

Full Length Research Paper

Clinical profiles, treatment modalities and the cost of the patients referring to a university emergency department with asthma attack in Turkey

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The data about admission rates of asthma attack (AA) to emergency department (ED) is very limited and to the best of our knowledge this is the first study about the cost of AA referring to the ED in Turkey. Sixty-five adult patients (65 females) who presented to the ED of Hacettepe University School of Medicine with AA for six months of duration in winter and spring were included in this study. The means and standard deviations of numerical values were calculated. Mann-Whitney U test, Kruskal-Wallis test and chi-square tests were used for comparisons of grouped data. $P < 0.05$ was accepted as statistically significant in all tests. The mean age of the patients was 54.9 ± 14.4 and they presented most commonly in January (32.3%) while least in June (3.1%). Thirty two (49.2%) patients had moderate, 23 (35.4%) had mild and 10 (15.4%) had severe attacks. The mean cost of patients including examination, tests and drugs was 260 Turkish Lira (TL) - US\$ 169.3. As a result, the patients with AA seem to stay for a long time in ED with a cost which is high for our country, but lower compared to that of other countries.

Key words: Asthma attack, cost, emergency department referral, Turkey.

INTRODUCTION

Asthma attack (AA) is a frequently faced problem in the emergency department (ED). Patients can be investigated, treated and discharged without a need for hospitalization depending on the degree of the attack. Although there are more available data about asthma pathophysiology in addition to developments in treatment modalities, the rate of ED presentations with AA has increased. The number of patients presented to ED in USA in 1995 was 1.9 million. Between years 1992-1999 presentation to ED with AA has increased from 5.8 to 7.4 per 1000 asthma patients in USA (Lendhardt et al., 2003). This rise in admission rate was explained by the

increasing prevalence of asthma. The data about admission rates of AA to ED is very limited and to the best of our knowledge this is the first study about the cost of AA referring to the ED in Turkey. In this study, we aimed to determine the clinical features of patients admitted to ED with AA, the causes of the attacks, treatment methods, length of stay in ED and the cost of the attack; and to increase the amount of the data on this issue.

METHODS

Patients admitted to Hacettepe University, School of Medicine Adult Hospital ED with AA between January 1 - June 30, are evaluated prospectively. Sixty-five patients over the age of 18 with prior diagnosis of asthma, using asthma medications and having findings of asthma on physical examination are included in the study. All of

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the patients accepting to participate this study signed a written consent form and the doctor on-call conducted the interviews and filled-in a questionnaire form for each patient. Approval was obtained from the ethical committee of the Hacettepe University. The following data have been obtained for each patient: age, gender, educational status, occupation, social security institution, accompanying diseases, asthma medications, prior admissions to ED and/or hospitalizations and/or intubations due to AA.

The degree (mild, moderate, severe, and life-threatening) and the possible cause of the attack is determined by the physician on-call depending on the physical examination and diagnostic tests (Expert Panel Report 2,1997). Complete blood count is performed for patients whose cause of attack is thought to be infection, and presence of leukocytosis is determined. The medications given to patients are recorded as nasal oxygen, intravenous (iv) and/or inhaled steroids, inhaled and/or nebulized β_2 mimetics, antibiotics, and theophylline derivatives. Admission times to ED are divided into two 12-h periods as 08:00-20:00 (daytime) and 20:00-08:00 (night). Length of stay of patients in ED is calculated and mean length of stay is given in hours. During statistical analysis, the data of a patient whose length of stay in ED was 15 days is excluded since her long stay was due to her accompanying diseases (coronary artery disease, diabetes mellitus).

Cost of admission to ED is calculated separately as physical examination, medications, tests, and total; and given as Turkish Lira (TL) and \$US. The medication costs of 5 patients have not been taken into account since 2 of them obtained their medication from another health center, and medication costs of another 2 patients were not recorded in cashier by mistake, and account of the above mentioned long staying patient was too much higher than the mean. Since there is no stable value for \$US in our country, arithmetical average rate of exchange of \$US for six month period was taken and this value was used in cost calculations ($1 \$US = 1,532 TL$).

Statistical analysis

SPSS for Windows 11.5 statistical programme was used for data analysis. The means and standard deviations of numerical values were calculated. Mann-Whitney U test, Kruskal-Wallis test and chi-square tests were used for comparisons of grouped data. $P < 0.05$ was accepted as statistically significant in all tests.

RESULTS

The mean age \pm SD of the patients was 54.9 ± 14.4 . Other demographic data, educational status, occupations, referral rates according to months, the accompanying diseases of the patients are given in Table 1. Investigation of the relationship between age and accompanying diseases to asthma showed there was significant relation between increasing age, and asthma-hypertension (HT) and asthma-chronic heart failure (CHF) coexistence. ($p < 0.05$) (Table 1). Referral rate to ED with AA was 69.2% in daytime and 30.8 % at night. The patients pre-sented most commonly in January (32.3%) while at least in June (3.1%) (Table 1). Mean time interval between the initiation of the AA and presentation to ED was 23.1 ± 26.4 h, mean length of stay in ED was 13.7 ± 14.9 h. It was determined that 35 patients have been admitted to ED with AA within the last year, where 17 of them were

hospitalized, and 6 were intubated and required mechanical ventilation.

The patients have been using short acting inhaled β_2 agonist (47.7%), inhaled steroid (41.5%), long-acting β_2 agonist (32.3%), inhaled combined steroid and long-acting β_2 agonist (24.6%), inhaled ipratropium bromide (18.5%), inhaled combined β_2 agonist and anticholinergic (23.1%), leukotriene receptor antagonist (1.5%), theophylline derivatives (15.4%), anti-tussive solutions (1.5%), mucolytics (4.6%), and expectorants (1.5%) as asthma medication on referral. Among 26 patients using inhaled steroids 14 of them (53.8%) referred to ED with AA within the last year. The degree of the attacks were mild in 35.4%, moderate in 49.2%, severe in 13.9%. and life-threatening in 1.5%. The mean ages of the patients presented with mild, moderate and severe attacks were 49.0 ± 12.2 , 55.8 ± 14.3 and 62.4 ± 16.3 , respectively. Comparison of the degree of the AA and length of stay in ED using Kruskal-Wallis test showed that length of stay of patients with severe degree of attack was significantly longer ($\chi^2 = 6.781$ $p < 0.05$). Causes of the attacks were infections (66.2%), irregular use of medications (64.6%), stress (3.1%), and exposure to cleaning agents (4.6%). There was no statistically significant relationship between educational status and irregular use of medications ($p = 0.778$).

All patients received nasal oxygen on admission. Other treatment modalities consisted of nebulised and inhaled short acting β_2 -agonist (90.8 and 12.3%, respectively); inhaled and intravenous steroid (16.9 and 63.1%, respectively) and intravenous theophylline derivatives (4.6%). One (1.5%) patient was intubated and mechanical ventilation was applied in the intensive care unit of our ED. Antibiotics were added to treatments of 27 (41.5%) patients in whom the cause of attack was thought to be infection. Overall mean cost of admission to ED was 260 TL, 169.34 \$US (Table 2). There was a positive weak relationship between the age and the cost by Spearman's rho analysis ($r = 0.345$, $p = 0.006$). There was no statistically significant relationship between the degree of the attack and the cost ($p = 0.73$).

DISCUSSION

During the course of the study between January 1 - June 30, 65 patients were admitted to Hacettepe University Hospital Adult ED with the diagnosis of AA most commonly in January, least in June. Admission hours to ED were most common in daytime. A prospective 1-year study has also displayed a seasonal difference and most admissions were recorded in March, least being in July. In the same study, the most common hours of admission to ED were determined as 10.00 - 11.00 am (Rossi et al.,1991). The study performed in Uruguay has shown that admission rates are higher in autumn between March

Table 1. Other demographic data, educational status, occupations, referral rates according to months, the accompanying diseases of the patients presenting with AA to ED.

N = 65	N (%)
Females	48 (73.8)
Educational status	
Elementary school	29 (44.6)
High school	10 (15,4)
College	7 (10.8)
University	4 (8.2)
Illiterate	13 (20.0)
Unknown	2 (1.0)
Occupations	
Housewife	39 (60.0)
Retired	6 (9.2)
Official	5 (7.7)
Teacher	4 (6.2)
Other	11 (16.9)
Referral rates to ER with AA according to months	
January	21 (32.3)
February	9 (13.9)
March	14 (21.5)
April	14 (21.5)
May	5 (7.7)
June	2 (3.1)
Accompanying diseases (n = 36)	
Hypertension	19 (52.8)
Diabetes mellitus	9 (25.0)
Congestive heart failure	5 (13.9)
Coronary heart disease	3 (8.3)

Table 2. The mean cost of patients presenting to ER with AA.

Cost	\$US(min)	\$US(mean)	\$US(max)
Physical examination	4.23	4.23	4.23
Tests	6.64	130.59	641.19
Medication	1.55	36.74	234.46
Total	12,66	169.34	770.46

and may, whereas lower in summer between december and february (the seasons are inversed in Uruguay compared to us since it is located in southern hemisphere) (Rodrigoc and Rodrigo, 2000). Different results were obtained in our study compared to these two studies and this may have a relationship with the cause of attacks. Infections, being the most common cause of attack, may tend to increase with decreasing temperature in january

due to living in closed areas with crowd more.

The mean length of stay of patients with AA in ED was previously reported to be 212 min in January 1994, 202 min in September 1994, 187 min in February 1995, and 159 min in June 1995; which disclosed that there was a 58 min decrease in the lentgh of stay in ED between January 1994 and June 1995 (Edmond et al.,1999). In another study including 51 emergency services the mean

length of stay of patients with AA in ED was 3.1 h in 1996 - 1997, and 3.2 h in 2000 (Lendhardt et al., 2000). Length of stay in ED in our study is much longer compared to these studies. This may have several reasons, including the treatment of patients mostly being performed by 6th year medical students under the supervision of a physician on-call and ED residents instead of experienced medical persons, which may cause delays in the initiation of the treatment in non-life-threatening cases in our university. Another reason might be that ED residents cannot find time to reevaluate their patients for 1 or 2 h due to unnecessary and excessive crowd. Infections were the most common cause for the attack in our study with a rate of 66.2%. This may have had an influence on the treatment of the attack and the length of stay in ED. In addition, the laboratory tests ordered according to the accompanying diseases and the degree of the attack may take time (minimum two hours); and consultations from other departments which can be concluded in a longer time might have influenced the length of stay.

A study showed that patients with university education had better compliance to their diseases and treatments compared to ones with high school graduations (Scherer and Bruce, 2001). There was no statistically significant relationship between the level of education and irregular use of medications in our study; and the most common co-existing disorder was Hypertension (HT) (29.2%). Similar to ours, another study including 328 patients also reported that the most common co-existing disorder with asthma was HT (10.2%) (Standford et al., 1999). In our opinion there might be two explanations for this: Occurrence of HT with asthma has a high rate; to show this with more reliable data, the number of the patient group should be increased and should be compared with a control group which have another concurrent chronic disorder. The mean age of patients in both studies is above 50 and as shown in our study the probability of having an accompanying disorder with asthma increases with age.

The mean age of patients with more severe attacks (62.4 ± 16.3) was higher than the patients with milder attacks (49 ± 12.2) in our study. However, in another study performed in New Zealand the rate of life-threatening asthma attack in patients below 25 years was reported to be as high as 45% (Richards et al., 1993). In contrast, another study also performed in New Zealand showed that the risk of developing life-threatening asthma attacks increased with increasing age (Kolbe et al., 2000). Increase in accompanying disorders with age may cause a decrease in patients' compliance to their diseases and medications leading to more frequent and more severe attacks. Another reason could be that increased susceptibility to infections due to suppression of the immune system with age may cause an increased risk for infection-related asthma attacks. In

our study, the most commonly used medications following oxygen treatment in decreasing frequency were nebulized β_2 agonist (90.8%); iv steroids (63.1%), and inhaled steroids (16.9%), and it was observed that iv steroid was given at the same time with nebulized β_2 agonist. Adding iv steroid to our patients' medications before waiting for the result of the β_2 agonist treatment show that treatment is not in accordance with ED treatment guidelines. In a study performed with ED doctors working as academicians and the ones practising privately, iv route was preferred for steroid treatment among 65% of all doctors, 57% of academicians and 78% of private doctors (Thomas et al., 2001). A retrospective study showed iv steroid was administered to 49% of adult patients in ED (Milks et al., 1999). On the other hand, a meta-analysis revealed that administration of parenteral steroids to patients at the time they presented to ED with AA had no influence on improvement of airway obstruction or rate of hospitalization (Rodrigo and Rodrigo, 2000). It was observed that measurement of pulmonary functions 3 hours after the administration of high dose inhaled steroids caused a significant improvement compared to placebo. Other studies showed that iv or oral forms of steroids in AA had the same influence (Barnes et al., 1998; Afifalo et al., 1999; Rodrigo and Rodrigo, 1998; Mc Fadden, 1998).

In a retrospective comparative study, use of antibiotics for AA in England had increased from 32 to 40% between years 1991 - 1992 (Neville et al., 1997). This result is close to the rate of antibiotic use in our study (41.5%). In addition, although infection is recorded as the cause of attack in 43 (66.2%) patients only 27 (41.5%) of patients received antibiotic treatment. This difference could be due to diagnosis of viral infections in the remaining 16 patients. The annual total cost of asthma in England was 322 - 686 million sterlins in 1990 (barnes et al., 1996). The total cost of asthma in ED and hospital in USA was 1.9 billion USA dollars at the same time period (Gottlieb et al., 1995). Total cost of asthma in Canada in 1990 was 504 - 648 million Canada dollars (Krahn et al., 1996). Only one study, mentioned that, the annual cost of asthma in Turkey could be estimated to be around 1.9 billion USA dollars (Çelik et al., 2004).

In our study, overall mean cost of patients presented to ED with AA was calculated as 260 TL - 169.3 \$US, mean cost of laboratory tests was 200 TL - 130.6 \$US, and mean cost of medications was 56 TL - 36.7 \$US. Stanford, et al recorded 3223 patients above age of 18 years presented to 27 EDs with AA between 1 October 1996 - 30 September 1997. Two thousand one hundred forty nine of these patients were treated only in ED and the mean cost of them were calculated as 234.48 \$US; 53.1% due to equipment and physician fee and 5.5% due to medications (Stanford et al., 1999). High cost of laboratory tests in our study might be the result of

Inappropriate use of expensive tests in addition to tests required for concomitant diseases. Besides this, examination fee in ED is standard and far less than laboratory tests, and care from physicians and nurses are not extra charged, so overall cost is cheaper in our country compared to USA. In the above mentioned study of Stanford, et al, it was determined that cost of asthma disease increased with age ($p < 0.001$), mean cost above 45 years was reported as 294.08 ± 10.5 \$US whereas it was 210.04 ± 5.0 \$US below 45 years (Stanford et al., 1999). In our study there was no statistically significant relationship between age and cost. May be this can be explained by the small number of patients. The weakness of this study is that the study period is limited to 6 months and study is single centered. It could be more appropriate to perform studies concerning this subject at least for 1 year in order to include all seasons, and multi-centered to obtain more accurate statistical results.

In conclusion, most of the patients presenting to ED of a third level hospital with AA in our country are middle aged women with low educational status, and the most common cause is infection. Short-acting β_2 treatment, which is one of the most important steps in the attack treatment, is preferred to be used in nebulized form, and steroid is used at high rates similar with the literature where iv route is most preferred route. When compared with similar studies performed in other countries the length of stay in ED is longer and the cost is lower. Rate of admission is greater in winter months and daytime. Patients mostly presented with moderate degree of attack. The most common accompanying disorder is hypertension. Almost half of the patients were receiving appropriate asthma treatment on presentation according to asthma management guidelines. Approach to AA in ED of a university hospital localized in the capital of Turkey does not seem to be in accordance with the treatment guidelines similar to the situation as in some developed countries (Thomas et al., 2001; Milks et al., 1999; Neville et al., 1997).

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