

Inpatient asthma mortality in a tertiary referral hospital from 2000 to 2010

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Summary

Objective: Asthma is a common respiratory disease, the prevalence of which varies according to multiple demographic and economic factors. The availability of therapy and implementation of treatment guidelines has made the asthma mortality rate stable or gradually in decline. This study was conducted to evaluate the mortality trend of asthmatic patients who died during hospitalization in a tertiary care center.

Methods: A retrospective study of hospitalized asthmatic patients was conducted by reviewing medical records selected on the basis of primary or secondary diagnosis of asthma, between January 2000 and December 2010. The record review focused on the patients admitted to the institution who died with the principal diagnosis of asthma or having asthma as a co-morbidity.

Results: Between January 2000 and December 2010, a total of 540,365 patients were hospitalized. Of these, 553 patients were admitted with their primary or the co-principal diagnosis of asthma. In the asthma group that were admitted, 3 male and 9 female patients died during this period, or 2.17% of asthma admissions. Eight patients died in the first five years of the study, compared to 4 in the second half.

Conclusion: The mortality rate of asthma in hospitalized patients has been declining in the last ten years. This finding has shown the

importance of long-term medication used to provide good disease control and the use of asthma treatment guidelines which may lead to the overall decreases in mortality rate. (*Asian Pac J Allergy Immunol* 2012;30:193-6)

Key words: asthma, mortality, prevalence, study characteristics, patient admission, therapeutics

Introduction

Asthma is one of the most common chronic respiratory diseases, the prevalence of which is increasing in many countries and which varies according to multiple demographic and economic factors.^{1,2} Due to better understanding of pathophysiology, the availability of effective therapy and extensive application of evidence-based treatment guidelines in the past decade has made the asthma mortality rate stable or gradually in decline in several reports,³ including in Thailand. Thailand's annual per capita asthma mortality rate is 14.55 deaths per million population which is the 39th in the world. The total of 934 asthma deaths per year is relatively high, ninth among the 53 countries in the data base,⁴ but only 1/3 of asthma deaths actually occurred in hospital. The majority of the patients died of asthma either from failure to seek medical attention, or because they were not appropriately hospitalized when they should have been.⁵ Patients who have severe symptoms and significant limitation of airflow are at greater risk. However, fatal asthma exacerbations can occur in a minority of asthmatics whether the baseline level of the disease activity is mild, moderate or severe.^{6,7} Thus, any asthma exacerbation can potentially be fatal.

Therefore, this study was conducted to evaluate the mortality trend of asthmatic patients who died during hospitalization in a single tertiary care center during the past decade.

A decline in asthma mortality is expected following the introduction of the domestic⁸ and international asthma management guidelines, such as the Global Initiative for Asthma (GINA).⁹ The characteristics of those patients with acute asthma who died during hospitalization were also evaluated.

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Methods

A retrospective study of hospitalized asthmatic patients was conducted at King Chulalongkorn Memorial Hospital. The medical records were selected for study on the basis of a primary or secondary diagnosis of asthma, defined by the International Classification of Diseases [the 10th revision¹⁰ (ICD-10)] of asthma (J45) or status asthmaticus (J46), between January 2000 and December 2010. The record review focused on patients being admitted to the institution and who died with a principal diagnosis or co-morbidity of asthma. The subjects were excluded if they died from other conditions but had asthma as an underlying disease. The medical records of those who met all the criteria were manually reviewed in detail regarding baseline demographic data, medical condition, medication used, history of smoking and precipitating factors for asthmatic attack by two independent researchers. The data which were collected included the use of inhaled corticosteroid, long-acting beta-agonist and the assessment of disease severity according to GINA guideline. The study protocol was approved by the Ethics Committee of the Faculty of Medicine, Chulalongkorn University.

Results

Between January 2000 and December 2010, a total of 540,365 patients were hospitalized while 133,882 were admitted to the Department of Internal Medicine. Of these, 553 patients were admitted with a primary or co-principal diagnosis of asthma. The hospital records showed overall 16,168 patients died, or 2.99% of all hospitalized patients. The mortality of the hospitalized patients under the Department of Internal Medicine was 7.6 % or 10,888 cases. The ratio of asthma death cases compared to mortality in internal medicine was 0.001 to 0.003 (Table 1).

In the asthma group that were admitted, 3 male and 9 female patients died during this period which was 2.17% of asthma admissions. The average age of the patients who died during hospitalization was 63 years. Of these, 6 of them had cardiac arrest secondary to hypoxia upon hospital arrival. The hospitalized asthma mortality declined in comparison to the first half of this period, 2000-2005, during which there were 8 asthma deaths, while only 4 patients died during 2006 to 2010. The baseline data for the asthmatic patients who died during the period of study are shown in Table 2.

Table 1. In-patient asthma mortality at King Chulalongkorn Memorial Hospital

Year	Death in internal medicine dept	Death from asthma	Ratio asthma / internal medicine death
2000	1,072	3	0.003
2001	1,171	1	0.001
2002	1,009	3	0.003
2003	1,006	1	0.001
2004	893	0	0
2005	913	0	0
2006	936	2	0.002
2007	849	0	0
2008	846	1	0.001
2009	767	0	0
2010	726	1	0.001

Source: Division of Statistics and Medical Records, King Chulalongkorn Memorial Hospital,

Regarding the use of inhaled corticosteroids, 6 out of 12 patients had been using low-to-medium doses of inhaled corticosteroids as controller. None of the patients used long acting beta-agonist. Of the 12 patients, 10 of them used a short-acting beta-agonist as reliever medication, while two of the patients did not take any regular asthma treatment. Six out of 12 non-surviving asthma patients had uncontrolled asthma and three of them had partially controlled asthma, but only one of them had controlled asthma while the other 2 patients were unable to be defined regarding their asthma control level. The levels of asthma control in these patients are shown in Figure 1.

The precipitating factors that exacerbated the asthma attack of the patients who died are shown in Figure 2. Respiratory tract infection was the most prevalent co-morbidity.

Discussion

We have shown, in a retrospective study that the overall asthma mortality in hospitalized patients was 2.17% of asthma admissions in the past decade. Although the prevalence is higher than in previous reports from developed countries^[5, 11-14], the trend is declining in our region.^[15] In our study, we found that two-thirds of the cases died during the period of 2000 to 2005. The asthma deaths in the last five years have decreased to half of the level in the first 5-year period. This finding may reflect the improving quality of asthma treatment with better



Table 2. Demographic data

Case	Year	Gender	Age (y)	Medications**	ICS Dose	Level of Asthma control
1	2010	female	79	Salbutamol	None	Control
2	2008	male	59	Salbutamol, ICS	Medium	Uncontrolled
3	2006	female	76	Salbutamol, ICS	Low	Partial controlled
4	2006	female	74	Salbutamol, ICS	Low	Uncontrolled
5	2003	female	67	Salbutamol, ICS	Low	Uncontrolled
6	2002	male	54	Salbutamol, ICS	Medium	Uncontrolled
7	2002	female	77	Salbutamol, ICS	Low	Uncontrolled
8	2002	female	74	Berodual, Theophylline	None	Uncontrolled
9	2001	female	66	Salbutamol, Theophylline	None	Partial controlled
10	2000	female	27	Salbutamol	None	-
11	2000	female	70	None	None	-
12	2000	male	36	Nebulized Bronchodilator as needed	None	Partial controlled

**ICS: Inhaled corticosteroid, Berodual MDI: is a combine inhaler which contain fenoterol 50 mcg and ipratropium 20 mcg per puff

access to medication and wider use of national guideline for asthma management.

This study, nevertheless, has several limitations in term of the size of the population, i.e. it is a study from only one tertiary care center. Secondly, the study design was limited only to the inpatients hospitalized with asthma. This may not provide the full evaluation of both the quality and quantity of asthma managements in general, since the majority of patients are treated in an outpatient clinic.

It has been reported that asthma mortality was 2,878 for every annual 100,000 admission in a critical care subgroup analysis by Watson et al.,¹⁶ which was close to our study. This may reflect the group with severe asthma exacerbation and poor control before admission that usually did not do well in the critical care unit. Half of our patients had cardiac arrest due to hypoxia. These findings could be caused by the severity of asthma exacerbation and delayed treatment prior to admission. The concern raised in this study's findings is the under utilization of both inhaled corticosteroids (ICS) and long-acting beta-agonists, especially in patients with uncontrolled asthma. The possible explanation for these events is that they were not able to afford these medications which are considered to be expensive for uninsured patients. Moreover, the combination of ICS and long-acting beta-agonists can only be prescribed by pulmonary or allergy specialists, but not by general practitioners under the National Health Coverage Program, by which the majority of the citizens have access from their minimal medical coverage. On the other hand, the author considers

that the introduction of asthma management guideline in Thailand, first introduced in 1995 and revised four times in the last ten years,⁸ may have had an impact on the declining asthma mortality in hospitalized asthmatic patients.

In conclusion, the asthma mortality in hospitalized patients has been declining during the last ten years. These findings have shown the importance of long-term medication use to provide good disease control and the use of asthma treatment guidelines which may lead to an overall decrease in the mortality rate. It also reveals the risks of exacerbations that could be prevented or treated early when they occur. A further, multicenter study might be valuable in providing a better understanding of the national level of asthma mortality.

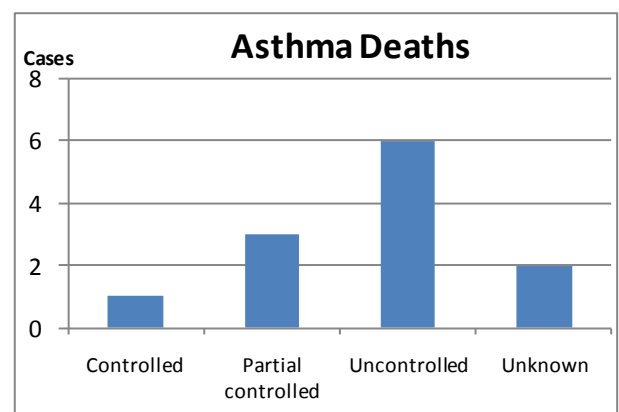


Figure 1. Asthma deaths categorized by the level of asthma control

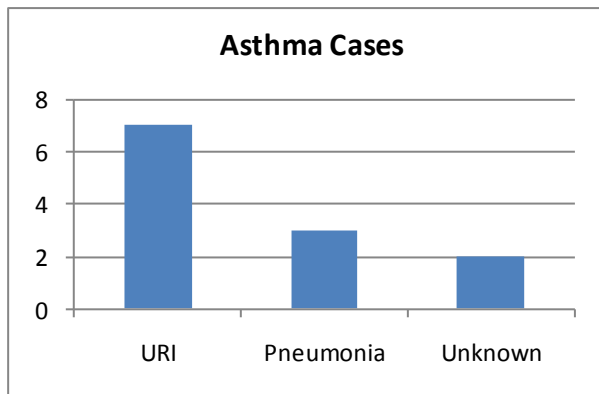


Figure 2. The trigger for asthma exacerbation prior to decease

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References

1. Valet RS, Gebretsadik T, Carroll KN, Wu P, Dupont WD, Mitchel EF, et al. High asthma prevalence and increased morbidity among rural children in a Medicaid cohort. *Ann Allergy Asthma Immunol.* 2011;106:467-73.
2. Moorman JE, Zahran H, Truman BI, Molla MT, Centers for Disease Control and Prevention. Current asthma prevalence - United States, 2006-2008. *MMWR Surveill Summ.* 2011;60 Suppl:84-6.
3. Rodrigo GJ, Plaza V, Forns SB, Tordera MP, Salas J. Factors associated with mortality in patients hospitalized in Spain and Latin America for acute severe asthma in 1994, 1999 and 2004. *J Bras Pneumol.* 2008;34:546-51.
4. Mortality Statistics. New South Wales, Australia: Asthma death by country. [cited 2012 April 17]. Available from: http://www.nationmaster.com/graph/mor_ast-mortality-asthma
5. Krishnan V, Diette GB, Rand CS, Bilderback AL, Merriman B, Hansel NN, et al. Mortality in patients hospitalized for asthma exacerbations in the United States. *Am J Respir Crit Care Med.* 2006;174:633-8.
6. Romagnoli M, Caramori G, Braccioni F, Ravenna F, Barreiro E, Sifakas NM, et al. Near-fatal asthma phenotype in the ENFUMOSA Cohort. *Clin Exp Allergy.* 2007;37:552-7.
7. Restrepo RD, Peter J. Near-fatal asthma: recognition and management. *Curr Opin Pulm Med.* 2008;14:13-23.
8. Thai Asthma Council. Public health service guideline:Care for patients with asthma. Bangkok, Thailand: National Health Security Office Publication; 2008. p. 3-37.
9. Bousquet J, Clark TJ, Hurd S, Khaltaev N, Lenfant C, O'byrne P, et al. GINA guidelines on asthma and beyond. *Allergy.* 2007;62:102-12.
10. World Health Organization. International Statistical Classification of Diseases and Related Health Problems 10th Revision. Geneva, Switzerland: World Health Organization Publication; 2010. p.515-36
11. Triasih R, Duke T, Robertson CF. Outcomes following admission to intensive care for asthma. *Arch Dis Child.* 2011;96:729-34.
12. Dantzer C, Tessier JF, Nejari C, Barberger-Gateau P, Dartigues JF. Mortality of elderly subjects with self-reported asthma in a French cohort, 1991–1996. *Eur J Epidemiol.* 2001;17:57-63.
13. Huovinen E, Kaprio J, Vesterinen E, Koskenvuo M. Mortality of adults with asthma: a prospective cohort study. *Thorax.* 1997;52:49-54.
14. Ringbaek T, Seersholm N, Viskum K. Standardised mortality rates in females and males with COPD and asthma. *Eur Respir J.* 2005;25:891-5.
15. Pearce N, Ait-Khaled N, Beasley R, Mallol J, Keil U, Mitchell E, et al. Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax.* 2007;62:758-66.
16. Watson L, Turk F, James P, Holgate ST. Factors associated with mortality after an asthma admission: a national United Kingdom database analysis. *Respir Med.* 2007;101:1659-64.