

Time Trend in the Prevalence of Adult Asthma in Japan: Findings from Population-Based Surveys in Fujieda City in 1985, 1999, and 2006

Yuma Fukutomi^{1,2}, Masami Taniguchi¹, Junko Watanabe¹, Hiroyuki Nakamura², Yuko Komase³, Ken Ohta⁴, Akira Akasawa⁵, Takemasa Nakagawa³, Terumasa Miyamoto⁶ and Kazuo Akiyama¹

ABSTRACT

Background: The burden of asthma is recognized as an important public health problem worldwide. In most countries, the prevalence of asthma has been reported to increase in the last few decades. However, more recent epidemiological studies have shown that the prevalence of asthma has been flat or even decreasing after the 1990s in some developed countries. The recent time trend in the prevalence of adult asthma in Japan is unknown.

Methods: Population-based surveys were conducted three times in the same region, in 1985, 1999, and 2006, at Fujieda City, Shizuoka, Japan, and the results were reported previously. We compared the results of these surveys to reveal the time trend in the prevalence of adult asthma. Although the questionnaires used in these surveys were not exactly the same, the time trend was assessed by comparing the responses to relevant questions between questionnaires.

Results: The prevalences of wheeze following a common cold and dyspneal feeling at night increased significantly from 1985 to 1999 (4.2% to 7.6%, and 3.2% to 5.3%, respectively). The prevalences of lifetime asthma and current asthma also significantly increased from 1999 to 2006 (5.1% to 6.7%, and 1.5% to 3.4%, respectively).

Conclusions: The prevalences of asthma among adults in Fujieda City consistently increased from 1985 to 2006. There was no evidence that the prevalences were in plateau or decreasing. These findings suggest that more efforts are required to stop the increase in the burden of this disease in Japan.

KEY WORDS

adult, asthma prevalence, Japan, population-based study, time trend

ABBREVIATIONS

DALYs, disability-adjusted life years; ATS-DLD, American Thoracic Society-Division of Lung Disease; ECRHS, European Community Respiratory Health Survey; ISAAC, International Study of Asthma and Allergies in Childhood.

INTRODUCTION

Asthma is one of the most common chronic respiratory diseases, affecting an estimated 300 million peo-

ple worldwide, and in most countries, the prevalence of asthma has been reported to increase in the last few decades.^{1,2} Because of its high prevalence, the burden of this disease is internationally recognized as

¹Clinical Research Center for Allergy and Rheumatology, Sagami-hara National Hospital, ³St. Marianna University School of Medicine, Kanagawa, ²Department of Environmental and Preventive Medicine, Graduate School of Medical Science, Kanazawa University, Ishikawa, ⁴Division of Respiratory Medicine, Department of Medicine, Teikyo University School of Medicine, ⁵Department of Allergy, Tokyo Metropolitan Children's Medical Center and ⁶Japan Allergy Foundation, Tokyo, Japan.

Correspondence: Yuma Fukutomi, MD, Clinical Research Center for Allergy and Rheumatology, Sagami-hara National Hospital, 18-1 Sakuradaai, Minami-ku, Sagami-hara, Kanagawa 252-0392, Japan.

Email: y-fukutomi@sagami-hara-hosp.gr.jp

Received 16 October 2010. Accepted for publication 21 January 2011.

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an important public health problem. Indeed, asthma was the 25th leading cause of disability-adjusted life years (DALYs) lost worldwide in 2001.¹ However, more recently, after the 1990s, a ceiling effect or decline in the prevalence of asthma has been reported in recent studies from some developed countries.³⁻⁵ On the other hand, reports on the time trend in asthma prevalence in Japan have been limited and the recent trend in adult asthma in Japan is unknown. Knowing the prevalence and its time trend is important for health service planning.

Population-based surveys have been conducted on the adult population three times in the same region, in 1985, 1999, and 2006, at Fujieda City, Shizuoka, Japan, and the results were reported previously.⁶⁻⁸ In the 1985 survey, the prevalence of asthma (defined as meeting original criteria used for the study) among adult residents aged 15 yrs or more was reported to be 3.15%.⁶ That in the 1999 survey was reported to be 4.1%, which was significantly higher than that in the 1985 survey.⁷ In 2006, a postal survey was also conducted as part of a nationwide asthma prevalence survey.⁸

To reveal the time trend in adult asthma prevalence in Japan, we compared the results of these surveys. In the first and second surveys, an original questionnaire and the Japanese version of the American Thoracic Society-Division of Lung Disease (ATS-DLD) questionnaires⁹ were used. However, the third survey was performed using only the Japanese version of the European Community Respiratory Health Survey (ECRHS) questionnaire.^{8,10} Because we could not compare the results directly due to the difference in the questionnaires used, we compared the responses to relevant questions between questionnaires.

METHODS

DESIGN

We compared the results of population-based surveys conducted three times in the same region, in 1985, 1999, and 2006 at Fujieda City, Shizuoka, Japan. Fujieda City is located in a suburban area near Shizuoka City, which is the seat of the prefectural government of Shizuoka Prefecture. Shizuoka Prefecture is located in central Japan. Details of the three surveys are described below. This study was approved by the Ethics Committee of Sagami-hara National Hospital.

1985 SURVEY

The first survey was conducted in 1985 and is described elsewhere.⁶ The population of Fujieda City in 1985 was 111,985. The target subjects of this study were the entire 12,562 residents aged 15 yrs or more living in 20 selected towns, which was about 10% of the entire city population. These 20 towns are spread throughout the city and were selected after considering the location and degree of urbanization or indus-

trialization. The survey was performed door-to-door by the staff of residents' associations. The subjects were asked to participate in the survey and complete a self-administered original screening questionnaire on asthma symptoms and diagnosis (see Appendix). Subjects suspected of having asthma on the basis of the original screening questionnaire were then asked to answer a second questionnaire.

1999 SURVEY

A second survey was conducted in 1999 and is described elsewhere.⁷ The target subjects of the second survey were restricted to the entire 4187 residents aged 15 yrs or more in 4 towns, Horinouchi, Yokouchi, Kariyado, and Tanumanaka, selected from the 20 towns studied in the first survey. Horiuchi was one of the rural towns with a low asthma prevalence in the 1985 survey, and Yokouchi was one of the urban towns with a high asthma prevalence. Kariyado was selected to represent the northern part of the city with an intermediate prevalence and Tanumanaka was selected to represent the southern part of the city with an intermediate prevalence. The survey was also performed door-to-door by the staff of residents' associations. The subjects were asked to complete both the same screening questionnaire used in the 1985 survey and the Japanese version of the ATS-DLD questionnaire.⁹

2006 SURVEY

The third survey, which was a postal survey, was conducted in 2006 as part of a nationwide survey on adult asthma prevalence using the Japanese version^{8,10} of the ECRHS questionnaire^{11,12} and is described elsewhere.⁸ The target subjects of the third survey were the entire residents aged 20-79 yrs in the 4 towns that were studied in the 1999 survey. The subjects were asked to complete only the Japanese version of the ECRHS questionnaire.

PREVALENCES OF RESPIRATORY SYMPTOMS AND ASTHMA

The questions on asthma symptoms and diagnosis in the original screening questionnaire used in the 1985 and 1999 surveys are shown in the appendix and the responses to each question were compared directly. The questionnaire used in the 2006 survey was not the same as those used in the 1985 and 1999 surveys; therefore, we compared the responses to relevant questions between the questionnaires. Lifetime asthma in the 1999 survey was considered as an affirmative response to the question "Have you ever been diagnosed with asthma?" in the Japanese version of the ATS-DLD questionnaire, and that in the 2006 survey was considered as an affirmative response to the question "Q5 Have you ever had asthma?", followed by "Was this confirmed by a doctor" in the Japanese version of the ECRHS question-

Table 1 Studied subjects, methods, and questionnaires used in the three surveys

	1985 survey ⁶	1999 survey ⁷	2006 survey
Subjects	Entire residents aged ≥15 yrs in 20 towns	Entire residents aged ≥15 yrs in 4 towns	Entire residents aged 20-79 yrs in 4 towns
Method of survey	Door-to-door survey by residents' associations	Door-to-door survey by residents' associations	Postal survey
Target (n)	12562	4187	3935
Responders (n)	12152	3829	2710
Response rate	96.7%	91.5%	68.9%
Questionnaire	Original screening questionnaire + Secondary questionnaire	Original screening questionnaire + ATS-DLD questionnaire ⁹	Japanese version of ECRHS questionnaire ⁸

ATS-DLD, American Thoracic Society - Division of Lung Disease; ECRHS, European Community Respiratory Health Survey.

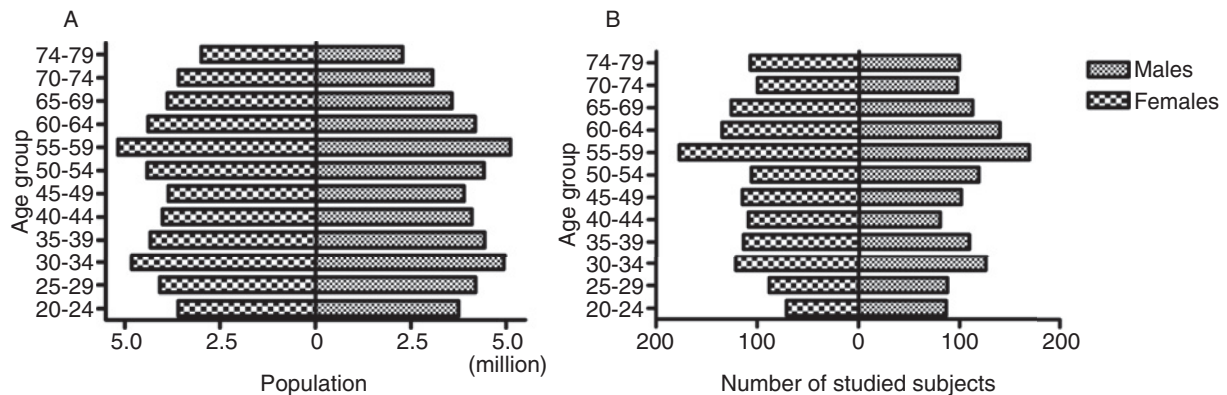


Fig. 1 Population distribution in entire of Japan (A) and that of subjects studied in the 2006 survey (B) according to age and gender.

naire.^{8,10} Current asthma in the 1999 survey was defined as meeting the following two criteria: (1) an affirmative response to the question “Have you ever been diagnosed with asthma?” in the Japanese version of the ATS-DLD questionnaire and (2) affirmative responses to any of the questions about asthma symptoms in the recent 2 years. Current asthma in the 2006 survey was defined as meeting the following two criteria: (1) an affirmative response to the question “Q5 Have you ever had asthma”, followed by “Was this confirmed by a doctor?” in the Japanese version of the ECRHS questionnaire,⁸ and (2) having at least one asthma-related symptom in the last 12 months, namely, an affirmative response to at least one of Q1-Q4 of the questionnaire. “Wheeze with breathlessness ever” in the 1999 survey was considered as an affirmative response to the question “Have you ever had an attack of wheezing that has made you feel short of breath?” in the Japanese version of the ATS-DLD questionnaire. “Wheeze with breathlessness in the last 12 months” in the 2006 survey was considered as an affirmative response to the question “Have you had wheezing or whistling in your chest at any time in the last 12 months?”, followed by “Q1.1 Have you been at all breathless when the wheezing noise was present?” in the Japanese

version of the ECRHS questionnaire.

ANALYSIS

Chi-square tests were carried out to assess the differences in the prevalences. The time trends of the prevalences were shown using a line chart with time in the x-axis and prevalence in the y-axis.

RESULTS

Differences in survey method, questionnaire used, and response rate are summarized in Table 1. The response rate in the 2006 postal survey was significantly lower than those in the 1985 and 1999 door-to-door surveys, because of the difference in the survey method ($p < 0.001$). Figure 1 shows the age distribution of the studied subjects in comparison with that of the entire Japanese population in 2006. Compared with the age distribution of the entire Japanese population, that of the studied subjects was slightly biased toward older individuals, reflecting that this city is located in a suburban area.

The prevalences of respiratory symptoms and asthma in the three surveys are shown in Table 2. The prevalence of patients with an affirmative response of “I have been diagnosed with asthma” in the original screening questionnaire significantly in-

Table 2 Prevalences of respiratory symptoms and asthma in each survey

	1985 ⁶	1999 ⁷	2006
Original screening questionnaire			
Wheezing following a common cold	4.2%	7.6%	ND
Dyspneal feeling at night	3.2%	5.3%	ND
Cough and wheezing during exercise	2.6%	6.8%	ND
Said to be asthmatic	3.5%	6.3%	ND
Diagnosed with asthma	2.1%	3.9%	ND
Respiratory symptoms in the Japanese version of the ATS-DLD questionnaire			
Wheeze with breathlessness ever	ND	4.4%	ND
Respiratory symptoms in the Japanese version of the ECRHS questionnaire			
Wheeze in the last 12 months	ND	ND	7.2%
Wheeze with breathlessness in the last 12 months	ND	ND	4.5%
Wheeze without a cold in the last 12 months	ND	ND	5.4%
Waking with tightness in the chest in the last 12 months	ND	ND	4.1%
Waking with an attack of shortness of breath in the last 12 months	ND	ND	2.4%
Waking with cough in the last 12 months	ND	ND	11.0%
Lifetime asthma	ND	5.1%	6.7%
Current asthma	ND	1.5% [†]	3.4% [‡]

ATS-DLD, American Thoracic Society - Division of Lung Disease; ECRHS, European Community Respiratory Health Survey. ND, not determined.

[†] defined as having any asthma symptom in the last 2 years.

[‡] defined as having any asthma symptom in the last 12 months.

creased from 1985 to 1999 (2.1% to 3.9%, $p < 0.001$). The prevalences of lifetime asthma and current asthma also increased significantly from 1999 to 2006 (5.1% to 6.7%, $p = 0.003$, and 1.5% to 3.4%, $p < 0.001$, respectively). The prevalences of subjects with affirmative responses to the questions on asthma symptoms in the original screening questionnaire were also increased from 1985 to 1999. The prevalence of wheeze and wheeze with breathlessness in the last 12 months in the 2006 survey was 7.2%, and 4.5%, respectively. However, they could not be compared with those in the 1999 survey because the 1999 survey did not have the same questions. The line chart of the prevalences shows a consistently increasing trend in the prevalences of asthma from 1985 to 2006 (see Fig. 2).

DISCUSSION

This study revealed an increasing trend in the prevalences of adult asthma and respiratory symptoms in Fujieda City, Shizuoka, Japan. This study is important in the sense that, although recent reports from some developed countries have shown a downward trend in asthma prevalence, our finding clearly indicates that an increasing trend still persists in this region. Even the ceiling effect was not observed. These data alert us to the possibility of further increase in the prevalence of asthma.

In terms of childhood asthma, there are controversial reports on the time trend in the prevalence in Japan. A study on elementary schoolchildren in Western Japan has shown that the prevalence of childhood asthma consistently increased from 1982 to 2002 by about two-fold.¹³ However, more recently, a study in Fukuoka City has shown that the prevalence of childhood asthma did not change significantly from 1996 to 2006.¹⁴ A population-based survey on schoolchildren in Kyoto has also shown a plateau with respect to the change in asthma prevalence from 1996 to 2006.¹⁵ One possible reason for the discrepancy between these reports is considered to be the regional difference in the time trend. A worldwide variation in the time trend in the prevalence of childhood asthma has already been described from the comparison between phases I and III of the ISAAC (International Study of Asthma and Allergies in Childhood) study.³ Therefore, we consider that there is also domestic regional variation in the trend in the prevalence of childhood asthma.

In terms of adult asthma, the time trend in the prevalence is hardly reported in Japan. To the best of our knowledge, there is no other report that shows a recent time trend in the prevalence of adult asthma. Our observation was performed in one of the suburban cities in central Japan. Therefore, the time trend in the prevalence of adult asthma in other regions is unknown. However, we consider that Fujieda city is a good representative of general suburban cities in central Japan, because this city is characterized by being relatively average in terms of climate and degree of urbanization or industrialization. This city does not specialize in any specific type of industry or agriculture.

The major limitation of this study is that the survey method and questionnaire used were not exactly the same in the three surveys. In particular, in the 2006 survey, neither the original screening questionnaire nor the ATS-DLD questionnaire were used; thus, the responses to the same questions could not be directly compared. Therefore, we compared the responses to questions considered to have the same meaning in the ATS-DLD and ECRHS questionnaires. One more limitation is that age and gender standardizations could not be performed because the age distributions

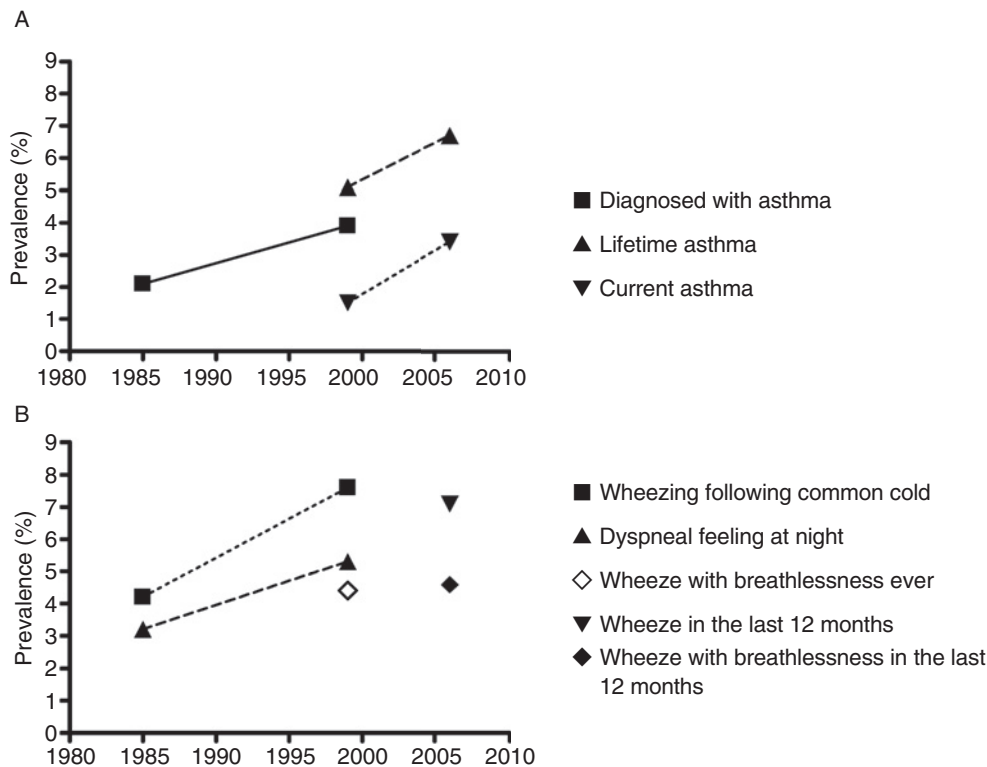


Fig. 2 Time trend in the prevalence of asthma (A) and respiratory symptoms (B) among adult residents in Fujieda City.

in the first and second surveys were obscure. However, no marked difference in asthma prevalence between age groups was observed in the 2006 survey (data not shown). We consider that the difference in the age distribution between the studies, if it exists, did not have a significant impact on the difference in the overall asthma prevalence.

In conclusion, our findings show that the prevalence of adult asthma and respiratory symptoms in Fujieda City consistently increased from 1985 to 2006. Although the time trend in the prevalence of adult asthma in other regions was not investigated, it is suspected that the prevalence of adult asthma in other regions also increased. These findings suggest that more attention should also be paid to the nationwide time trend in the prevalence of adult asthma in the next few decades. It is required to monitor the nationwide time trend in the future for better health service planning in Japan.

ACKNOWLEDGEMENTS

This work was supported by Health and Labour Sciences Research Grants from the Ministry of Health, Labour, and Welfare, Japan. The authors would like to thank all those involved in the data collection and processing, in particular, Dr. Koji Nakazawa and Dr. Junichi Nakano; as well as Kyoko Matsuno, Hiromi Morita, and Masanori Watanabe from the Depart-

ment of Health and Welfare of Fujieda City.

APPENDIX

Selected items concerning asthma in the original screening questionnaire used in the 1985 and 1999 surveys.

-
- 5)-2 I suffer from wheezing following a common cold.
1. Yes 2. No
- 3 I have had dyspneal feeling at night or early in the morning.
1. Yes 2. No
- 4 I cough or wheeze during exercise.
1. Yes 2. No
- 6 I have been said to be asthmatic.
1. Yes 2. No
- 8 I have been diagnosed with asthma.
1. Yes 2. No
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