Original Article : Pharmacy Administration

Association of Medication Adherence, Level of Asthma Control, and other Factors with Patient Satisfaction on Combination Inhaler

ความสัมพันธ์ของการใช้ยาตามแพทย์สั่ง ระดับการควบคุมโรคหอบหืด และปัจจัยอื่น กับความพึงพอใจของผู้ป่วยต่อการใช้ยาสูดสูตรผสม

Katesiri Kitthongpoon, B.Sc.Pharm*; Kamon Kawkitinarong, M.D.**; Vithaya Kulsomboon, Ph.D.***

Kitthongpoon K, Kawkitinarong K, Kulsomboon V. Association of Medication Adherence, Level of Asthma Control, and Other Factors with Patient Satisfaction on Combination Inhaler. Thai Journal of Hospital Pharmacy 2010; 20(1):33-42.

The objective of this study was to assess the factors associated with satisfaction of asthmatic patients treated with combination inhaler. A cross-sectional survey was performed by using survey instrument. All patients were outpatients who visited chest clinic and allergy clinic of King Chulalongkorn Memorial Hospital during March 1, 2009 to April 15, 2009. Of the 110 patients, these patients had moderate to severe persistent asthma. Their age ranged from 32 to 80 years old. All patients were being treated with dry powder combination inhaler of budesonide/formoterol or salmeterol/fluticasone for more than 3 months. Assessment of patient satisfaction was performed by using the Satisfaction with Asthma Treatment Questionnaire (SATQ); which classified into four domains including effectiveness of treatment, ease of use, medication burden, and side effects and worries. Association of patient satisfaction with factors such as patient demographics, level of asthma control, number of drugs, and adherence with medication was analyzed by multiple regression analysis (MRA).

Results showed that the overall satisfaction score could be explained by the explanatory variables in the multiple regression model with statistically significance ($F = 3.32$, $p = 0.001$). All explanatory variables in the MRA model could explain 25.1 percent (adjusted R square = 0.176) of the satisfaction overall score. The most important explanatory variables was the adherence score (B weight = 0.311, $p = 0.001$) followed by the second most important which was the poorly-controlled variable (B weight = 0.213, $p = 0.036$). Only these two explanatory variables had statistically significance in the MRA model.

It can be concluded that two major factors associating with the patients' satisfaction to combination inhaler drugs were medication adherence and asthma controlled level. The adherence score had significantly largest positive correlation with satisfaction overall score. Interestingly, poorly-controlled asthmatic patient also had significant positive correlation with satisfaction overall score, which may be due to their lower level of expectation. The results on the influencing factors associated with satisfaction on combination inhaler could be used to improve the standard guidelines and the advice for counseling the asthmatic patients individually to give better treatment outcome though the patients had totally-controlled level.

Keywords : Patient satisfaction, medication adherence, level of asthma control, combination inhaler.

* Pharmacy Department, Saint Louis Hospital.

** Department of Medicine, Faculty of Medicine, Chulalongkorn University.

*** Social and Administrative Pharmacy, Faculty of Pharmaceutical Science, Chulalongkorn University

เกศศิริ กิจทองพูล, กมล แก้วกิติณรงค์, วิทยา กุลสมบูรณ์. ความสัมพันธ์ของการใช้ยาตามสั่ง ระดับการควบคุมโรคหอบหืดและปัจจัยอื่น กับความพึงพอใจของผู้ป่วยต่อการใช้ยาสูดสูตรผสม. วารสารเภสัชกรรมโรงพยาบาล 2553; 20(1):33-42.

การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีความสัมพันธ์กับความพึงพอใจของผู้ป่วยโรคหอบหืดที่ได้รับยาสูดสูตรผสม เป็นการศึกษาวิจัยแบบภาคตัดขวาง โดยใช้เครื่องมือเก็บข้อมูลจากผู้ป่วยนอกที่มารักษาที่คลินิกโรคปอดและโรคภูมิแพ้ของโรงพยาบาลจุฬาลงกรณ์ รวบรวมข้อมูลระหว่างวันที่ 1 มีนาคม ถึง 15 เมษายน 2552 จากผู้ป่วยจำนวน 110 รายที่เป็นโรคหอบหืด ซึ่งมีอายุตั้งแต่ 32 ถึง 80 ปี และมีระดับความรุนแรงของโรคปานกลางถึงมาก ผู้ป่วยได้รับยาสูดสูตรผสมของ ยาบิวดีโซนายผสมกับฟอร์โมเทรอล หรือ ยาซาลเมเทอรอลผสมกับฟลูติคาโซล ซึ่งถูกนำส่งโดยเครื่องสูดยาแบบผงแห้งเป็นเวลานาน 3 เดือนขึ้นไป เครื่องมือเก็บข้อมูลประกอบด้วยแบบวัดความพึงพอใจในการใช้ยาสูดรักษาโรคหอบหืด มี 4 องค์ประกอบ ได้แก่ ประสิทธิภาพของการรักษา ความง่ายในการใช้ ความยากลำบากในการรักษาด้วยยา และผลข้างเคียงและความกังวล พร้อมกับทำการประเมินปัจจัยที่ส่งผลต่อความพึงพอใจของผู้ป่วยต่อการใช้ยาสูดสูตรผสม คือ ลักษณะทางประชากรศาสตร์ ระดับของการควบคุมโรคหอบหืด จำนวนยาที่ผู้ป่วยได้รับ รวมทั้งการใช้ยาสูดตามแพทย์สั่ง นำข้อมูลมาวิเคราะห์ทางสถิติโดยการวิเคราะห์แบบสมการถดถอยพหุคูณ

จากผลการศึกษา พบว่า คะแนนความพึงพอใจโดยรวมต่อยาสูดสูตรผสมสามารถอธิบายได้โดยตัวแปรอธิบายในแบบจำลองการวิเคราะห์แบบสมการถดถอยพหุคูณอย่างมีนัยสำคัญทางสถิติ ($F = 3.32$, $p = 0.001$). ตัวแปรอธิบายทั้งหมดสามารถอธิบายคะแนนความพึงพอใจโดยรวมต่อยาสูดสูตรผสมได้ร้อยละ 25.1 (adjusted R square = 0.176). ตัวแปรอธิบายที่สำคัญที่สุด คือ คะแนนจากการใช้ยาตามแพทย์สั่ง ($B = 0.311$, $p = 0.001$) รองลงมา คือ การควบคุมโรคหอบหืดได้ไม่ดี ($B = 0.213$, $p=0.036$) โดยทั้งสองตัวแปรเท่านั้นที่เป็นตัวแปรอธิบายในแบบจำลองที่พบนัยสำคัญทางสถิติ

โดยสรุป การใช้ยาตามแพทย์สั่งและการควบคุมโรคหอบหืดได้ไม่ดีเป็นสองปัจจัยหลักที่มีความสัมพันธ์กับความพึงพอใจของผู้ป่วยในการใช้ยาสูด โดยการใช้ยาตามแพทย์สั่งมีความสัมพันธ์เชิงบวกกับความพึงพอใจมากที่สุด น่าสนใจที่การควบคุมโรคหอบหืดได้ไม่ดีเป็นปัจจัยที่สัมพันธ์ในทางบวกกับความพึงพอใจของผู้ป่วยในการใช้ยาสูด ซึ่งอาจเนื่องมาจากความคาดหวังของผู้ป่วยในกลุ่มนี้อยู่ในระดับต่ำผลการศึกษาเกี่ยวกับปัจจัยที่ส่งผลต่อความพึงพอใจในการใช้ยาสูดสูตรผสมนี้ สามารถนำไปใช้ในการปรับปรุงแนวทางที่เป็นมาตรฐานและปรับปรุงคำแนะนำสำหรับการให้คำปรึกษาแก่ผู้ป่วยโรคหอบหืดรายบุคคล เพื่อทำให้ผลการรักษาในด้านความพึงพอใจต่อการใช้ยาดีขึ้นแม้ในกลุ่มผู้ป่วยที่สามารถควบคุมโรคหอบหืดได้ดี

คำสำคัญ : ความพึงพอใจของผู้ป่วย การใช้ยาตามแพทย์สั่ง ระดับการควบคุมโรคหอบหืด ยาสูดสูตรผสม

Introduction

Asthma is a chronic disease characterized by airway inflammation, hyper-responsiveness to a variety of stimuli, and reversible airway obstruction. Common aggravating factors include exposure to allergens (such as house dust mites, animals with fur, cockroaches, pollens and molds), occupational irritants, tobacco smoke, respiratory infections, exercise, emotional stresses, chemical irritants, and drugs such as aspirin and beta blockers. Symptoms of asthma are cough, wheezing, tightness of the chest, shortness of breath, and increased sputum production.

Exacerbations are episodic but airway inflammation exists chronically. The pattern,

frequency, and intensity of symptoms may vary in an individual over a period of time. Some patients have extended symptom-free periods. Some patients have symptoms only when they exercise or expose to a stimuli. Other patients have continuous symptoms or frequent recurrent acute episodes.

Asthma can be effectively treated and most of the patients can achieve good control of the disease. The new Global Initiative for Asthma (GINA) guidelines has focused on level of control as a guide for selection of treatment.[1] A classification of asthma control into well-controlled, partly controlled and poorly controlled are recommended.[1] Inhaled corticosteroids has been used to treat patients with persistent asthma by controlling airway inflammation.[1] Patients who remain uncontrolled even using an inhaled corticosteroid (ICS) alone are recommended to be treated with combination inhaler of long-acting beta-2 agonist (LABA) plus corticosteroid.[1]

Treatment satisfaction is a patient-reported outcome that may give useful insights into patients' perspective on their current treatment among alternative treatments.[2] Patient satisfaction is an important measurement that should be included in healthcare evaluation.[3] Asthma is a chronic disease which its specific treatment have the greatest impact on patient outcomes and needs long-term care, so it is reasonable to evaluate patients with asthma about their satisfaction on treatment. Patient satisfaction may be associated with level of asthma control and should be considered as one of the goals in management of asthma.

A number of questionnaires have been developed to measure health care from patients' perspective.[3,4] Ideally, the satisfaction questionnaire in asthmatic patients should measure patient satisfaction with inhaled asthma medication.[5] However, most of the researches has focused on satisfaction with generic aspects of patient care, such as helpfulness of the health care provider. Whilst drug adherence is an important issue affecting asthma treatment outcome especially in moderate to severe disease, there are only few studies regarding satisfaction with inhaled medication. We assess the treatment satisfaction in patients with moderate to severe persistent asthma using combination inhaler.

Objective

The objective of this study was to assess the factors associated with satisfaction of asthmatic patients treated with combination inhaler, budesonide/formoterol combination inhaler, and fluticasone/salmeterol combination inhaler.

Method

Research Design. This research was a cross-sectional survey. Data were collected during March 1, 2009 to April 15, 2009 by using self-reporting questionnaire. The study assessed patient satisfaction with combination inhaler using the Satisfaction with Asthma

Treatment Questionnaire (SATQ), the level of asthma control which was measured by the Asthma Control Test (ACT), and the evaluation of patient adherence based on self-reporting questionnaire.

Subjects. Patients with moderate to severe persistent asthma who visited the outpatient department of King Chulalongkorn Memorial Hospital were studied. Totally 150 asthmatic patients who met the eligible criteria and came to allergy clinic and chest clinic during November 1, 2008 to January 31, 2009 were enrolled the study. All patients met asthma diagnosis criteria based on the GINA guidelines. All patients met asthma diagnosis criteria based on GINA guidelines and had been using budesonide/formoterol turbuhaler or salmeterol/fluticasone accuhaler for maintenance therapy least three months prior to their enrollment into the study. They were allowed to use inhaled short-actingbeta -2 agonist for relieving symptoms. Eligible patients who visited the clinic were recruited until the number of patients met the required number from the sample size calculation.

Sample Size Calculation. Sample size is estimated from Jacob Cohen table with the medium effect size of 0.15.[5] The power was 0.8 and α was 0.05. There were eight independent variables including age, sex, marital status, educational level, length of time having diagnosis of asthma, number of drugs used, asthma control level, and patient adherence towards combination inhaler. From the Jacob Cohen table, the required sample size is 107, thus the expected total number of subjects in this study was 110 patients.

Measurement. Data collection was performed by a questionnaire on patient characteristics (age, gender, marital status, educational level, length of time having diagnosis of asthma); asthma control level; and patient adherence towards combination inhaler.

The assessment of patient satisfaction with budesonide/formoterol turbuhaler or fluticasone/salmeterol accuhaler for maintenance therapy was based on the score, as measured by the SATQ, which was developed by Campbell et al.[6,7] For this study, SATQ was translated into Thai version by using backward-forward method. SATQ contains 26 questionswhich was divided into four domains; effectiveness, ease of use, burden of asthma medication, and sideeffects/worries. Cronbach's alpha values of four domains of SATQ ranged from 0.68-0.85, indicating evidence of reliability of the scales. The satisfaction score in each question range from 1 to 5. The overall satisfaction score was calculated from the mean of satisfaction scores.

The ACT was consisted of five questions as suggested by the GINA asthma management guidelines; asthma symptoms, use of reliever medications, the impact of asthma on daily functioning, and patients' self-rating of asthma control in the past four weeks were evaluated. The sum score was ranged from 5 to 25. The

levels of control are divided into 3 levels. If a score is 25, the patient is in the totally controlled level. If a score is 20-24, the patient is in the well-controlled level. If a score is less than 20, the patient is in the poorly controlled level.

Patients' adherence to prescribed asthma inhalers was assessed by six questions.[8,9] The items also monitor adherence during the last three months to improve the accuracy of recall. The response of each question is a five-point Likert scale. A mean score of 5 indicates perfect adherence with the medication regimen, while a mean score < 5 indicates to lower levels of adherence.

Data Analysis. Descriptive statistical analysis was used to analyze the characteristics of patients including age, gender, marital status, educational level, length of time having diagnosis of asthma, number of drug used. The satisfaction score, the level of asthma control, the medication adherence were described in terms of the mean and standard deviation. The relationship between the factors associated with satisfaction of asthmatic patients treated with the combination inhaler was assessed by using the multiple regression analysis (MRA). The α value < 0.05 was considered significant for all statistic values.

Results

1. **Characteristics of Patients**. Characteristics of 110 patients are shown in Table 1. Of all patients, 76 percent were female. For

Table 1. Characteristics of patients

Characteristics of Patients	Number of Patients (%)
Gender	
Female	84 (76)
Male	26 (24)
Marital status	
Single	28 (25)
Married	77 (70)
Widowed	5 (5)
Educational level	
Lower level than undergraduate	54 (49)
Undergraduate level and higher	56 (51)
Number of drugs used	
Having two inhalers	50 (45)
Having two inhalers with others	60 (55)
Level of asthma control	
Poorly-controlled	14 (13)
Well-controlled	46 (42)
Totally-controlled	50 (45)
Other characteristics	**Mean (SD)**
Age (years)	54.13 (12.25)
Length of time having diagnosis of asthma (months)	192.62 (151.31)
Score of adherence	4.34 (0.55)

their marital status, 70 percent were married, 25 percent were single, and 5 percent were widowed. Concerning the educational background, 51 percent accomplished undergraduate level and higher. Less than half (45 percent) had been using only 2 inhalers including 1) budesonide/formoterol turbuhaler or salmeterol/fluticasone accuhaler and 2) short-acting beta-2 agonist inhaler, More than half (55 percent) had been using medications more than those two inhalers. For their asthma control level, 45 percent were totally-controlled, 42 percent were well-controlled, and only 13 percent were poorly-controlled. The mean age of the participants was 54.13 years old. The mean length of time having diagnosis of asthma was more than 16 years (192.62 months). The mean adherence score was 4.34.

2. **Satisfaction with Combination Inhaled Asthma Treatment**. There are four domains reflecting four aspects of satisfaction as follows; effectiveness of treatment, ease of use, medication burden, and side-effects and worries.

Table 2 showed the mean scores of medication satisfaction with asthma treatment and other statistics in the four domains which were 1) the effectiveness of treatment score, 2) the ease of use score, 3) the medication burden score, 4) the side-effects and worries score, and the overall score of the four domains. Patients in this study were generally satisfied with their combination inhaled medication; mean domain score values indicate they were satisfied with the effectiveness (4.15) and ease of use (3.99) of their combination inhaled medications more than with the burden of medication (3.57) and the sideeffects and worries (3.22). The overall score was 3.73.

3. **Exploring the Factors Influencing Satisfaction Score**. The MRA was used to analyze the relationship between the satisfaction overall score as the dependent variable and eight independent variables including adherence score, gender, age, length of time having diagnosis of asthma, number of drugs, marital status, educational level, and level of asthma control. The analysis results were shown in Table 3 and 4.

The MRA model that was used to explain the relationship between the explanatory variables and the satisfaction overall score and the explanatory variables with their B coefficient and Beta weight were shown in

Table 2. Mean scores and other statistics of medication satisfaction with asthma treatment in each domain and of the over all score

Domains of Medication Satisfaction	Scores of Medication Satisfaction with Asthma Treatment				
	Mean	Minimum	Maximum	Standard Deviation	Standard Error
Effectiveness	4.15	1.63	5.00	0.56	0.05
Ease of use	3.99	2.71	5.00	0.41	0.04
Burden of medication	3.57	1.50	4.83	0.62	0.06
Side-effects and worries	3.22	1.40	5.00	0.74	0.07
Overall score	**3.73**	**2.63**	**4.71**	**0.38**	**0.04**

Table 3. Multiple regression model to explain the relationship between the explanatory variables and the satisfaction overall score and the coefficients of the explanatory variables

Explanatory Variables	B Coefficient	Standard Error	Beta Weight	p-Value
(Constant)	3.106	0.482		0.000
Adherence score	0.216	0.065	0.311	0.001
Male	-0.027	0.087	-0.030	0.760
Age	-0.001	0.003	-0.021	0.821
Length of time having diagnosis of asthma	0.0003	0.0002	0.126	0.177
Two inhalers with others	-0.093	0.074	-0.122	0.211
Married	0.036	0.102	0.043	0.726
Widowed	0.053	0.186	0.029	0.774
Undergraduate level and higher	-0.132	0.082	-0.173	0.112
Poorly-controlled	0.244	0.115	0.213	0.036
Well-controlled	0.116	0.077	0.150	0.132
R	**0.501**			
R square	**0.251**			
Adjusted R square	**0.176**			
R square change	**0.251**			
F change	**3.320**			
p-value F change	**0.001**			

table 3. The satisfaction overall score could be explained by the explanatory variables in this regression model (F = 3.32, p = 0.001). The explanatory variables explained 25.1 percent (adjusted R square = 0.176) of the satisfaction overall score. The most important explanatory variable was the adherence score (Beta weight = 0.311) followed by the second most important explanatory variable which was the poorly-controlled variable (Beta weight = 0.213). Of the explanatory variables, only these two variables had statistically significant association with the satisfaction score in the MRA model. Other explanatory variables in the MRA model included gender (male), age, length of time having diagnosis of asthma, number of drugs used (two inhalers with others), marital status including married and widowed, educational level (undergraduate level and higher), and asthma control level (well-controlled).

The equation to explain the relationship between the explanatory variables and the satisfaction overall score is in the following:

Satisfaction overall score = 3.106 + 0.216 adherence score + 0.244 poorly-controlled level

The magnitude of correlation was arranged in order of Pearson's correlation (r) values. Therefore, the magnitude of correlation with satisfaction overall score was arranged from adherence score, two inhalers with others, poorly-controlled level, and under graduate

Table 4. Correlations between the explanatory variables and the overall scores and correlations matrix of all the explanatory variables

	Overall Score	Adherence Score	Male	Age	Length of Time	Two Inhalers with Others	Married	Widowed	Undergrad level and higher	Poorly-controlled	Well-controlled
Overall score	1										
Adherence score	0.38**	1									
Male	-0.07	-0.05	1								
Age	0.03	-0.05	0.01	1							
Length of time	0.04	-0.06	0.02	0.10	1						
Two inhalers with others	-0.26**	-0.30**	0.04	-0.13	0.05	1					
Married	0.04	-0.08	0.27**	0.15	0.10	-0.16*	1				
Widowed	-0.04	-0.12	0.08	0.21*	0.07	0.02	-0.33**	1			
Undergrad level and higher	-0.21*	-0.03	0.12	-0.19*	0.15	0.13	-0.44**	0.21*	1		
Poorly-controlled	0.23**	0.12	-0.02	-0.004	-0.01	0.20*	-0.17*	0.18*	-0.06	1	
Well-controlled	0.06	0.07	0.08	0.03	0.23**	0.11	-0.17*	-0.10	-0.02	-0.32**	1
Mean	3.73	4.34	0.24	54.13	192.60	2.55	0.70	0.05	0.51	0.13	0.42
Standard deviation	0.38	0.55	0.43	12.25	151.30	0.50	0.46	0.21	0.50	0.33	0.50

*$p < 0.05$

**$p < 0.01$

level and higher (r = 0.38, -0.26, 0.23, and 0.21, respectively).

Firstly, adherence score had significantly largest correlation with satisfaction overall score. It meant the more adherence score the more satisfaction overall score. Secondly, patients who had two inhalers with others had negative correlation with satisfaction overall score. It meant the patients who had two inhalers with others had less satisfaction overall score than the patients who had two inhalers. Thirdly, patients who had poorly-controlled level had significant positive correlation with satisfaction overall score. It meant the poorly-controlled patients had the higher satisfaction overall score than the totally-controlled patients. Finally, patients who finished under graduate level and higher had negative correlation with satisfaction overall score. It meant the patients who finished undergraduate level and higher had less satisfaction overall score than the patients who finished lower level than undergraduate.

Discussions and Conclusions

This study showed that adherence score had significantly largest positive association with satisfaction overall score. The patients who had higher adherence score also had more satisfaction overall score than the patients who had lower adherence score. Poorly-controlled level also had significant association with satisfaction overall score. Thus, the patients who had poorly-controlled level had more satisfaction overall score than the patients who had totally-controlled level.

In the correlation matrix (Table 4), the patients who had two inhalers with others, and the patients who finished undergraduate level and higher, had significant negative correlation with satisfaction overall score. The associations were reasonable since using more medications could disturb patient satisfaction more than less medications,[10] and patients who had higher education may have higher expectation than lower educational level. However, these two variables did not have statistically significant association with patient satisfaction overall score in the MRA model.

It is reasonable that adherence was associated with satisfaction level in a positive direction. The patients who had good adherence to combination inhaler also had higher satisfaction level than the patients who had poor adherence. This finding agrees with a previous study by Koch et al.[11]

However, level of asthma control affect satisfaction level in a negative direction. The patients who had poorly-controlled level had more satisfaction overall score than the patients who had totally-controlled level. The satisfaction level was relatively lower when the patients had totally-controlled level may be due to the reason that their expectation of the treatment is higher than the patients who had poorly-controlled level.

It can be concluded that there are two major factors associating with the patients' satisfactions to combination inhaler drugs were medication adherence, and asthma controlled

level. There were a medium significant relationship between the explanatory variables and the satisfaction overall score in this model. The variance within the explanatory variables could explain 25 percent of variance within the satisfaction overall score. It is well-accepted that we must provide the special advice about the asthma medication to the patients who had lower levels of adherence. However, concerning the results of our study, we should not ignore the patients who had totally-controlled asthma. Lower satisfaction among this group of patient indicated their high expectation in medication satisfaction. The increasing of medication satisfaction could be achieved by providing. patients with adequate information regarding their treatment regimens in order to enhance their knowledge and improving their satisfaction towards using combination inhaler drugs.

Recommendations

This study provided further evidence of the factors influencing satisfaction of asthmatic patients treated with combination inhaler. The result on the influencing factors affecting satisfaction with combination inhaler could be used to improve the standard guidelines and the advice for counseling the asthmatic patients individually to give better treatment outcome.

In addition, larger scale study would be beneficial to further validate the finding of this study. Other factors that should be considered in future studies are family support, adherence with oral medications, good inhaler technique use, and psychological factors that may influence satisfaction with medications.

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