

The Current Conditions of Adult Asthma Patients: Health Status, Symptoms Management, and Antiasthmatic Prescription

Kaoru Fujisaki, RN, DNSc^{*1}, Kazuhiko Fujisaki, MD^{*2}

^{*1} Osaka University Graduate School of Medicine, Nursing Science

^{*2} Gifu University School of Medicine, Medical Education Development Center

Key words : asthma, adult, disease management, medication, compliance

<Summary>

Background & Objective

More than 10 years has already passed since doctors other than respiratory disease specialists recognized that inhaled steroids were the mainstay of asthma therapy and the use of inhaled steroids became more prevalent. The purpose of this study is to investigate current health status and symptoms management of the patients along with antiasthmatic prescription.

Methods

A cross-sectional survey was conducted by using a self-report questionnaire. Convenience sampling was used. But for generalization of the results, the survey was conducted in cooperation with as many respiratory disease specialists as possible at municipal hospitals in several areas, and specific hospitals such as university hospitals were excluded.

Results & Conclusions

Subjects were receiving continued treatment at 11 municipal hospitals. Three hundred sixty-seven outpatient complete answers replied.

The use of inhaled steroids was recognized as the mainstay of asthma therapy in clinical practice; the prevalence rate was more than 90%.

Meanwhile, most of the asthma patients were elderly, they had received medical treatment for a long period and no sign of significant improvement was observed in history of severe asthma and current health status.

The physicians prescribed drugs based on the following criteria; inhaled steroids, oral steroids and drugs other than steroids were prescribed according to level of severity, requiring a hospital visit without an appointment and patient complains, respectively. Inhaled $\beta 2$ agonists were still prescribed to more than 60% of the patients, especially to male patients, which was considered as a problem regarding death from asthma.

Medication compliance was not always high even in the patients regularly visiting a hospital, and in particular, the younger patient showed poor compliance. The following also can not be used as indicators for the assessment of medical compliance because of the little influence on it; severity of health status impairment, history of severe asthma and antiasthmatic prescription. The asthma therapy should be conducted in considering these results.

1. Introduction

Bronchial asthma (hereinafter abbreviated as asthma) is an allergic inflammatory disease characterized by reversible obstruction of the airways and hypersensitivity, and is a chronic disease requiring continuous treatment and specific health behaviours for therapeutic regimen treatment^{1,2)}. It is a main concern for home doctors to control asthma adequately, because asthma has been a very common disease in primary care settings and the following asthma therapy is at a major turning point³⁻⁶⁾.

According to the latest "Outline of patient survey" published by Ministry of Health Labour and Welfare in 2002, the total number of asthma patients in Japan is 1,069,000 (the estimated number of patients by disease types); 9 inpatients and 111 outpatients per 100,000 population⁷⁾. In terms of adult patients, those numbers are similar to the number of in- or outpatients with other chronic diseases; 11 inpatients with hypertension and 146 outpatients with diabetes.

It is acknowledged that the control of symptoms in asthma patients became considerably easier due to the development and high prevalence of inhaled steroids since the 1990s^{8,9)}. Those changes might be contributed to a decrease in the number of people dying from asthma in Japan, which had been about 5,000 per year until recently, but fell to 3,701 in 2003¹⁰⁾. Large-scale surveys were, then, conducted among adult asthma patients since the late 1990s, and the results on symptoms management of the patients have been reported¹¹⁻¹⁵⁾.

More than 10 years has already passed since doctors other than respiratory disease specialists recognized that inhaled steroids were the mainstay of asthma therapy and the use of

inhaled steroids became more prevalent, and 5 years has passed since the above surveys were conducted. Those facts raise questions as to whether disease severity and daily control levels in asthma patients have improved compared with the results of the surveys. It has clinical significance to understand symptoms management of asthma patients at regular intervals, because the number of patients with asthma has not decreased, although the number of those dying from asthma has decreased.

We, therefore, conducted a survey on adult asthma patients in Japan to investigate current health status and symptoms management of the patients along with antiasthmatic prescription.

2. Methods

A cross-sectional survey was conducted by using a self-report questionnaire to adult asthma patients.

1) Subjects

The subjects were asthma patients aged 20 years or older and receiving continued treatment for 6 months or longer by a primary physician specialized in respiratory diseases at a municipal hospital with a bed capacity of 100 to 400.

Convenience sampling was used. But for generalization of the results, the survey was conducted in cooperation with as many respiratory disease specialists as possible at municipal hospitals in several areas, and specific hospitals such as university hospitals were excluded.

2) Survey items

Based on previous studies, the following sur-

vey items were selected to comprehend anti-asthmatic prescriptions and symptoms management of the patients; i) age, ii) sex, iii) age of onset and total years with asthma, iv) history of sever asthma (frequency of the experience of hospitalisation due to asthma, unconsciousness, intubations), v) severity of asthma, vi) level of requiring a hospital visit without an appointment for the past 6 months vii) incidence of subjective symptoms for the past few months, viii) the name and amount of prescribed antiasthmatic agents, ix) level of hospital visit / medication compliance.

The question v), vi) and viii) were answered by the primary physicians, and the others were by the patients.

3) Data Collection

In Survey, doctors at cooperating institutions explained about the survey to their outpatients on their visits, and asked them to participate. Only when the patient consented, the doctor filled in some part of the questionnaire in reference to the patient's medical history, and gave the patient a set of the survey request letter, the questionnaire, and an envelope with return postage. The patient brought it home to fill in and mailed back to the investigator.

4) Ethical considerations

The surveys were conducted anonymously. The participants were assured that the data would be used only for the study and discarded immediately after analysis. In Survey, to make sure that patients would not feel the request for participation obligatory, it was explained orally and in a written form that the patient was free to make a final decision on returning the com-

pleted questionnaire, there was no need to tell the doctor whether the questionnaire was sent back, and participation would not affect medical care to be provided or the relationship with the doctor.

This study was approved by the Research Ethics Committee of St. Luke's College of Nursing in 2002 prior to the study implementation.

3. Results

The survey was conducted from August 2003 to May 2004. The questionnaires were distributed to 964 individuals at 11 institutions, and 403 responded (41.8% collected). After the questionnaires with incomplete answers were excluded, data from 367 individuals were selected for analysis.

The subjects were 171 males (46.6%) and 196 females (53.4%), and the sex ratio was about the same. Sex difference was statistically tested in all of the items ($p < 0.05$ level of significance). The results showed no significant difference between the genders in any of the items except "Prescription rate of inhaled β_2 agonists". More males were prescribed inhaled β_2 agonists than females ($p=0.036$, Fisher's exact test).

1) Health status and symptoms management of asthma patients

(a) Basic attributes

The average age of the patients was 55.8 ± 16.0 years. Many of the enrolled patients were elderly, but the age range was wide; 19.9% aged from 20 to 40 years old, 48.5% from 41 to 65 years old and 31.6% over 66 years. Figure 1 shows the age distribution of the patients per 10-year age group (Fig.1) .

(b) Previous history of asthma

Age of onset was from 0 to 75 years; mean 36.4 ± 19.5 years, mode 45 years, median 39 years. It showed bimodal distribution with the first peak in childhood onset group at around 5 years old, and the second peak in the adulthood onset group at the age of 45-50.

The total years with asthma were longer; mean 17.9 ± 12.6 years, mode and median 15 years, maximum 66 years. The total years with asthma were not always compatible with age of onset and current age because of remission and exacerbation.

Of the patients, 54.8% had the experience of hospitalisation due to asthma, of which 37.0% had it more than once; 19.9% had unconsciousness; and 9.0% had intubations (Fig.2).

(c) Current health status

According to the asthma severity classification, 18.3% of the patients were in Intermittent (Step 1), 37.9% in Mild persistent (Step 2), 34.3% in Moderate persistent (Step 3), and 9.5% in Severe persistent (Step 4).

Regarding the requirement of a hospital visit without an appointment, 71.1% of the patients regularly visited a hospital only with an appointment. About 30% required a hospital visit without an appointment, of which 10% or more required frequently (Fig.3).

The incidence of subjective symptoms reported by the patients was as follows; 33.2 % of the patients had no symptoms for the past 2 to 3 months, and the rest, about two-third of the patients, led their lives with various levels of subjective symptoms of asthma (Fig.4).

Fig.1 Age distribution

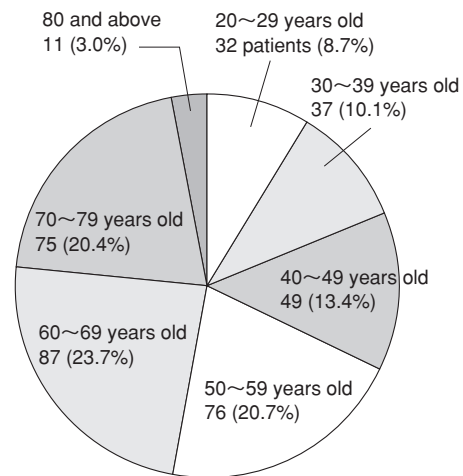


Fig.2 Experience of near fatal Asthma (NFA)

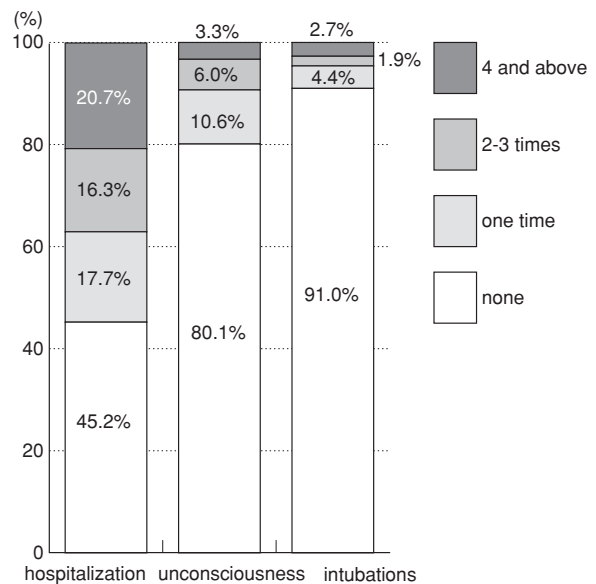


Fig.3 Asthma control level according to the requirement of unscheduled hospital visit in this half of year

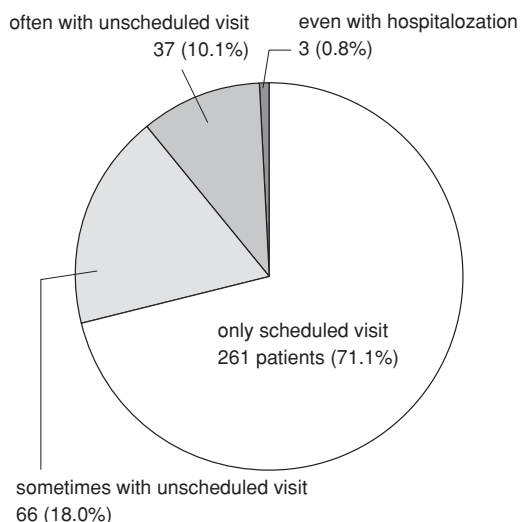


Fig.4 Frequency of asthma symptoms perception within a few months

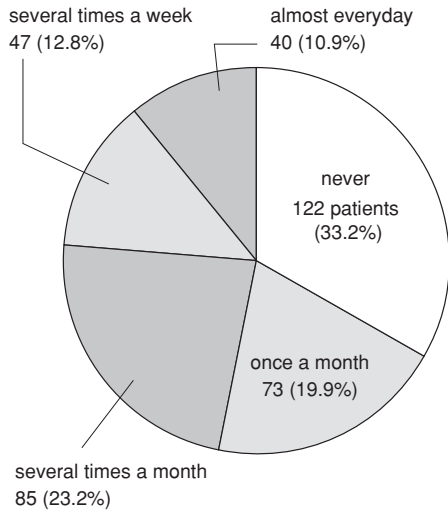


Fig.6 Inhaled corticosteroids prescription

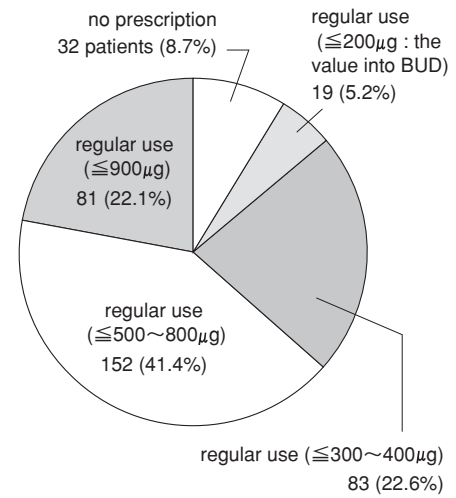


Fig.5 Oral coeticosteroids prescripton

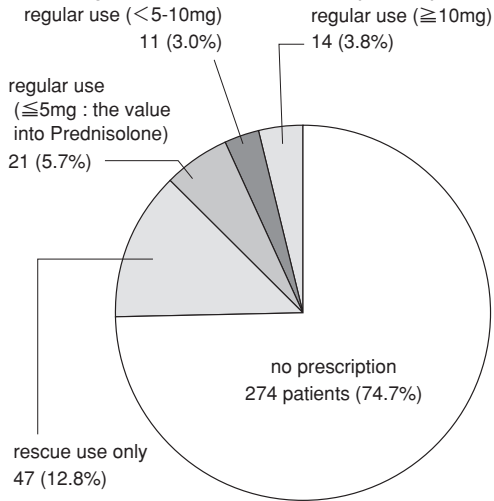


Fig.7 Number of prescription medicine excluding corticosteroids

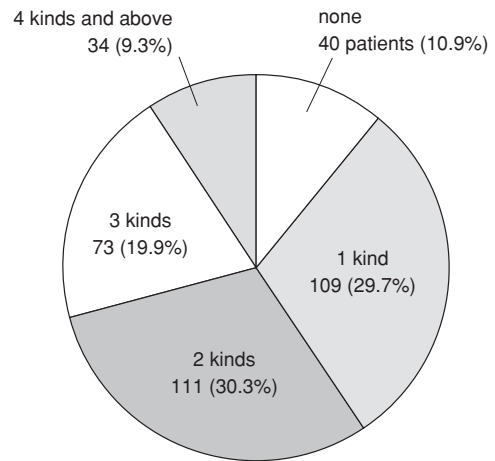
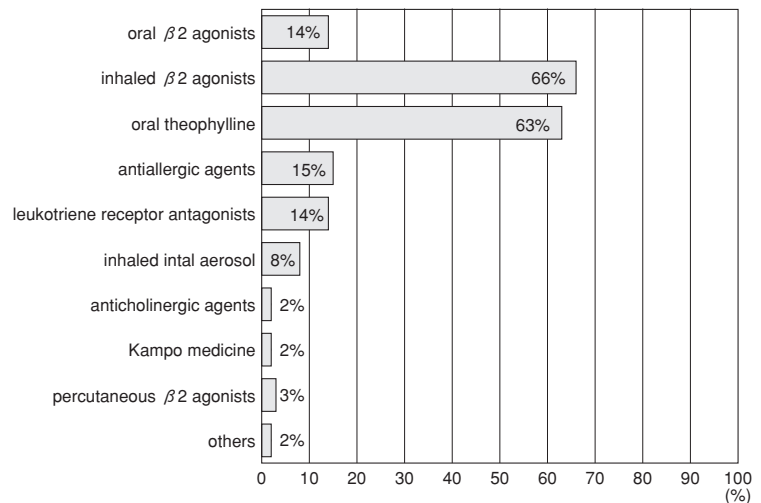


Fig.8 prescription rate of various antiasthmatic medicine



原著

Fig.9 Compliance with hospital visit and medication



About 65% of the patients were prescribed inhaled $\beta 2$ agonists or theophylline; 15% were oral $\beta 2$ agonists, antiallergic agents or leukotriene receptor antagonists; and 7.9% were intal aerosol (Fig.8).

(e) Hospital visit and medication compliance

A five-point scale was used to assess hospital visit and medication compliance, and answered by the patients.

Of the patients, 85.0% replied that they "Regularly visit a hospital" and 10.1% replied "Almost regularly visit a hospital" (Fig.9).

Individual variability was slightly higher in medication compliance than in hospital visit compliance. Of the patients, 61.3% replied that they "Assuredly follow the directions for the use of medicine" and 32.2% replied "Almost follow the discretions for the use of medicine". Meanwhile, 3.0% replied that they "Find it difficult to give a clear-cut answer" and 2.7% replied "Rarely follow the discretions for the use of medicine".

(d) Antiasthmatic prescription

About one-fourth of the patients, 25.3%, were prescribed oral steroids; 12.8% were for rescue use and 12.5% were for regular use (Fig.5).

Of the patients, 91.3% were prescribed inhaled steroids; 27.8%, 41.4 % and 22.1% were prescribed 400 μg or less, 500 to 800 μg and 900 μg or more per day, respectively, in the conversion and integration of the values into BUD (Fig.6).

The number of prescribed drugs other than steroids was 1.9 ± 1.2 types per person in average (Fig.7).

2) Correlation between indices of health status and symptoms management

Kendall's rank correlation coefficient (τ) was used to calculate the correlation between each

Table.1 Correlation between indices of health status and symptoms management

	age	duration	severity	unscheduled visit	symptoms perception	NFA: hospitalization	NFA: unconsciousness	NFA: intubations	oral corticostero	inhaled corticosteroids	other medicine	hospital visit compliance
age	1.00											
duration of asthma	.08*	1.00										
disease severity	.13**	.15**	1.00									
requirement of unscheduled visit	.15**	.15**	.47**	1.00								
frequency of asthma symptoms perception	-.05	.18**	.25**	.32**	1.00							
NFA: hospitalization	.10*	.28**	.34**	.37**	.21**	1.00						
NFA: unconsciousness	.01	.13**	.22**	.21**	.12*	.36**	1.00					
NFA: intubations	.10*	.07	.13**	.17**	.04	.19**	.43**	1.00				
oral corticosteroids prescription	.15**	.14**	.41**	.68**	.26**	.32**	.10*	.11*	1.00			
inhaled corticosteroids prescription	.04	.06	.51**	.35**	.18**	.24**	.18**	.17**	.25**	1.00		
other prescription medicine	.03	.18**	.28**	.32**	.30**	.32**	.20**	.17**	.24**	.35**	1.00	
hospital visit compliance	.21**	.07	.11*	.04	-.09*	.09	-.00	.01	.03	.05	.08	1.00
use of medicine compliance	.25**	.07	.20**	.12*	.01	.12*	.09	.03	.03	.11*	.16**	.31**

Kendall's rank correlation coefficient τ

** p < 0.01, * p < 0.05

index. The results are shown in the table ($p < 0.05$ level of significance) (Table.1).

(a) Indices related to "History of severe asthma"

Significant correlations were observed between the experience of hospitalisation, unconsciousness and incubations ($\tau = 0.36, 0.19, 0.43$). Generally, there were significant correlations of those indices with the indices related to "Health status" and "Antiasthmatic prescription".

(b) Indices related to "Health status"

There was a moderately significant correlation between "Severity" and "Level of requiring a hospital visit without an appointment" assessed by the physicians ($\tau = 0.47$). However, those indices were only weakly correlated with "Incidence of subjective symptoms" reported by the patients ($\tau = 0.25, 0.32$).

(c) Correlation between indices of "Health status" and "Antiasthmatic prescription"

The degree of correlation was assessed between each index of "Health status" and three indices of "Antiasthmatic prescription". The results showed a very strong correlation between the following indices; "Severity" and "Prescribed amount of inhaled steroids" (inhaled steroids 0.51 > oral steroids 0.41 > drugs other than steroids 0.28); "Level of requiring a hospital visit without an appointment" and "Prescribed amount of oral steroids" (Oral steroids 0.68 > inhaled steroids 0.35 > drugs other than steroids 0.32); "Incidence of subjective symptoms" and "The number of prescribed drugs other than steroids" (Drugs other than steroids 0.30 > oral steroids 0.26 > inhaled steroids 0.18).

(d) Indices related to "Compliance"

Only a weak correlation was observed between "Hospital visit compliance" and "Medical compliance" ($\tau = 0.31$). Although the correlations of the both indices with "Age" were weak, between 0.2 and 0.3 (hospital visit: $\tau = 0.21$, medication: $\tau = 0.25$), those with the indices of "History of severe asthma", "Health status" and "Antiasthmatic prescription" were not significant or very low.

4. Discussion

1) Antiasthmatic prescription and symptoms management behaviours

The result of this study showed that the rate of the asthma patients prescribed inhaled steroids was 91.3%, which was obviously higher than that in the large-scale surveys conducted 5 years ago, 58 to 80%¹¹⁻¹⁵). However, the use of oral $\beta 2$ agonists decreased from 30- 60% to 14.2%, and theophylline decreased from 80- 95% to 62.9%. It was, therefore, confirmed that inhaled steroids were the mainstay of asthma therapy instead of oral $\beta 2$ agonists and theophylline.

The results 2)-(c) showed that inhaled steroids, oral steroids and drugs other than steroids were prescribed by the physicians according to level of severity indicating daily control levels of the disease, level of requiring a hospital visit without an appointment and level of patient complaints, respectively. This result suggested that indices of prescription were slightly different between the drugs. It was, thus, confirmed that the drugs were appropriately prescribed according to "Daily symptoms management", "Frequency and level of the attack" and "Level of subjective symptoms and

patient complaints".

The prescription of oral β_2 agonists decreased, while inhaled β_2 agonists were still prescribed to 66.1% of the patients; the ratio of the male patients prescribed inhaled β_2 agonists was significantly higher than that of the female.

It is unlikely that the physicians choose a medication based on sex, and thus the sex difference might be related to patient preferences and requirements. Asthma patients might prefer using a medication familiar to them, because a lot of the patients have suffered from asthma for a long period. Considering excessive use and mental dependence of inhaled β_2 agonists could be a risk factor for death from asthma^{16~19)}, changes to an appropriate antiasthmatic prescription should be promoted further with careful patient education on medication.

The results of 2)-(d) showed that higher medication compliance was not always noted even in the patients regularly visiting a hospital. Therefore, hospital visit compliance should be distinguished from medication compliance, and it is necessary to promote both compliances. Medication compliance was not greatly affected by severity of health status impairment, history of severe asthma or antiasthmatic prescription, but by age; the younger the age of the patients, the poorer the compliance.

Previous research has reported that age and/or gender were significant predictors, with younger asthma patients and male asthma patients being more likely to not to be adherent^{20~24)}. These results have important implications for the types of the patients who should selectively be provided patient education on medication.

2) Basic attributes and medical histories of asthma patients

Although the use of inhaled steroids has become more prevalent, sex ratio, age, years with asthma and age of onset in this study were almost the same as in the large-scale surveys; the patients had received medical treatment for a long period and many of them were elderly. Similar results were found in history of severe asthma.

Additionally, the following about asthma patients have been reported; the rate of suffering from psychosomatic disorder and depressive tendencies was higher in late-middle aged or elderly patients with moderate asthma; after the onset of asthma, many cases of depression and neurosis were observed in old-aged asthma patients^{25,26)}; patients with asthma for a long period were more likely to suffer from psychosomatic disorder; and the older the age of onset, the more the patients had neuroticism and alexithymia²⁷⁾. The asthma therapy should be conducted in considering these aspects.

3) Current health status

There was no considerable change in current health status. The result might be related to a characteristic of asthma as a lingering illness. It is, therefore, necessary to observe changes in health status and symptoms management of asthma patients over a long period.

The results of 2)-(b) showed that consistency was not always high between health status assessed by the physicians and incidence of subjective symptoms reported by patients. Similar results have been reported overseas^{28~30)}. Therefore, the influences of vexations and difficulties the patients have in daily life are not

small, even their severity and requirements of a hospital visit without an appointment are not particularly high. Nowadays, the improvement of QOL, the subjective assessment of "life", is recognised as the mainstay of asthma therapy along with the improvement of objective indices such as peak flow rates¹²⁾. Further studies on QOL of asthma patients will be conducted based on the results of the study, especially the level of the consistency between health status assessed by the physicians and the patients.

5. Conclusions

The use of inhaled steroids was recognized as the mainstay of asthma therapy in clinical practice; the prevalence rate was more than 90%. Meanwhile, most of the asthma patients were elderly, they had received medical treatment for a long period and no sign of significant improvement was observed in history of severe asthma and current health status.

Consistency was not always high between the indicators for the physician's assessment, "Severity" and "Level of requiring a hospital visit without an appointment", and "Incidence of symptoms in daily life" reported by the patients. The physicians prescribed drugs based on the following criteria; inhaled steroids, oral steroids and drugs other than steroids were prescribed according to level of severity, requiring a hospital visit without an appointment and patient complains, respectively. Inhaled β_2 agonists were still prescribed to more than 60% of the patients, especially to male patients, which was considered as a problem regarding death from asthma.

Medication compliance was not always high even in the patients regularly visiting a hospital,

and in particular, the younger patient showed poor compliance. The following also can not be used as indicators for the assessment of medical compliance because of the little influence on it; severity of health status impairment, history of severe asthma and antiasthmatic prescription. The asthma therapy should be conducted in considering these results.

(This research paper is a part of PhD thesis submitted to St. Luke's College of Nursing, Graduate School)

Acknowledgements

We are grateful to the asthma patients for participating in the survey, the doctors and medical staff for graciously cooperating in the survey despite being busy at work, and Professor Sigeko Horiuchi at St. Luke's College of Nursing, Graduate School and others for providing novel advice.

Reference

- 1) National Heart, Lung, and Blood Institute, National Institutes of Health; Global Initiative for Asthma: Global strategy for asthma management and prevention. NHLBI/NIH Workshop Report, January 1995; NIH Publication No.95-3659.
- 2) National Heart, Lung, and Blood Institute, National Institutes of Health; National Asthma Expert Panel Report 2, Education and Prevention Program: Guidelines for the diagnosis and management of asthma. NHLBI/NIH Workshop Report, April 1997; NIH Publication No.97-4051.
- 3) Jacobs, J.E., Van de Lisdonk, E.H., Smeele, I, et al.: Management of patients with asthma and COPD: monitoring quality of life and the

原 著

- relationship to subsequent GP interventions. *Fam Pract* 2001; 18: 574-580.
- 4) Ganse, V.E, Leufkens, H.G., Vincken, W., et al.: Assessment asthma management from interviews of patients and family physicians. *J Asthma* 1997; 34: 203-209.
- 5) Byer, B. & Myers, L.B.: Psychological correlates of adherence to medication in asthma. *Psychology, Health & Medicine* 2000; 5: 389-393.
- 6) Mancuso, C.A., Rincin, M.A., et al.: Patients' expectations of asthma treatment. *J Asthma* 2003; 40: 873-881.
- 7) Ministry of Health, Labour and Welfare, Official Web Site (2004/12/27) : <http://www.mhlw.go.jp/toukei/saikin/hw/kanja/02/>.
- 8) National Heart, Lung, and Blood Institute, National Institutes of Health; US Department of Health and Human Services: Your asthma can be controlled: expect nothing less. NIHHLBI/NIH Workshop Report, September 1991; NIH Publication No.91-2664.
- 9) Suissa, S., Ernst, P., Benayoun, S., Cai, B.: Low-dose inhaled corticosteroids and the prevention of death from asthma. *N Engl J Med* 2000; 343: 332-336.
- 10) Ministry of Health, Labour and Welfare, Official Web Site (2004/12/27) : <http://www.mhlw.go.jp/toukei/saikin/hw/jinkou/geppo/nengai03/toukei5.html>.
- 11) Haruta, Y. Ikegami, Y, Tamagawa, K., et al.: Kikanshizensoku kanjyano QOL anketo, 1,385 reino syukei kekka GENDAIIRYO 2000; 32: 2534-2544.
- 12) Miyamoto, A., Akiyama, K, Ota, T., et al.: Kanagawakenka niokeru seijinkikansizensokukanjya 6,000 reino anketo syukeikekka. GENDAIIRYO 2001; 33: 2791-2802.
- 13) Niigata Zensokutiryō Kenkyukai : Anketotyousa niyoru niigatakennaino seijizensokuno genjyo kaiseki. SINYAKU TO RINSHO 2001 ; 50 : 461-472.
- 14) Yuko Komase, Yuuji Miyakuni, Arai, M., et al.: Clinical features of adult asthmatic patients consulting our hospital. Analyzed by a Disease-specific Questionnaire. *St. Marianna M J* 1999 ; 27 : 763-771.
- 15) Soda, R., Takahashi, K., Tamaki, A, et al.: Clinical study of bronchial asthma in adult, intractable asthmatics after introduction of guideline therapy. *Japanese J Allergology*: 44; 1387-1393.
- 16) Taylor, D.R., Sears, M.R., Herbison, G.P., et al. : Regular inhaled β -agonist in asthma: effects on exacerbations and lung function. *Thorax* 1992; 48: 134-138.
- 17) Comino, E.J., Henry, R.L., Mitchell, C.A., et al.: Asthma management and mode of acquisition of inhaled bronchodilators. *Aust N Z J Med* 1995; 25: 496-502.
- 18) Campbell, D.A., Luke, C.G., McLennan, G., et al.: Near-fatal asthma in south Australia: descriptive feature and medication use. *Aust N Z J Med* 1996; 26: 356-362.
- 19) Miyagawa, T. : The relation between inhaled beta-agonist use and death of asthma. *ARERUGI NO RINSHO* 1998; 18: 748-754.
- 20) Jessop, D.C. & Rutter, D.R.: Adherence to asthma medication: the role of illness representations. *Psychology and Health* 2003; 18: 595-612.
- 21) Cooke, L., Myers, L.B. & Derakshan, N.: Lung function, adherence and denial in asthma patients who exhibit a repressive coping style. *Psychology, Health & Medicine* 2003; 8:

原著

- 35-44.
- 22) Afari, N. & Schmalig, B.: Asthma patients and their partners: gender differences in the relationship between psychological distress and patient functioning. *J Asthma* 2000; 37: 153-161.
- 23) Harris, G.S., & Shearer, A.G.: Beliefs that support the behaviour of people with asthma: a qualitative investigation: *J Asthma* 2001; 38: 427-434.
- 24) Put, C., Van den Bergh, O, Demedts, M., Verleden, G: A study of the relationship among self-reported noncompliance, symptomatology, and psychological variables in patients with asthma. *J Asthma* 2000; 37: 503-510.
- 25) Saito, K. & Dohi, T., Tanabe, K., Nabe, M.: Aging effect of bronchial asthma evaluated by CAI. *Japanese J Psychosom Med Respiratory Disease* 1996; 13: 66-72.
- 26) Ebana, S.: Bronchial asthma in the middle age. *Japanese J Psychosom Med Respiratory Disease* 1996; 13: 57-60.
- 27) Yasumizu, E, Hashizume, M, Nishii, S., Nakai, Y.: A study on the relationship between the psychological features and the age of onset or duration of bronchial asthma. *Japanese J Psychosom Med Respiratory Disease* 1996; 13: 39-43.
- 28) Sawyer, S.M. & Fardy, H.J.: Bridging the gap between doctor's and patients' expectations of asthma management. *J Asthma* 2003; 40: 131-138.
- 29) Janson, S. & Reed, M.L.: Patients' perceptions of asthma control and impact on attitudes and self-management. *J Asthma* 2000; 37: 625-640.
- 30) Rietveld, S. & Prins, P.J.: Accuracy of

symptom perception in asthma and illness severity. *Children's Health* 2001; 30: 27-41.

連絡先：藤崎 郁

〒565-0879 吹田市山田丘1の7

大阪大学医学部保健学科

kaoruu@shas.med.osaka-u.ac.jp