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Research Article

Relationship between Self-Related Adherence to Asthma and Asthma Control in Adult Patients

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Abstract

Objective: To assess the self-reported adherence to asthma treatment in outpatients with asthma, to investigate the relationship between adherence and asthma control. In addition, it aimed to describe the characteristics of patients with poor adherence.

Methods: In a cross-sectional study we recruited patients aged 14 years and older with confirmed asthma diagnosis from the outpatient asthma clinic of Hospital de Clínicas de Porto Alegre, Brazil. They underwent an evaluation by a general questionnaire, an asthma control questionnaire (based on Global Initiative for Asthma - GINA 2011), an adherence questionnaire and pulmonary function tests. Poor adherence was defined as the reporting of non-use or use less than 5 times in the week of devices containing inhaled corticosteroids.

Results: Out of 275 patients studied, 239 (86.9%) were considered with high level of adherence and 36 (13.1%) with poor adherence. There was a significant association between asthma control and self-reported adherence to treatment (p=0.005), so that most patients with high level of adherence kept their disease under control, whereas most patients with poor adherence had uncontrolled status. Logistic regression analysis identified that age was inversely associated with poor adherence (odds ratio=0.98, 95% confidence interval 0.95-0.99, p=0.016).

Conclusions: Self-reported adherence to treatment of patients attending an asthma outpatient clinic was elevated (86.9%). The poor adherence was associated with uncontrolled asthma. Younger patients were more likely to be poorly adherent with treatment.

ABBREVIATIONS

GINA: Global Initiative for Asthma; ICSs: Inhaled Corticosteroids; HCPA: Hospital de Clinicas de Porto Alegre; $FEV_{1:}$ Forced Expiratory Volume in One Second; PEF: Peak Expiratory Flow; FVC: Forced Vital Capacity; OR: Odds Ratio

INTRODUCTION

Asthma is defined as a chronic inflammatory disease of the airways, characterized by symptoms such as dyspnea, chest tightness, wheezing, and coughs [1]. This is a serious public health problem that affects more than 300 million patients throughout the world, and its prevalence is increasing in the last years [1].

The goal of asthma treatment is to achieve and maintain adequate asthma control, which can be measured by assessing the severity of asthma symptoms, the control of airway inflammation, the incidence of asthma-related exacerbations and patient's quality of life [1]. Adherence to treatment is one of the most important factors that guarantee the success of the asthma treatment [2].

Many studies have reported about poor adherence to asthma medication treatment [3-5]. Therapy adherence could have a substantial impact on asthma morbidity and healthcare utilization [3]. Navaratnam et al. (2010), observed that better asthma control and adherence to prescribed inhaled corticosteroids (ICSs) are associated with lower overall asthma-

related resource use and charges [6]. As an example, Gamble et al. [3], observed that non adherence to medications was observed in up to 70% of patients with asthma. Medication non adherence occurs in patients with a wide range of disease severities, and interventions which increase patient adherence to therapy have been shown to be beneficial with regard to important clinical parameters such as lung function, asthma-related quality of life, rescue bronchodilator use and asthma-related healthcare utilization [3,7].

The aim of this study was to assess the self-reported adherence to asthma treatment in outpatients with asthma, to investigate the relationship between adherence and asthma control. In addition, it aimed to describe the characteristics of patients with poor adherence.

MATERIALS AND METHODS

This was a prospective cross-sectional study planned out to evaluate the impact of self-reported adherence on asthma control. To be eligible for the present study, patients underwent an evaluation that included answering a general structured questionnaire and an asthma control questionnaire, an assessment of inhaled device technique, and pulmonary function tests.

The study design and procedures were approved by the Ethics Committee of Hospital de Clinicas de Porto Alegre (HCPA). All patients or their parents in case of patients younger than 18 years gave written informed consent, and their identification data were maintained confidential.

Patients from the outpatient Asthma Clinic of HCPA, Porto Alegre, State of Rio Grande do Sul, Brazil, were invited to participate. The outpatient clinic has 630 patients and treats an average of 24 ambulatory patients per week.At a routine outpatient visit, the patients were invited to participate in the study. All patients who agreed to participate were studied sequentially. All patients have received a standards-based asthma education during previous regular visit to the outpatient clinic.

The study included patients aged 14 years or older (age range of attendance of the clinic was ≥ 14 years) with a physician's diagnosis of asthma. The diagnosis was confirmed following three criteria: symptoms of asthma, reversible airflow obstruction with improvement of 12% or more and 200 mL in forced expiratory volume in one second (FEV_1) after administration of a short-acting β2-agonist, or bronchial hyper responsiveness to a broncho constricting agent.

Patients with chronic pulmonary diseases other than asthma such as emphysema, chronic bronchitis or bronchiectasis, or if they did not complete all the evaluations required by the study protocol were excluded.

The questionnaire included questions about socioeconomic and demography characteristics (i.e., age, gender, education). In addition, question were asked about history of asthma, severity of the symptoms, medication used, smoking status, comorbid conditions, access to asthma medications and their regular use, type of inhaler device and its correct use.

Adherence to asthma treatment was measured as self-reported adherence, using a questionnaire adapted from another study [8]. For each question, the weekly frequency of use of inhaled corticosteroids should be indicated: option a) every day or almost every day; option b) 3 to 5 days per week; or option c) less than 3 days per week. Poor adherence was defined as the reporting of non-use or use less than 5 times in the week of devices containing inhaled corticosteroids. High level adherence was defined as reporting of use 5 or more times in the week of devices containing corticosteroids. The rate of adherence to inhaled corticosteroid was checked once during the inclusion in the study.

The classification of asthma severity was based on the 2002 GINA [9] according to daily medication regimen, which divides patients into 4 severity categories: mild intermittent, mild, moderate and severe persistent asthma, based on frequency of symptoms, spirometric data, and intensity of drug therapy [9].

Asthma control was assessed using the GINA [9] composite measurements, with each week being classified as "uncontrolled", "partly controlled" or "controlled". Asthma was considered to be controlled if daytime symptoms twice a week or less and no asthma attack in the last 3 month (requiring oral corticosteroids, hospitalizations or emergency visits), no limitation of activities, no nocturnal symptoms or awakenings, need for reliever/rescue treatment twice a week or less, normal airflow (FEV_1 and peak expiratory flow rate (PEF), equal to or greater than 80% of predicted value). Asthma was considered to be partly controlled if one or two of the above features were absent. Asthma was considered to be uncontrolled if more than two features were absent or if asthma had caused hospital/emergency department admission in the previous 12 months.

Lung function was assessed using a computerized spirometer (Jaeger, v4.31, Germany). Spirometry was performed pre- and post-bronchodilator treatment. Forced vital capacity (FVC), FEV_1 and FEV_1/FVC were measured three times, and the best trial was reported. All pulmonary function tests were reported as percent of predicted for age, height, and gender [10]. PEF was measured using a portable Peak Flow Monitor (Vitalograph, Boehringer Ingelheim, Germany). Three successive expiratory maneuvers were performed, and the one with the highest value was recorded. The result also was reported as percentage of predicted for age, height and gender [11].

Data were analyzed using the Statistical Package for the Social Sciences, version 18.0 (SPSS Inc., Chicago, IL, USA). The mean and SD were calculated for the quantitative variables that presented normal distribution.

Categorical variables were presented as frequency and proportion. The chi-square test was used for the evaluation of the statistical significance among categorical variables and Student's t test was used for the comparison among the means of the quantitative data. The Mann-Whitney U test and the Kruskal-Wallis test were used for the analysis of quantitative variables presenting asymmetric data. Multivariable analyses were performed by using logistic regression techniques with forward stepwise conditional method. The odds ratio (OR) from this analysis is the OR for poor adherence. Selected non collinear variables with a $P < 0.10$ were introduced in the binary logistic

regression, controlled by gender and age. The level significance was set at P < 0.05. All probabilities reported were two-tailed.

RESULTS

During a ten-month period of study, 334 eligible subjects were examined in the study. Thirty patients refused to participate, 27 patients were excluded because they had another chronic pulmonary disease, and 2 patients were excluded because they failed to complete all evaluations required by the study protocol. Thus, 275 patients were included in this study.

Table (1) describes the general characteristics of the patients. Out of 275 participants enrolled, 74.9%were female and 83.3% were white. Mean age was 51.0 ± 16.5 years. One hundred and sixty-seven (60.7%) patients were never smokers, 98 (35. %) were past smokers and 10 (3.6%) were current smokers. One hundred and sixty-four (34.5%) had one and 16 (5.8%) had two or more comorbid conditions. Over half (52.4%) of the patients presented severe asthma.

The asthma medications were dispensed by the public health in 37% of patients.

Table (2) shows univariate analysis of clinical characteristics

Table 1: General characteristics of the patients.

Characteristics	N = 275
Gender, N (%)	
Female	206 (74.9)
Male	69 (25.1)
Age (years), mean ± SD	51.0 ± 16.5
Race, N (%)	
White	229 (83.3)
Non-white	46 (16.7)
BMI (kg/m^2), mean ± SD	27.4 ± 5.3
GINA severity classification, N (%)	
Mild, intermittent or persistent	38 (13.8)
Moderate, persistent	93 (33.8)
Severe, persistent	144 (52.4)
GINA levels of asthma control, N (%)	
Controlled	48 (17.5)
Partly controlled	74 (26.9)
Uncontrolled	153 (55.6)
PEFR % predicted, mean ± SD	64.03 ± 22.1
FVC % predicted, mean ± SD	81.01 ± 14.1
FEV_1 % predicted, mean ± SD	69.07 ± 23.1
FEV_1/FVC % predicted, mean ± SD	83.8 ± 21.3

Abbreviations: N = Number of Cases; SD = Standard Deviation; BMI = Body Mass Index; GINA = Global Initiative for Asthma; IR = Interquartile Range; PEFR = Peak Expiratory Flow Rate; FVC = Forced Vital Capacity; FEV_1 = Forced Expiratory Volume in 1 s.

Table 2: Clinical characteristics according to the classification of patient-reported adherence.

Characteristics	High level adherence N=239	Poor adherence N=36	P
Gender, N (%)			
Female	184 (77)	22 (61.1)	0.065
Male	55 (23)	14 (38.9)	
Age (years), mean ± SD	52.0 ± 16	44.8 ± 18.4	0.032
Age at diagnosis (years), median (IR)	30 (39)	14 (30.5)	0.046
Race, N (%)			
White	197 (82.4)	32 (88.9)	0.466
Non-white	42 (17.6)	4 (11.1)	
Educational level, N (%)			
≤ 8 years of school	150 (62.8)	16 (44.4)	0.108
> 8 years of school and < high school	73 (30.5)	16 (44.4)	
≥ high school	16(6.7)	4(11.1)	
Income level per annum, N (%)			
≤ US$8,300	168 (70.3)	24 (66.7)	0.681
US$8,300 - US$27,660	68 (28.5)	12(33.3)	
>US$27,660	3 (1.3)	0 (0)	
Marital status, N (%)			
Married/cohabiting	123 (51.5)	24 (66.7)	0.081
Never married	57 (23.8)	10 (27.8)	
Divorced/separated	33 (13.8)	1 (2.8)	
Widowed	26 (10.9)	1 (2.8)	
Comorbid condition, N (%)			
none	139 (58.2)	25 (69.4)	0.230
1	87 (36.4)	8 (22.2)	
≥ 2	13 (5.4)	3 (8.3)	
Smoking status, N (%)			
Never	146 (61.1)	21 (58.3)	0.794
Current	8 (3.3)	2 (5.6)	
Past	85 (35.6)	13 (36.1)	
BMI (kg/m^2), mean ± SD	27.4 ± 5.1	28 ± 6.2	0.572
GINA severity classification, N (%)			
Mild, intermittent or persistent	36 (15.1)	2 (5.6)	0.128
Moderate, persistent	83 (34.7)	10 (27.8)	
Severe, persistent	120 (50.2)	24 (66.7)	
GINA levels of asthma control, N (%)			
Controlled	45 (18.8)	3 (8.3)	0.005
Partly controlled	70 (29.3)	4 (11.1)	
Uncontrolled	124 (51.9)	29 (80.6)	
Access to asthma medications, N (%)			
By private acquisition only	153 (64)	18 (50)	0.232
Dispensed by the public health system only	52 (21.8)	12 (33.3)	
Dispensed by the public health system and by private acquisition	34 (14.2)	6 (16.7)	
PEF predicted, mean ± SD	308 ± 119	307 ± 104	0.984
PEF % predicted, mean ± SD	64.4 ± 22.3	61.1 ± 20.3	0.395
FVC predicted, mean ± SD	2,7 ± 1	3 ± 1	0.183
FVC % predicted, mean ± SD	84 ± 21.4	82.2 ± 21.1	0.665
FEV_1 predicted, mean ± SD	1.8 ± 0.82	1.9 ± 0.8	0.327
FEV_1 % predicted, mean ± SD	69.5 ± 23.3	65.7 ± 21.7	0.408
FEV_1/FVC, mean ± SD	66.3 ± 12.9	65.3 ± 8.8	0.601
FEV_1/FVC % predicted, mean ± SD	81.3 ± 14.5	79.2 ± 11.4	0.405

Abbreviations: N = Number of Cases; SD = Standard Deviation; BMI = Body Mass Index; GINA = Global Initiative for Asthma; IR = Interquartile Range; PEF = Peak Expiratory Flow; FVC = Forced Vital Capacity; FEV_1 = Forced Expiratory Volume in One Second. Outcomes measures of asthma adherence analyzed as dichotomous measures: high adherence and low adherence. Chi-square test for categorical variable. Student *t*-test of Mann-Whitney U-test for continuous variables. P < 0.05 compared to high adherence group.

according to the classification of patient-reported adherence. Out of 275 patients studied, 239 (86.9%) were considered with high level of adherence and 36 (13.1%) with poor adherence. There was a significant association between asthma control and self-reported adherence to treatment (0.005), so that most patients with high level of adherence kept their disease under control, whereas most patients with poor adherence had uncontrolled status. There were significant association between group of patient-reported adherence and age (44.8 ± 18.4 years in the poor adherence group versus 52.0 ± 16.1 years in the high level adherence group; p = 0.032) and age at diagnosis of asthma (19.6 ± 19.4 years in the poor adherence group versus 27.1 ± 20.9 years in the high level adherence group; p = 0.046). There were a tendency to association between self-reported adherence and gender (p=0.065) and marital status (p=0.081). No significant associations were found between self-reported adherence and asthma severity, type of dispositive, income level and education level.

Logistic regression analysis identified that age was inversely associated independently with poor adherence (β=-0.026, odds ratio=0.98, 95% confidence interval 0.95-0.99, p=0.016).

DISCUSSION

This cross-sectional study showed a high self-reported adherence to treatment in 239 patients (86.9%) from a total of 275 patients who attended at an outpatient asthma clinic in a large, tertiary care, university-affiliated hospital in Southern Brazil. There was a significant association between asthma control and adherence to treatment, in which patients with poor adherence presented uncontrolled asthma. Age was an independent factor associated with adherence. Older adult patients were more likely to be adherent with treatment. Prior reviews of medication adherence in older adults cite inconsistencies across studies. Age by itself is not a determining factor in medication non adherence. However, there is evidence to suggest that with the proper motivation, education, and support, older persons can overcome many barriers to medication adherence [12]. One possible explanation for the finding in the present study was that older adults were more susceptible to the educational intervention in the asthma clinic.

Similar Brazilian study that evaluated 160 subjects with severe asthma showed a high rate of adherence to asthma treatment (83.9%) [2]. In addition to that, Gamble et al. [3], performed an analysis of adherence in Northern Ireland Regional Difficult Asthma Service and detected in up to 88% of patients with asthma nonadherence to therapy.

The results of this study suggest that asthma adherence treatment is strongly associated to asthma control. This result corroborates the findings of Souza-Machado [2], which observed a higher rate of adherence among patients with controlled asthma in comparison to those with uncontrolled asthma (88.5% versus 80.9; p < 0.008).

Despite a number of studies [2,13] have shown association between asthma severity and adherence to treatment, in the present study we found no association between GINA severity classification and adherence to treatment. Additionally, there were no statistically association between adherence to asthma treatment and race, educational level, income level, comorbid condition, smoking status, BMI, access to asthma medications and pulmonary function.

An important aspect that might have contributed to the high adherence found in our study is the fact that the population of patients with asthma was regularly monitored at a referral center for the disease, with scheduled medical visits every 90 days, at most. Even though we found high adherence to use of inhaled corticosteroids, it is of concern that 13.1% of the patients reported non-use or less than 5 times /week of inhaled corticosteroids, since this therapeutic measure constitutes a fundamental point in the management of the disease.

Subjective measures that are based on patient self-reporting overestimate adherence. Nevertheless, subjective self-report techniques are easy to use and seem to allow, albeit with less sensitivity, the identification of a group of patients presenting non adherence to treatment. This can be useful for identifying reasons for this attitude and for developing strategies designed to improve adherence to treatment [14,8,15].

Another difficulty in the study of patient-reported adherence is the fact that there are no validated questionnaires for that purpose. In our study, we opted for the strategy of adapting a questionnaire used in another study [8]. We believe that the weekly use of therapeutic orientations as an objective reference for the questions has reduced the possible interference of this limiting factor.

The present study has some limitations. First, this was a single center study evaluating more difficult cases referred to a tertiary hospital. Secondly, this was a cross-sectional study, and therefore it is not possible to establish the temporal sequence between asthma control and adherence to treatment. Additionally, evaluation of adherence to treatment was based on self-reported measure and we did not count powder capsules neither weight inhalers returned. We did not measure markers in the blood serum for medications taken. Also, our questionnaire did not include evaluation for adverse events of asthma medications. In this study, we did not evaluate depression as a factor related to adherence.

CONCLUSION

In conclusion, the self-reported adherence to treatment in patients with asthma attended an outpatient asthma clinic was elevated (86.9%). The poor adherence was associated with uncontrolled asthma. Younger patients were more likely to be poorly adherent with treatment.

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