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Factors Associated with Asthma Control

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Abstract	Original Research Article

The objective of treating asthmatic patients is to obtain optimal control of the disease. Knowledge of the predictive factors of non-control of asthma, especially modifiable factors, will allow targeted action to improve control of the disease. The objective of the study was to assess asthma control using the Asthma Control Test (ACT) and to identify sociodemographic, environmental and clinical factors associated with asthma uncontrolled. ***Methods:*** Retrospective observational study carried out at the pulmonology department in Casablanca, covering the files of asthmatic patients. ***Results:*** 384 patients were included in the study, 70% were women, the average age was 38 years (±18.5). The prevalence of uncontrolled asthma at the time of the study was 48%. Poor compliance with treatment (p=0.001), poor technique for using the devices by the patient (p=0.007), smoking (p=0.013), obesity (p=0.036), lack of activity physical condition (p=0.019), the presence of allergic rhinitis (p=0.03) and low educational level (p=0.017) were the main factors associated with non-control of asthma. ***Conclusion:*** The present study identified a high prevalence of uncontrolled asthma and factors that may contribute to poor asthma control. Therapeutic education and management of comorbidities are the cornerstones of asthma management.
Keywords: Asthma, education, control, treatment compliance, risk factors.

INTRODUCTION

Asthma is a heterogeneous disease characterized by chronic inflammation of the airways. It is estimated that 315 million people have asthma worldwide [1].

Asthma is a public health problem in all countries, regardless of their level of development. In Morocco, a survey conducted in 2009 showed that 3.89% of the Moroccan population had asthma, which represents more than 1.2 million people [2]. It has a negative impact on patients, their families, and the community, leading to absenteeism from work and school, affecting quality of life, and constituting a frequent cause of consultations and hospitalizations in emergency services [3, 4].

According to guidelines, the goal of asthma control is to prevent acute exacerbations, minimize asthma symptoms (including nighttime symptoms), and reduce the use of bronchodilators and activity limitations. Many factors can influence the level of asthma control, such as age, gender, presence of comorbidities, psychological factors, socioeconomic status, smoking, treatment adherence, and level of education [5-7].

The majority of asthmatic patients remain uncontrolled, resulting in a significant burden not only in terms of quality of life but also in terms of healthcare costs. In Europe, the annual cost per adult asthmatic patient varies between 509 euros for a controlled asthmatic patient and 2281 euros for an uncontrolled asthmatic patient [8].

The aim of this study is to identify socio-demographic, environmental, and clinical factors associated with uncontrolled asthma.

MATERIALS AND METHODS

We conducted a retrospective observational study on 384 medical records of asthmatic patients followed in allergy consultations at the CHU Ibn Rochd de Casablanca from January 2017 to January 2024.

We included medical records of patients aged over 18 years with confirmed asthma for at least 12 months and under background treatment for at least 3 months. The diagnosis of asthma was made according to GINA criteria. All patients had undergone a

comprehensive assessment, including spirometry, chest imaging, skin tests, vitamin D levels, and complete blood count.

We excluded medical records of patients with doubts about the diagnosis of asthma, incomplete records, and records of patients with other chronic respiratory diseases (diffuse interstitial lung disease, bronchiectasis, sequelae of tuberculosis, lung cancer, etc.).

Asthma control was assessed using the Asthma Control Test (ACT). Asthma was considered controlled if ACT was equal to or greater than 20.

We developed an exploitation form to collect socio-demographic data, educational level, lifestyle, occupation, comorbidities, toxic habits, asthma history (duration, severity), triggers, environmental factors (pets, carpets, air conditioners, etc.), nutritional status (BMI), respiratory functional data, skin test results, background treatment (drug, dosage, duration), and evaluation of device usage technique.

Treatment adherence was assessed using the Morisky questionnaire (4 items). Quality of life was assessed using the George's Respiratory Questionnaire.

Sample Size
Based on the proportion of patients with uncontrolled asthma (50%) according to literature data, the calculated sample size was 384 participants. This formula was used to determine the sample size: $(1.96^2 \times 0.5(1-0.5))/(0.05)^2$

Statistical Analysis
Data were collected and analyzed using Jamovi version 1.6.7.0 Setup software.

Descriptive statistics were described with percentages for qualitative variables, mean (± standard deviation) for normally distributed quantitative variables, and median (interquartile range) for variables with skewed distribution.

Pearson's chi-square test or Fisher's exact test was used to test associations between each independent variable and asthma control. Logistic regression was used to identify factors associated with uncontrolled asthma and to calculate the Odds ratio (OR) and 95% confidence interval (CI). Univariate analysis was performed for each variable, and statistically significant results ($p < 0.05$) were then included in the multivariate model.

RESULTS
A total of 384 medical records of adult patients with confirmed asthma were collected. The mean age was 38 years (±18.5) with a predominance of females at 70%. More than half of the participants (58%) were married. About half of the patients had secondary education, 39% had no education, and only 12% had a university degree. The majority of participants were from rural areas (67%). Most participants were either employees or workers (59.1%), and only 37.8% had health insurance.

The majority of participants (85%) had asthma symptoms for more than 5 years, with a median of 9 years (IQR = 4-18), and 65% had asthma since childhood. Forty-three percent of patients had a family history of atopy, and 78% had personal atopy.

Eight percent of patients were smokers. Fifty-two percent of participants had a comorbidity, mainly hypertension (26%), gastroesophageal reflux (22%), and 4% had obstructive sleep apnea.

Respiratory functional exploration performed in all patients showed reversible obstructive ventilatory impairment after salbutamol test in 34% of cases.

Therapeutically, there was a clear difference according to asthma control. The use of inhaled corticosteroids alone was observed in 16% of patients with uncontrolled asthma vs. 38% of patients with controlled asthma.

Poor adherence was observed in 68% of patients (non-compliance with prescription and/or treatment duration). Forty-eight percent of patients with uncontrolled asthma forgot to take their background treatment compared to 26.6% of those with controlled asthma ($p < 0.001$). Treatment discontinuation when patients felt better was reported by 56% of patients with uncontrolled asthma compared to 18% with controlled asthma ($p < 0.001$).

Inappropriate inhaler use was documented in 52% of patients. 290 patients received formal education on asthma and asthma treatment, 68% received therapeutic education from physicians, and in 32%, education was provided by pharmacists.

About one-third (38%) of asthmatic patients reported a history of emergency department visits.

Based on the ACT score, uncontrolled asthma was observed in 48% of patients, with a mean ACT score of 12 (± 3) in uncontrolled asthma patients vs. 22 (± 1) in controlled asthmatic patients.

Among the variables studied, 20 were considered in the multivariate analysis.

Treatment non-adherence (p=0.001), poor patient device usage technique (p=0.007), smoking (p=0.013), obesity (p=0.036), lack of physical activity (p=0.019), presence of allergic rhinitis (p=0.03), and low

level of education (p=0.017) were the main factors associated with asthma non-control.

DISCUSSION

This study showed that 48% of patients had uncontrolled asthma according to the ACT questionnaire evaluation. Similar results have been reported in the literature, indicating a suboptimal control level. A study conducted in Europe involving 3123 patients showed that 38.5% of subjects had uncontrolled asthma. Higher percentages of uncontrolled asthma were observed in Africa (71.3%) and the United States (71%) [9, 10].

Our results on asthma control obtained by ACT are consistent with GINA classification. However, patients tend to overestimate their control level if asked to respond about their health status (item 5).

In terms of demographic factors, our study shows that uncontrolled asthma was more frequent in the elderly and in women. The majority of elderly subjects has other comorbidities and is therefore polymedicated, which negatively impacts disease management, and often these patients have more difficulties in executing device usage techniques [11]. Kämpe et al. reported that uncontrolled asthma was more common in patients over 65 years old [12].

Many studies have shown that asthma in women is associated with poor disease control. Women perceive asthma differently from men, reporting higher levels of symptoms and more limitations in daily life with a less effective response to corticosteroid treatments [13, 14].

Regarding socio-economic determinants, we found in our study that low socio-economic status and low education level are associated with poor asthma control.

Education level significantly influences asthma control, probably due to various factors such as easier access to information and better handling of inhalation devices. Ilmarinen et al. showed that primary education was associated with uncontrolled asthma in daily users of inhaled corticosteroids (OR 1.92, 95% CI 1.15-3.20) [15].

The majority of our patients had a low monthly income, which may influence treatment adherence and thus asthma control. This is consistent with literature data [16].

Obesity is one of the comorbidities associated with uncontrolled asthma. It is a risk factor for asthma development and a severity factor for asthmatic disease with a reduction in response to corticosteroids [17]. Weight loss has been shown to improve respiratory function in obese individuals and disease control scores. In a study of 382 adults, patients with a high BMI had poor control of asthmatic disease regardless of their age, sex, and asthma severity; with an odds ratio of 2.99 (95% CI 1.14-7.08) [18].

Studies have shown that allergic rhinitis influences asthma control, which our study confirmed. Bousquet *et al.*, in a multivariate analysis found that patients with both asthma and allergic rhinitis had more acute exacerbations (OR 1.35, 95% CI: 1.03-1.77) with more emergency department visits (OR 2.35, 95% CI: 1.12-4.80) [19]. Therefore, it is important to manage allergic rhinitis in all asthmatic patients for better asthma control.

Smoking has a negative impact on asthma control, characterized by a reduced response to inhaled corticosteroids resulting from alteration of inflammatory cell phenotypes in the airways (an increase in the number of neutrophils or a reduction in the number of eosinophils), changes in glucocorticoid receptors (e.g., overexpression of the β glucocorticoid receptor), and increased activation of pro-inflammatory transcription factors [20, 21].

Establishing a background treatment with inhaled corticosteroids plays an important role in asthma control [22]. However, patients with severe asthma may present resistance to corticosteroids [23], hence the interest in developing other therapies, especially immunotherapy, which has well-defined indications in the management of asthmatic disease.

CONCLUSIONS

In this study, uncontrolled asthma was associated with several factors: age, gender, education level, occupation, monthly income, BMI, rhinitis symptoms, and use of inhaled corticosteroids as background treatment. Emphasis should also be placed on structured therapeutic education, which should be offered early to all asthmatic patients.

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