A model to predict short-time asthma morbidity: what could be the explanatory factors?

Minoo Habibi 1, Bersabeh Boroumand 2, Haleh Rezayee 3, Jamshid Salamzadeh 2*

1 Shaheed Labbafinezhad Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
2 Clinical Pharmacy Department, School of Pharmacy, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
3 Clinical Pharmacy Department, School of Pharmacy, Tabriz University of Medical Sciences, Tabriz, Iran

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ABSTRACT

Background: There is an increase in the worldwide prevalence, morbidity and mortality of asthma. Therefore, study of the possible factors related to the burden of this disorder could help the health providers to introduce effective initiatives and reduce adverse consequences due to this condition. This study was designed to investigate any relationship between asthma morbidity with inhaler technique and other probable explanatory factors in asthmatic patients.

Methods: An observational, cross-sectional study was designed in which asthmatic patients referring to the outpatient respiratory clinic of the Shaheed Labbafinezhad hospital were entered the study using a non-probability sampling method. Their demographic, socio-economic, medical and medication history, inhaler technique (using a 10-step check list), as well as short-term morbidity index (in the past 4 weeks using the Jone’s morbidity questionnaire) were determined and recorded in organized data collection forms. These data were entered the Excel and SPSS (version 17.0) worksheets and analyzed using appropriate statistical tests. A step-by-step analysis method was used in order to find out any relationship between possible explanatory factors and the morbidity index of the patients.

Results: 199 adult asthmatic patients (94 male and 105 female) with mean ± SD age of 54.29 ± 15.52 years enrolled the study. In the first step of data analysis only 5 factors out of 20 explanatory factors were eligible to be included in the multivariate analysis leading to the final predictive model. In the multivariate regression analysis, 2 out of 5 factors could remain in the final model, which were “history of systemic steroid usage” and “age” (p=0.007, r=0.32). So that, patients with a positive history of systemic steroid use and those with a younger age had higher asthma morbidity rate.

Conclusion: The observed positive relationship between history of systemic steroid usage and asthma morbidity remarks the importance of asthma control in the primary care level and highlights its role on patient’s quality of life. Possible reasons leading to a higher morbidity rate in younger asthmatic patients should be evaluated in the future studies.

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Introduction

Global prevalence, morbidity, mortality and economic burden associated with asthma are growing in many countries (1-3). Literature review shows that morbidity of asthmatic patients not only is affected by direct patient care, but could also be associated with different explanatory factors such as low socio-economic status that may cause a poor primary health-care access; inappropriate environmental conditions consisting of irritant gases, chemicals and allergen exposures; lack of attention to the inflammatory nature of the illness which follows an
Methods
This is an observational, cross-sectional study to determine the probable factors related to the morbidity in Iranian asthmatics living in the metropolitan city of Tehran. Study setting was the Shaheed Labbafinezhad teaching hospital affiliated to the Shahid Beheshti University of Medical Sciences, and patients referred for routine follow-up visit were included in the study, during the Spring and Autumn of the year 2009. Study population consisted of adult (age over 15 years) known asthmatic patients, from both genders who referred to the respiratory clinic for their routine follow-up and drug therapy monitoring. A non-probability sampling method was used. Patients were receiving drug therapy for their asthma and their drug regimen included at least one metered dose inhaler (MDI).

Patients’ demographic information and supplementary data which could be possibly related to asthma morbidity were collected by a questionnaire. Table 1 shows 20 explanatory factors used in this study. Their possible relationship with asthma morbidity was investigated. Patients’ morbidity was assessed using the Jone’s questionnaire and their metered dose inhaler techniques were evaluated applying a 10-step check list (Table 2–MDI technique check list).

Short-term morbidity assessment method
The Jone’s morbidity questionnaire was applied. It contains three questions as below:

During the past four weeks, have you:
1. Been in a wheezy or asthmatic condition at least once a week?
2. Had time off work or school because of your asthma?
3. Suffered from attacks of wheezing during the nights?

If answers to all 3 questions are negative, the patient’s morbidity is ranked as low. One positive answer to any of the questions is considered as an intermediate morbidity level and positive answers to two or all of the questions present a high rate of morbidity.

Inhaler technique determination
Without giving any instruction on how to use an inhaler correctly, the inhaler technique of each patient was evaluated. Patients were given a MDI containing salbutamol and asked for inhaling two puffs of the drug to demonstrate their inhaler technique. Their performance was assessed with a 10-step check list (Table 2). One negative mark was assigned for each of the steps missed or performed inappropriately. A patient with score 10, thus, had displayed the most correct inhaler technique. Patients with an inhaler technique score less than 5 and patients with a score higher than 8 were classified as patients with poor and good inhaler techniques, respectively. Scores from 5 to 8 considered as an intermediate inhaler technique.

Statistical analysis
All of the collected data was entered into the worksheets of the Excel and SPSS (version 11.0) software. In order to identify variables eligible to be
included in the multi-variate linear regression analysis, firstly appropriate preliminary analyses including rank correlation analysis, the Mann-Whitney and Kruskal-Wallis tests were performed to find out any probable relationship between morbidity and the explanatory factors. In these analyses, factors with a p<0.2 were considered qualified to enter the multivariate analysis (13). Possible interactions between eligible variables were studied and no significant interaction was found. Then, in order to build the final model, relationships between these eligible explanatory factors and morbidity were assessed using a multivariate linear regression analysis. P value less than 0.05 was considered as significance level.

**Results**

Study sample consisted of 199 adult asthmatic patients (94 male and 105 female) with Mean ± SD age of 54.29 ± 15.52 years.

Preliminary analysis revealed that only 5 of the 20 possible explanatory factors were eligible (p<0.2) to enter the multivariate regression analysis (Table 2). These were
history of systemic steroid usage ($p = 0.001$), age ($p = 0.02$), smoking ($p = 0.036$), easy access to asthma drugs ($p = 0.101$) and history of allergy ($p = 0.147$). Then, these 5 parameters were entered in a multivariate linear regression analysis to build the final model. A stepwise-forward method was used ($p \leq 0.05$).

Two factors of “history of systemic steroid usage” and “age” remained in the final model ($p=0.007$, $r=0.32$) (equation 1):

$$\text{Morbidity level} = 1.93 + \text{age}(-1.18 \times 10^{-2}) + (\text{steroid usage} \times 0.39) \quad \text{equation 1}.$$  

A positive relationship was observed between the history of systemic steroid usage ($\text{yes}=1$, $\text{no}=0$) in the past 4 weeks and asthma morbidity rate. In other words, patients with a positive history of systemic steroid use in the past 4 weeks had experienced higher rates of morbidity. Also, an inverse relationship was found between age and asthma morbidity rate, so that younger asthmatic patients had a higher morbidity due to asthma compared to older patients.

Discussion

From twenty independent variables investigated in this study, only two factors (age and history of steroid usage in the past four weeks) were proved to be significantly related to the asthma morbidity determined by the Jone’s morbidity index.

Relationship between age and morbidity shows that an increase in patient’s age, could lead to reduction in the asthma morbidity; whereas, the history of systemic steroid usage in the past four weeks had direct relationship with morbidity rate.

Previous reports explaining an inverse relationship between age and morbidity are very rare. Controversies on the relationship between age and asthma morbidity remains to be clarified by further studies. While, a study on asthmatic patients carried out in the United States, during the years 1997-2006 had revealed a result in compliance with our finding (14), however a more recently published report in 2013, covering the years 1988-2006, shows that older adults with asthma have a considerable burden of morbidity and increased mortality (15). Those findings which confirms our results, elucidate that decrease in asthma morbidity in older patients may be due to their capability to adapt with their disease and medication use. This may also be confirmed with a lesser compliance with therapeutic regimen in younger asthmatic patients (14, 16, 17).

The significant association between prednisolone rescue courses and asthma morbidity has previously been reported by a number of other studies. Studies on asthmatic patients, found that history of systemic steroid use was associated with hospitalization risk. It has been reported that asthmatics with a history of prednisolone rescue courses could have a higher risk of severe life-threatening or near-fatal asthma attacks (18-19). Perry et al. also showed that overuse of rescue medications and underuses of inhaled corticosteroids were prevalent amongst a rural population even though they were highly insured and had frequent health care use (20).

Yukse et al. showed that asthmatic patients using corticosteroids are in a higher risk of hospital admission (21). Salamzadeh et al. have also revealed that patients with a history of oral steroid rescue course could have a higher rate of practice appointments (22). In addition, they found that patients with a positive history of prednisolone courses had a poor asthma prescribing quality indicated by the ratio of preventers to bronchodilators. In a study in the UK, Moudgil et al. find a direct relationship between forced expiratory volume in the 1st second (FEV1), which was associated with increased GP attendance, and the number of prescriptions for rescue oral steroids (23).

Since a history of recent steroid usage could be a sign of poor asthma control (24), then the results obtained in this study, confirming an increased rate of morbidity in systemic steroid users seems reasonable.

In conclusion, the observed relationship between history of systemic steroid usage and asthma morbidity remarks the importance of asthma control in the primary care level and highlights its role on patient’s quality of life. Possible reasons leading to a higher morbidity rate in younger asthmatic patients should be evaluated in the future studies. Physiologic as well as psychosocial needs of this age group should also be considered as a contributory factor for asthma morbidity.

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