

## ORIGINAL ARTICLE

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# Factors Affecting Patients' Compliance to Metered-Dose Inhaler Drugs in Two Asthma Clinics in Tehran, Iran

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## ABSTRACT

Asthma affects an estimated 300 million people worldwide. Poor compliance with the prescribed medication leads to increased mortality and morbidity. Various determinants of compliance have been described. The purpose of this study was to determine factors that can influence patients' compliance with prescribed Metered Dose Inhaler drugs.

179 patients with diagnosis of asthma were selected from two asthma clinics in Tehran. 160 of them met the inclusion criteria. Collected data consisted of patients' demographic data, asthma symptoms and severity, medical history of patients and their attitude towards asthma control and using drugs. Compliance was assessed by four questions regarding using Metered Dose Inhaler drugs.

There was a significant correlation between compliance and patient's literacy level, attitude about using drugs, and their knowledge about asthma ( $p=0.012$ ,  $p=0.0001$ ,  $p=0.001$  respectively). However there was significant negative correlation between symptom control score and compliance ( $r = -0.270$ ,  $p=0.004$ ). Other factors including sex, patients' attitude about asthma control and severity of asthma did not show any significant relation.

There are four major factors influencing the patients' compliance: level of literacy, attitude towards asthma management, knowledge about asthma, and symptom control. The negative relation between compliance and symptom control may be caused by patients' inadequate knowledge towards continuing treatment after improvement in their conditions. The study emphasizes on the importance of enhancing the patients' compliance. This could be done by providing patients with adequate information about their disease and treatment.

**Key words:** Asthma; Attitude; Compliance; Metered dose inhaler drugs

## INTRODUCTION

Asthma affects an estimated 300 million people

worldwide,<sup>1</sup> and the prevalence of asthma is continuing to rise throughout the world.<sup>2,3</sup> The economic burden to the society is well documented in industrialized countries. Poor asthma control is responsible for a large proportion of the total cost of the disease.<sup>4</sup>

International guidelines have been established for the management of asthma; however, in clinical

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practice, appropriate prescriptions do not result in asthma control in all patients.<sup>5</sup> The assumption is that, in addition to correct management, compliance with the therapeutic regimen is necessary to improve health.<sup>6</sup>

Compliance is used within the medical setting to define whether a patient follows a prescribed management plan in order to treat effectively an underlying illness or condition.<sup>7</sup> Adherence is often used interchangeably with compliance.<sup>8</sup>

Poor compliance with the prescribed therapy leads to increased mortality and morbidity.<sup>4,9</sup> Various determinants of compliance have been described.<sup>10</sup> Poor communication between the doctor and patient and inability to use inhaler devices correctly are major sources of non-compliance in patients with asthma.<sup>9,11</sup> A variety of different complex factors which include psychological, social, and medical issues can influence compliance with asthma therapy.<sup>9</sup>

There are two basic methods to assess compliance: Self-reporting, which is easy but inaccurate, and pill counting/weighing inhalers, that is more objective but is inadequate to distinguish between correct use of the drug and deliberate dumping of medication. The only theoretical alternative to more accurate assessment of compliance involves invasive testing of blood levels.<sup>7</sup> Despite all these methods, in most studies compliance is reported, rather than objectively measured.<sup>4,5,9,10,12</sup> According to Soussan et al, compliance can be assessed by four items: understanding the mechanism of action of each medication ; forgetting to take the drug; taking the prescribed doses without decreasing or increasing them; and correct technique of using inhaled medication approved by physicians.<sup>5</sup> Despite various degrees of adherence, much of the literature continue reporting adherence as a dichotomous construct, in which patients are considered to be either adherent or not.<sup>6</sup>

Inhaled corticosteroids (ICSs) and  $\beta_2$ -agonists are the cornerstone of modern asthma treatment,<sup>2,3</sup> thus it is very important to uncover the factors influencing compliance to Metered Dose Inhaler (MDI) drugs.

There are a few unpublished studies performed in Iran in this field, therefore it is imperative to identify and report the factors that influence the patients' compliance to drugs in Iran.

The purpose of this study is to identify factors that can influence asthmatic patients' compliance with prescribed MDI drugs.

## MATERIALS AND METHODS

### Study Design

One hundred and seventy nine patients with physician diagnosed asthma were selected from outpatient department of two tertiary hospitals (Milad and Fayaz bakhsh hospitals, Tehran, Iran) during 2005-2006. All the patients agreed to participate in the study.

### Study Population

The inclusion criteria consisted of: age older than 16, history of asthma diagnosed by a pulmonologist and history of MDI drug usage. The exclusion criteria were: having a history of chronic respiratory diseases other than asthma.

Asthma was diagnosed according to combination of both clinical and spirometric (reversibility to bronchodilators) criteria. Asthma severity was defined based on Guide for Asthma Management and Prevention 2004 guidelines,<sup>13</sup> and patients' clinical and/or spirometric parameters.

### Measurement

Data were collected via a questionnaire that was designed to collect data on demographic data, asthma characteristic and history, medical history of patients, history of prescribed medication for asthma and/or other chronic disease and their attitude towards asthma management and the prescribed medications. The questionnaire included both closed and open-ended questions. All of the participants were interviewed for data collection. The first author of this article conducted all the interviews. Among 179 patients who agreed to enter the study, 19 patients were excluded because they had no history of MDI drug use. One hundred and sixty patients entered the study.

Participants' compliance to prescribed MDI drugs were assessed by four oral questions: "Do you use your prescribed spray (MDI drug) regularly?", "Have you ever had any history of not using your spray?", "Do you still use your last prescribed spray?", "How do you use your spray? Show me". The higher the scores, the more the participants' compliance. Participants' attitude towards asthma management were assessed by asking 4 questions: "Do you think using your spray have had any effect on your disease?", "How much is it important to you to use your spray as prescribed?", "The more I have knowledge about asthma, the more I can help myself.", "I can control my asthma in most of

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the conditions". We scored the questions and summed them up to have a final score. To obtain more detailed analysis, we divided attitude into 2 parts, patients' attitude towards using drugs (first 2 questions) and their attitude towards asthma control (last 2 questions). We also scored asthma symptom control level by recording self-reported asthma attacks and emergency visits during previous year. If there were not any asthma attacks or emergency visits, there was the highest symptom control score; if there were any asthma attacks without emergency visit, there was a partial symptom control score and with both asthma attacks and emergency visit, the symptom control level was the lowest.

### Statistical Analysis

Pearson's correlation test was used to identify a relationship between compliance and other factors. Mann-Whitney Test was carried out to determine group differences in variables attitude and compliance. The grouping of patients was based on sex, employment, family history of asthma, history of other chronic diseases, history of taking medications for other conditions except asthma, taking herbal drugs and self-reported improvement in the patients' conditions while taking herbal drug. SPSS 10.0.5 software (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. P-value <0.05 considered as significant.

## RESULTS

All 160 patients were interviewed and their data were collected. Six out of 160 patients did not use any MDI or oral drugs at the time of interview. The demographic data of participants are shown in Table 1. All the asthma characteristics of patients are also shown in Table 2. The scores of compliance, attitude and symptom control were calculated according to above mentioned methods. The participants' mean compliance score was  $2.56 \pm 1.06$ . There was evidence of variation in the prevalence of compliance among interviewed patients. Frequency of the compliance based on their scores was as follows: score 0, 4(2.5%); score 1, 27 (16.9%); score 2, 35 (21.9%); score 3, 62(38.8%) and score 4, 32 (20%).

We analyzed data to determine whether there was a relationship between compliance and other factors. The analysis results are shown in Table 3.

**Table 1. Demographic data of patients.**

	Number (%)
<b>Age (years)</b>	
Mean(min-max)	47.67 (16-83)
SD	12.78
<b>Sex</b>	
Female	105 (65.6%)
Male	55 (34.4%)
<b>Literacy level</b>	
Illiterate	32 (20%)
Low-literate	19 (11.9%)
Elementary school education	38 (23.8%)
Guidance school(pre-high) education	28 (17.5%)
High school	33 (20.6%)
University education	10 (6.3%)
Family history of asthma	66 (41.3%)
<b>Length of time having diagnosis of asthma (months)</b>	
Mean(min-max)	102.05 (0-600)
SD	103.34
<b>Employment</b>	
Employed	64 (40%)
Unemployed*	96 (60%)
<b>Immigration status</b>	
Immigrant	97 (60.6%)
Native	51 (31.9%)
Living in other cities	12 (7.5%)
<b>Smoking status</b>	
Active	5 (3.1%)
Passive	25 (15.6%)
None smoker	104 (65%)
Ex-smoker	26 (16.3%)
History of other chronic disease	61(38.1%)
History of taking medication for other chronic disease	63(39.4%)

\* House keeper women are categorized as "unemployed"

There was a significant correlation between participants' compliance and literacy level ( $r=0.199$ ,  $p=0.012$ ). Mean compliance scores of different literacy levels were: 2.46, for illiterate, 2.05 for low literate, 2.39 for elementary school, 2.75 for guidance school, 2.93 for high school and 2.80 for college literacy level, respectively. There was significant negative correlation between symptom control score and compliance ( $r = -0.270$ ,  $p=0.004$ ).

**Table 2. Asthma characteristic of patients.**

	Number(%)
<b>Asthma symptoms</b>	
Cough	103 (64.4%)
Wheeze	124 (77.5%)
Difficult breathing	119(74.4%)
Chest tightness	73 (45.6%)
<b>Asthma severity (grade)</b>	
Stage 1	37 (23.1%)
Stage 2	60 (37.5%)
Stage 3	51 (31.9%)
Stage 4	12 (7.5%)
Spacer using	79 (49.4%)
<b>Spray using technique</b>	
Correct	56(35%)
Incorrect	104(65%)

There was a significant correlation between participants' compliance and their attitude ( $r=0.330$ ,  $p=0.0001$ ). After dividing attitude into 2 parts, there was a significant correlation between compliance and participants' attitude towards using drugs ( $r=0.530$ ,  $p=0.0001$ ), but no significant correlation was seen between compliance and patients' attitude towards asthma control.

**Table 3. Correlation of compliance and probable affecting factors.**

Demographic and other factors	Compliance <sup>†</sup>
Age (years)	$r = -0.046$ ( $p=0.561$ )
Literacy level	$r=0.199$ ( $p= 0.012^*$ )
Length of time having diagnosis of Asthma	$r=0.043$ ( $p=0.593$ )
Immigration status	$r=-0.069$ ( $p=0.384$ )
Smoking status	$r=0.002$ ( $p=0.982$ )
Asthma severity (grade)	$r=0.029$ ( $p=0.717$ )
Attitude	$r=0.330$ ( $p<0.0001^{**}$ )
Attitude towards using drugs	$r=0.530$ ( $p<0.0001^{**}$ )
Attitude towards asthma control	$r=0.029$ ( $p=0.720$ )
Symptom control	$r=-0.270$ ( $p=0.001^{**}$ )
Asthma knowledge	$r=0.227$ ( $p=0.004^{**}$ )

<sup>†</sup> The result of spearman correlation test.

\* Correlation is significant at .05 level (2-tailed)

\*\* Correlation is significant at .01 level (2-tailed)

No correlation was seen between the patients' compliance and other demographic data such as age and length of time having diagnosis of asthma (Table 3).

Table 4 shows patients' group differences in their compliance based on sex, employment, family history of asthma, history of other chronic diseases and taking medications, taking herbal drugs and self-reported improvement in the patients' conditions while taking herbal drugs.

There was a significant difference between participants' attitude scores of patients with positive and negative family history of asthma ( $p= 0.011$ ). Participants with positive family history of asthma had more attitude scores. Dividing attitude, there was a significant difference in patients' attitude towards asthma control between patients with positive and negative family history of asthma ( $p= 0.008$ ), but no group difference was seen in participants' attitude towards using drugs.

All the patients were asked about their asthma drug history; 24 out of 160 patients (15%) did not remember their drug history. The most reported drugs were: anti histamine drugs 15.6%, antibiotics 24.4%, different types of MDI drugs 78.1%, expectorants 8.1% and theophylline 48.1%. There was a significant difference in participants' attitude and attitude towards drug use scores between patients with history of using antibiotics and patients with no history of using antibiotics ( $p=0.001$ ,  $p=0.001$ , respectively). Patients with history of antibiotic use had a lower attitude and attitude towards drug use scores.

There was a significant difference in patients' compliance between patient groups based on self-reported improvement in the patients' conditions while taking herbal drugs ( $p= 0.028$ ). The higher compliance was noticed among patients who reported no improvement in their conditions after taking the herbal medications.

No group difference was noted in compliance and attitude scores of participants regarding other factors such as sex and employment (Table 4).

All the participants were asked to answer two questions to evaluate their knowledge about the asthma management, "Have you received any information and education about asthma?" and "Do you prefer to take asthma medication orally or as inhaler or both? "We scored both these questions as a knowledge score.

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**Table 4. Comparison of patient's compliance score in different groups.**

Factor	Group	Median (IqR)	p-value <sup>†</sup>
Sex	Female	3 (2-3)	0.347
	Male	3 (1.25-3.75)	
Family history of asthma	Yes	3 (2.75-3)	0.372
	No	2.5 (2-3.25)	
Employment	Employed	3 (2-3)	0.198
	Unemployed	3 (2-3)	
History of other chronic disease	Yes	3 (1-3)	0.771
	No	3 (2-3)	
History of taking medication for other chronic disease	Yes	3 (1-3)	0.422
	No	3 (2-3.25)	
Cough	Yes	3 (2-3)	0.585
	No	3 (2-4)	
Wheeze	Yes	3 (2-3)	0.443
	No	2 (1-3)	
Difficult breathing	Yes	3 (2-3)	0.279
	No	23(2-3.75)	
Chest tightness	Yes	3 (2.5-3)	0.365
	No	2 (1-4)	
Self-reported improvement by herbal drugs	Yes	3 (2-3)	0.028*
	No	3 (2-3.5)	
Antihistamines	Use	3 (2-4)	0.670
	Not use	3 (2-3)	
Different types of MDI <sup>a</sup> drugs	Use	3 (2.25-3.75)	0.379
	Not use	3 (2-3)	
Antibiotics	Use	3 (2-4)	0.051
	Not use	2 (1-3)	
Expectorants	Use	3 (2-3)	0.868
	Not use	2 (2-3)	
Theophylline	Use	3 (1.75-3.25)	0.739
	Not use	3 (2-3)	
Spacer using	Use	2 (1.75-3)	0.002*
	Not use	3 (3-4)	

<sup>†</sup> The result of Man-Whitney test

\* Significant p value

<sup>a</sup> Metered Dose Inhaler drugs.

There was a significant correlation between this knowledge score and participants' compliance ( $r=0.227$ ,  $p=0.004$ ).

In addition, there was a significant correlation between knowledge and attitude ( $r=0.171$ ,  $p=0.031$ ), and level of literacy ( $r=0.245$ ,  $p=0.002$ ).

Participants were asked about their asthma symptoms. The patients' asthma characteristics are shown in Table 2. There was a significant difference in

patients' compliance, between the patients with using spacer and without using it ( $p=0.002$ ). There was no significant correlation between the severity of asthma or asthma symptoms, and participants' compliance (Tables 3 and 4).

### DISCUSSION

Optimum drug treatment and good care can convert

asthma from a major handicap to a minor inconvenience, yet it continues to be an important cause of morbidity and mortality.<sup>14</sup>

The effect of patient's literacy level on the compliance was investigated in this study, which was shown to have a positive impact on compliance with the treatment regimen. Other studies also demonstrated the same result.<sup>9</sup> However, it should be mentioned that all of the subjects in our study were from low socio-economic areas in Tehran with low levels of literacy. Therefore, it is reasonable to consider this factor as an influencing factor in future studies.

This study showed a significant negative correlation between asthma symptom control and patients' compliance, whereas other studies reported a positive correlation between asthma control and compliance.<sup>5,8</sup> It should be mentioned that the results may be influenced by a conception that many asthmatic patients do not have a correct knowledge about controller drugs and preventive medicine. Thus they may stop taking their medication as they feel better, this attitude may decrease their compliance to their asthma drugs. It seems that good patient and doctor relationship and patient education can improve compliance.

A significant correlation was seen between patients' attitude and their compliance. Many studies also showed the same result.<sup>8,9</sup> As we divided attitude into two parts, we realized that to improve the patients' compliance, more attention must be paid to patients' attitude towards using drugs than asthma control.

In the authors' study, it was found that participants' knowledge had significant impact on their compliance and attitude. This finding is in agreement with Scherer et al and other studies<sup>8,9</sup> that compliance is thought to be heavily influenced by the knowledge of the patients. Patients' knowledge about their disease has a great relation with patients' motivation, thus correcting misconception about treatment might increase motivation to take medication.<sup>9</sup>

Although some studies have reported age and sex as factors influencing patients' compliance, our study demonstrated no correlation between age, sex and length of time having diagnosis of asthma, and the patients' compliance.<sup>4,9,15</sup> Absence of correlation between compliance and duration of asthma means that public health system has little or no educational program to improve knowledge of asthmatic patients about their disease.

Positive family history of asthma was shown to be significantly correlated with attitude other than compliance. Although positive family history does not affect the patients' compliance directly, it may have indirect influence on it. Therefore, it is important to investigate this issue in future studies.

Our study showed a decline in the patients' attitude and their attitude towards drugs with the history of using antibiotics. In our study increased antibiotic usage was found by those asthmatics that have low attitude toward their disease. Again education of physicians especially GPs and patients regarding rational drug use is an important factor to decrease adventitious drug use.

No asthma symptom affected patients' compliance. Other studies showed a significant relation between shortness of breath and compliance.<sup>9</sup> In authors' study, improved compliance of patients was noticed by spacer use, which has also been reported by others.<sup>2,3</sup>

According to Singh et al, lack of improvement in patient's asthmatic condition may motivate them to search for magic cures as claimed for many complementary therapies and may lead to non-compliance with regular treatment of asthma.<sup>15</sup> We noticed a negative relation between use of herbal drugs and compliance. Although the effect of alternative medicine on asthma has been studied and therapeutic efficacy of these treatments for asthma is not supported by currently available evidence,<sup>16</sup> but cultural and psychological effect of these medication on asthma may be important at least in some special patients and more work is needed to reach a definite conclusion.

We are aware that our study has some limitations. The first limitation is that all of the participants were chosen from two clinics, where most of the subjects had low socioeconomic status. Another limitation to the study is using a self-reported method to measure the compliance which might affect the result of the study.

For future research, the study should be repeated using a larger sample size and more community-based investigations should be undertaken to represent the full spectrum of people with asthma. In addition, more standardized methods should be used to assess compliance, attitude, knowledge, and asthma control. Considering the effect of poor communication between the doctor and patient on asthma compliance in the future studies is imperative, because poor communication has been identified as a major factor of non-compliance with treatment.<sup>11</sup> As it was shown

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knowledge about the difference between preventive and curative medications has direct and indirect effect on patients' compliance and must be considered as other major factor of compliance with treatment. Other factors that should be considered in future studies are family support, compliance with oral medications, good inhaler technique use and using various devices and psychological factors that may influence compliance.

The results of this study showed that there are four major factors influencing the patients' compliance to MDI drugs: level of literacy, attitude towards asthma management, knowledge about asthma treatment, and symptom control. The study emphasizes on the importance of enhancing the patients' compliance. This could be achieved by providing patients with adequate information regarding their treatment regimens in order to enhance their knowledge and improving their attitude towards using MDI drugs.

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