally and according to GINA it should be 100% (GINA, 2002).

6.6.1.2 Oral steroids:

We did not find a significant difference between frequent ER attendees and one-time attendees in the use oral steroid courses in the past year. However, using 10-15 courses per year of oral steroids was a significantly predictor of moderate/severe asthma. GINA guidelines (2002) recommended step up and step down therapy by oral steroids depending on asthma severity level and control. In Palestine each prescribed course of oral steroid contains 30 tablets, and if we compare this to the number of courses the moderate/severe asthma took in the past year (10-15) we can conclude that those patients have a high continuous consumption of oral steroids, which is not according to GINA guidelines (GINA, 2002).

6.6.1.3 Inhaled short B-agonist and beclomethasone use:

GINA guidelines. (2002) recommended the use of inhaled short B-agonist as needed (during attacks) but not on daily basis. Our univariate results revealed that patients used currently ≥ 1 canister/month of inhaled short B-agonist were at a significantly increased risk to be a frequent ER attendees and to have moderate/severe asthma compared to none current use. An inverse associations were observed between the study outcomes and using < 1 canister/month of inhaled short B-agonist.

These findings support our previous ones (we found in univariate analysis that most days regular intake of inhaled short B-agonist was significantly more likely to be associated with frequent attendees and moderate/severe asthma compared to none regular use) and

are similar to other studies that related its use to frequent ER attendance and worsening of asthma control and increased ER visits and asthma morbidity (Taylor et al., 1990; Dales et al., 1995; Anis et al., 2001; Eroglu G, Tugaeon A et al., 2004).

Studies showed that proper use of beclomethasone as a protective factor from ER attendance and as a good medication for control of asthma in specific (Dales et al., 1995; NHLBI, 1997; GINA, 2002; Eroglu G, Sulun F et al., February 2004; Eroglu G, Tugaeon A et al., 2004). However, inhaled beclomethasone does not necessarily predict to prevent ER attendance or decrease asthma morbidity unless it is used adequately and delivered in the context of proper dosage according to asthma severity level (NHLBI, 1997; GINA, 2002; Burney et al., 2004, Unpublished). Meanwhile, many studies have reported under treatment by inhaled steroids which cause a worsening of asthma control leading to increased risk of ER visits (Taylor et al., 1990; Anis et al., 2001; Eroglu G, Tugaeon A et al., 2004). We did support such studied as we found that only 37% of mild persistent asthma, 9.5% of moderate persistent, and no case of the severe persistent asthmatic were adequately treated by inhaled beclomethasone, and that moderate/severe persistent asthma were significantly less likely to be adequately treated by inhaled beclomethasone than mild persistent asthmatics. Even though, we do still believe that a proper dosage of inhaled beclomethasone according to asthma severity level and GINA guidelines might reduce ER attendance and asthma morbidity and that there is a need to institute aggressive interventions to improve the quality of care for asthma (GINA, 2002; Ait-Khaled and Enarson, 2005).

6.6.1.4 Theophylline:

The recent international and national guidelines don't recommend but further doubt the effectiveness of theophylline in asthma management if it is not used in combination with other proper asthma medications (GINA, 2002; Abdeen et al., 2003; NHLBI, 2003).

In our study 80% of moderate/severe asthmatics used oral theophylline compared to 54% of mild asthmatics. After adjustment, this was shown as a predictor factor for moderate/severe asthma compared to none regular use. This raised a question about the possibility that patients with severe asthma can not afford using the proper medications which leads to the use of a cheaper medications like theophylline. Another possible explanation is the poor effectiveness of this medication that is prescribed by the patient's physician, in controlling the patient asthma. .

6.6.2 Medications discharged with:

Since most patients came with their medications, prescription of medications did not exceed for 15% of the patients in general. But, an over prescription of antibiotics (50% of the patients) and cough mixtures (25% of the patients) were noticed. These findings contradict the GINA. (2002) and the American NAEPP guidelines. (1997) who indicated that antibiotics should be used only when bacterial infection is confirmed and that cough mixtures may worse asthma symptoms leading to exacerbation of asthma. Although the ERs are often busy facilities we would recommend them to be included in any future intervention program as the ER doctor can add inhaled steroids to patient's medications with the recommended proper dose together with long acting B-agonists leading to reduction in ER attendance for asthmatics (Singh A, Woodruff P et al., 1999; Walsh-Kelly et al., 2005).

6.7 Conclusions

This study results are important in providing detailed information on patients attending the ER for asthma and the risk factors that are possibly associated with asthma morbidity and frequent attendance at ER of Alia governmental hospital in Hebron district.

The study showed that the majority of the patients attending the ER of Alia hospital for asthma are used to attend the ER frequently. Patients living in cities and refugee camps showed six folds risks to be frequent ER attendees compared to villages although difference was not significant. Low socio-economic indicators such as lower level of education and being unemployed were more likely to be associated with severe asthma. The other outcome indicator for this study, i.e. asthma severity, was shown at the same time as a strong indicator for ER attendance. This indicates that frequent ER attendees represent a group of asthmatic patients with moderate/severe, poorly controlled and managed asthma.

Another important issue that this study highlighted was the access to health services and the quality of care patients received at the ER. Our data suggest that having access to health services does not necessarily ensure a good quality of care and proper treatment. This might be also true as moderate/severe asthma were more likely to get regular treatment although this treatment was considered as an under-treated.

Therefore, Alia ER is a proper target for an intervention program that aims to prevent or reduce ER attendances for asthmatics and also a place for teaching the sever patients how to manage their asthma properly. However, compliance and adherence to asthma medications should be considered for patients attending the ER for asthma especially those with the more sever disease.

In summary, in general, poor understanding of the disease process or medication's proper functioning and use, inhalers/devices proper use and lack of disease management are major problems for patients with asthma in Palestine. Furthermore, over-reliance on short B-agonists (reliever therapy) together with the under-treatment with inhaled steroids (controller therapy) might add to the risk factors for frequent ER usage and asthma morbidity. Meanwhile, oral steroids were not prescribed according to GINA guidelines; i.e. step up and step down (GINA, 2002) which might be contributed to asthma severity. Increasingly, moderate/sever patients might try to compensate for cheaper drugs (theophylline) instead of the more expensive and effective asthma medicines. However, effectiveness of theophylline in controlling and managing the more severe asthma should be reconsidered by the physicians.

As a miss prescription of medications, an over prescription of antibiotics and cough mixtures (mucolytics) to asthma patients upon discharge don't substitute the effective and adequately prescribed anti-inflammatories, but could worse asthma symptoms especially cough mixtures (GINA, 2002; NHLBI, 2003).

In brief, asthma severity and reporting difficulty in asthma inhalers/devices use are more likely to be associated with the frequent ER attendees. Under-treatment with inhaled beclomethasone, get regular treatment, follow up with patient carer, inability to obtain asthma medicines, using other remedies for asthma, and most day regular intake of oral theophylline were all more likely to be associated with moderate/severe asthmatics. On the

other hand, reporting beneficial results from doctor in managing asthma at home, and an occasional regular intake of inhaled steroid were less likely to be associated with moderate/severe asthmatics.

6.8 Recommendations

The study researchers suggest the following recommendations for reducing or preventing ER attendance and its associated risk factors.

- 1) Asthmatic patients should not only have access to healthcare services but an access to an improved quality of services.
- 2) Primary health care physicians should address the socio-economic determinants of health for patients with asthma especially the more severe patients. This could be done through prescribing the less cost and most effective available preparations, avoiding improper and unnecessary drugs combinations. Also through educating patients how to avoid trigger factors, hygiene process, and usage of inhalers especially the married, less educated, and older ages patients.
- 3) Exploring the barriers to financing and asthma medications could further stratify targeted interventions in reducing the ER attendance for asthmatics, and would increase patients' compliance and adherence to prescribed medications, specially in low socio-economic status patients.
- 4) Asthma should be pharmacologically-adequately managed and controlled according to established national and international guidelines, other wise further steps toward its control will be useless.
- 5) Strengthen the role of primary health care in prevention and management of asthma.
- 6) Construction of clear simple technically and clinically practiced national guidelines and protocols for asthma management.
- 7) Raising the quality of health professionals by; continuous education and training of the medical staffs to improve performance, monitoring and evaluation of practice, increasing their adherence to asthma management guidelines for proper anti-inflammatory use.
- 8) Functional follow up and referral to asthma specialist for asthmatics after ER and hospital discharge as well as close medical review at specific time intervals.
- 9) Asthma should be recognized as a major public health problem and a reportable disease at the national level through improvement of recording system and effective steps toward its control should be started.
- 10) An ER and/or PHC based educational intervention program for asthma patients with an integral activity of all health workers concentrated on;
 1. Providing instructions for proper inhalers/devices technique and usage.
 2. Cultural aspects of inhalers use.
 3. Fears of steroids.
 4. Understanding of the disease process and medication's work as well as the implementation of asthma management plan.
 5. Proper pharmacotherapy of asthma according to severity level as well as addressing the importance of proper inhaled anti-inflammatory use rather than over-reliance on reliever medications especially for moderate/severe asthmatics.
 6. Importance of long term adherence to medications on reducing asthma morbidity.
 7. Patients' knowledge and skills about asthma control criteria.

6.9 Area for future research

1. An intervention study with ER and/or primary care clinic-based asthma education program that addresses the deficiencies observed in this study and then evaluates asthma morbidity outcomes after the intervention program.
2. A qualitative study that identifies doctors' knowledge, attitudes and prescribing behaviour of asthma medications.
3. A quantitative study that explores the economic evaluation of asthma with both direct and indirect costs.
4. A study that evaluate the assessment and management of acute asthma in emergency departments in Palestine.

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Appendices

Appendix 4.1: An official letter to conduct the study in emergency room of Alia hospital and the permission given from the manager of Alia hospital.

بسم الله الرحمن الرحيم

Al-Quds University

Jerusalem

School of Public Health



جامعة القدس

القدس

كلية الصحة العامة

التاريخ: 2005/3/19م

الرقم: ك.ص.ع/ ٢٦ / 2005/3م

حضرة الدكتور إسماعيل بدير المحترم،

مدير مستشفى عاليه الحكومي،

اعتماداً على ما ورد في المراسلة السابقة
بسمه من شأنه إسماعيل بدير وجامعة القدس
فيما يتعلق بعمله في مستشفى عاليه
ما نفاً من شأنه الطلاب المذكورين
دراسة في مستشفى عاليه
وأنه قد تم التوصل إلى اتفاق
مع إدارة المستشفى
بحسب ما ورد في المراسلة السابقة
بحسب ما ورد في المراسلة السابقة
بحسب ما ورد في المراسلة السابقة

تحية طيبة وبعد،،

يقوم الطالب حمزة الزبيدي بإجراء دراسة حول موضوع الربو في غرف الطوارئ في المستشفيات، لقد قمنا
بإجراء الدراسة القبلية في مستشفى رام الله الحكومي، ونود أيضاً القيام بها في مستشفى عاليه الحكومي. تقيس
هذه الدراسة الأسباب التي تؤدي إلى وصول مرض الربو إلى غرف الطوارئ وأيضاً فهم الطرق المناسبة
للقائه من تطور المرض إلى مراحل متقدمة والذي قد يؤدي إلى الوفاة في بعض الحالات.
سيتم استخدام استبيان للمرضى المراجعين، وسيقوم الطالب حمزة الزبيدي بتعبئة استبيانته بنفسه للغرض البحثي.
لذلك، نرجو منكم السماح للطالب حمزة الزبيدي بالعمل في غرف الطوارئ مع المرضى المراجعين من فترة
تيسل إلى حزيران 2005م،

شاكراً لكم حسن تعاونكم،،



Jerusalem Branch/Telefax 02-2799234

Gaza Branch/Telefax 08-2878166,2878177

P.O. box 51000 Jerusalem

فرع القدس / تلفاكس 02-2799234

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ص.ب. 51000 القدس

Appendix 4.2: An explanatory letter about the study with a written informed consent in Arabic language to cover the ethical issue.

بسم الله الرحمن الرحيم

جامعة القدس

كلية الصحة العامة



دراسة الربو (الأزمة) في غرف الطوارئ في

مستشفى رام الله وعالية الحكوميين

حضرة الأخ / ت المحترم / ة:

تحية طيبة و بعد.....

يقوم الباحث من كلية الصحة العامة / جامعة القدس بإجراء بحث علمي كمتطلب لرسالة الماجستير في الصحة العامة. يهدف البحث إلى تحديد العوامل التي تؤدي إلى حضور مرضى الربو (الأزمة) إلى كل من مستشفى رام الله وعالية الحكوميين ، وذلك من أجل وضع برنامج وطني للوقاية و الحد من انتشار هذا المرض. هذا البحث مجاز من لجنة الدراسات والبحث العلمي في جامعة القدس .

يتطلب هذا البحث أن نقوم بتعبئة استبانة لكل مريض ربو (أزمة) يحضر إلى غرفة الطوارئ في مستشفى رام الله وعالية خلال فترة الدراسة. وحيث أن فوائد هذا البحث العلمي تعود عليكم بالدرجة الأولى فإننا نطمح إلى تعاونكم و مشاركتكم معنا ، علماً بأننا نعدكم بالحفاظ على السرية التامة للمعلومات التي سيتم جمعها وعدم استخدامها إلا لأغراض البحث العلمي فقط ، كما و لن يكون هناك أي تأثيرات أو مخاطر عليكم نتيجة للمشاركة في هذا البحث و يمكنكم الانسحاب من المشاركة لحظة ما شئتم.

ولكم جزيل الشكر ،،

الباحث: حمزة محمد الزبدي

المشرف : د. نهى الشريف

اشهد أن الطالب حمزة محمد الزبدي قد وضح لي هدف ، فوائد ومخاطر البحث العلمي الذي يقوم به والمتعلق بمرض الربو (الأزمة) ، وبناءً على ذلك فإنني أوافق طوعاً وبرغبتي الشخصية على المشاركة في هذا البحث العلمي .

المشارك/ة : -----

التوقيع : -----

التاريخ : ----- / ----- / 200 5 م.

Appendix 4.3: The study questionnaire.

File Number:				
<u>Demographic information</u>				
<input type="checkbox"/>	1-Hospital	1. Alia	2. Ramallah	
	2- Date of arrival : -----/-----/----- (Day/Month/Year)			
	3- Time of arrival: -----:----- (Hours: Minutes)			
	4- Patient's name:	first	middle	last
	5- Patient's address:-----			
	6- Home phone:-----		7- Cellular phone:-----	

<input type="checkbox"/>	8- Sex	1. Male	2. Female	
<input type="checkbox"/>	9- Place of residence:	1. City	2. Village	3. Refugee camp
<input type="checkbox"/>	10- Marital status	1. Single	2. Married	
		3. Divorced	4. Widowed	
<input type="checkbox"/>	11- Occupation:-----			
	12- Age ____ Years	13- Height: ____, __m	14- Weight: __ __ __, __Kg	
<input type="checkbox"/>	15- Highest level of education:			
	1. (0-6) years of schooling		2. (7-9) years of schooling	
	3. (10-12) years of schooling		4. >12 years of schooling	

Vital Characteristics	
16- Temperature: __ __, __ (°centigrade)	17- Pulse: __ __ (beats/minute)
18- Respirations: __ __ (breaths/minute)	19- PaO2 (in Air) : __ __
20- SaO2 (in Air): __ __	21- PaCO2 (in air): __ __
22- Peak Expiratory Flow Rate (before salbutamol): __ __ __ __ (L/min)	23- PEF1 (% predicted): ____%
24- Peak Expiratory Flow Rate (2 hrs after salbutamol): __ __ __ __ (L/min)	25- PEF2 (% predicted): ____%

26- Time since asthma attack began:

1. >24 hrs

2. 3-24 hrs

3. <3 hrs

27- Repeat appearance of this patient in this study?

0. No

1. Yes

28- At the time of attending the ER, the patient status was

	Answer code	(1)	(2)	(3)	(4)
	a. Breathless	None	On lying down	On talking	At rest
	b. Wheeze	Only end expiratory	Continuous	Loud	Absent
	c. Can speak in	Sentences	Phrases only	Words only	Impossible
	d. Accessory Muscle use	Not used	Some use	Strenuous use	Paradoxical movement
	e. Mental State	Alert	Agitated	Confused	Comatose

	f. Oxygen:	1. No	2. $\leq 28\%$	3. $>28\%$
	g. Systemic steroid:	1. Oral	2. Intramuscular	3. intravenous

29- <u>Patient's Medications</u>			
	i- Regularly take (0) None (1) Occasionally (2) Most days	ii-Receive in hospital (0) No (1) Yes	iii- Discharged with (0) None (1) Prescription (2) Medication
Oral			
a. Anti-biotics			
b. Anti-histamine			
c. Anti-leukotriene			
d. Cough mixtures			
e. Sedatives			
f. Short acting B-agonist			
g. Steroid			
h. Theophylline			
Inhaled			
i. Anti-cholinergic			
j. Cromoglicate			
k. Short acting B-agonist			
l. Long-acting B-agonist			
m. Steroid			
Parenteral			
n. B2-agonist			
o. magnesium			
p. methylxanthine			
q. Sedatives			
r. Steroid			
Nebulized			
s. Anti-cholinergic			
t. Short acting B-agonist			
Others			
u. Intubation/IPPV			
v. Oxygen			

- ☐ 30- Does the patient take cardiac medications (circle all right answers)
- | | |
|--------------|-----------------------|
| 1. None | 2. Anti-hypertensives |
| 3. Diuretics | 4. Beta-blockers |
- ☐ 31- Does the patient take psychiatric medications? (circle all right answers)
- | | |
|---------------------|--|
| 1. None | 2. Sedatives/ Minor tranquilisers |
| 3. Anti-depressants | 4. Anti-psychotic/ Major tranquilisers |
- ☐ 32- How many courses of oral steroid has the patient taken in the past year? -----
- ☐ 33- Does the patient use steroids?
- | | |
|-------------------------------|-------------------------------|
| 1. None | 2. Beclomethasone 500mcg/day |
| 3. Beclomethasone 1000mcg/day | 4. Beclomethasone 2000mcg/day |

- ☐ 34- Does the patient use short acting B2-agonist?
1. None
 2. < 1 cannister/ month
 3. \geq 1 cannister/ month

- ☐ 35- Are you currently using any remedies, other than conventional medicines, to help your asthma? (not nasal symptoms)
0. No
 1. Yes

36- Over the 3 months before this attack began, how often did your asthma:					
	1. Every or almost every	2. More than once a week	3. At least twice a month	4. Less than twice a month	5. Not at all
a) Wake you up (night)?					
b) Give you trouble breathing (day)?					
c) Prevent you working/carrying out usual activities (day)?					

37-	0. No	1. Yes
(a) Have you ever had eczema and/or Rhinitis?		
(b) Have you ever had a skin prick test "allergy test" before?		
(c) Have you ever had a lung function test before?		
(d) Do you have a spirometer or a peak flow monitor at home?		
(e) Have you ever been diagnosed with asthma?		
(f) Do you suffer symptoms of asthma only during a particular season?		
(g) Do you suffer symptoms of asthma at any time of the year?		

- ☐ 38- How old were you when you first diagnosed with asthma? _____ years

- ☐ 39- Where did you have first been diagnosed?
1. At the clinic
 2. At the hospital clinic
 3. At the hospital ER

- ☐ 40- By whom have you been diagnosed?
1. General doctor
 2. Specialized doctor

- ☐ 41- Has this patient visited an ER room before with asthma?
0. No
 1. YES, less than a year ago
 2. YES, more than a year ago

- ☐ 42- How many times have you attended the ER in the past year? _____ times

- ☐ 43- Has this patient ever been admitted to hospital with asthma?
0. No
 1. YES, less than a year ago
 2. YES, more than a year ago

- ☐ 44- How many times have you been admitted the hospital with asthma in the past year? _____ times

<input type="checkbox"/>	g. Would you like to have more information on asthma disease?		
<input type="checkbox"/>	h. Would you like to have more information on asthma medications/devices?		
<input type="checkbox"/>	i. Did the patient receive a MANAGEMENT PLAN		
<input type="checkbox"/>	j. Did patient receive training in inhaler use?		
<input type="checkbox"/>	k. Was the patient's usual carer sent a letter?		
<input type="checkbox"/>	l. Does the patient take all their medicines?		

☐ 56- How do you find the inhalers/devices are to use?

1. Easy

2. Difficult

☐ 57- How could you describe your relationship with your doctor at the clinic?

1. Good

2. Poor

3. No regular doctor

<input type="checkbox"/>	58- Why do you attend the ER?	0. No	1. Yes
<input type="checkbox"/>	a. Respiratory infection		
<input type="checkbox"/>	b. Shortness of breath		
<input type="checkbox"/>	c. Less medication cost		
<input type="checkbox"/>	d. Misuse of asthma medication		
<input type="checkbox"/>	e. Worried about asthma symptoms		
<input type="checkbox"/>	f. others		
<input type="checkbox"/>	If yes, specify _____		

☐ 59- Why do not you use all your medication?

1. Don't need them

2. Can't afford them

3. Can't obtain them

4. Don't want them

60- Your regular practitioner name and address

61- Patient: 1. Discharged 2. Admitted

62- Patient Discharge: 1. Alive 2. Dead

63- Date of discharge: -----/-----/----- (Day/Month/Year)

64- Time of discharge: ----- :----- (Hours: Minutes)