

Clinical Reality of Asthma Death and Near-fatal Cases, in a Department of Pediatrics of a Japanese Chest Hospital

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ABSTRACT

Asthmatic deaths have shown a tendency to decrease in National Fukuoka Hospital. According to our analysis of asthma death and near-fatal asthma, the risk factor for death was considered as follows: low compliance, underestimation of severity (by patient or family), becoming used to attacks through experiencing many attacks, insufficient knowledge about attacks, overuse of β -stimulant metered-dose inhaler, etc. One of the reasons for the decrease in asthma death was thought to be the regular usage of many anti-asthmatic drugs especially inhaled corticosteroid.

KEY WORDS

asthma death, bronchial asthma, inhaled corticosteroid, near-fatal case, puberty, β -agonist

INTRODUCTION

The most important thing in the treatment of childhood asthma is to prevent asthma death. Although recently developed anti-asthma drugs help many patients control their symptoms, some patients still died from asthma attacks or experience near-fatal events. In this paper, we reported the clinical reality concerning asthma deaths and near-fatal cases in our hospital, in an attempt to learn methods of preventing death from asthma.

CLINICAL REALITY OF ASTHMA DEATH IN OUR HOSPITAL

The National Fukuoka Hospital is located in Fukuoka City, in Kyushu, in the south-west of Japan. In the last year, about 1200 cases of asthmatic attack patients were admitted to pediatric wards which contain 50 beds for children. 25,000 outpatients a year consulted about asthma. We have 10 pediatricians, with a 24-hour emergency asthmatic attack service.

Since the pediatric wards opened in 1975, there have been 22 cases of death of asthmatic patients. We retrospectively classified the time, place and cause of

death. Table 1 gives the background of these cases. Delay in visiting the outpatient clinic was considered one of the reasons for death in 11/22 cases.

Before 1988, there were no deaths in patients aged 17 or more, but after 1988 there was a tendency for death to occur in patients aged 17 or more (Fig. 1, upper graph).

We held a summer camp for out-patients with asthma. In the camp, the drugs used by patients were closely examined (Fig. 1, lower graph). After 1988, there was an increasing tendency throughout Japan to use prescribed drugs, especially inhaled corticosteroids (ICS) and round the clock therapy of bronchodilators (theophylline and β_2 agonist) and leukotriene receptor antagonist.^{1,2} There was also an increasing tendency of more frequent deaths in cars, after 1988 (Fig. 2). Figure 3 shows asthma deaths in relation to calendar months, and there were no deaths from November through April.

Therefore we should pay attention to severe cases of attack from May to October. We examined the number of the patients visiting our emergency room (ER), and hospitalized via the ER in 1992 and 2002 (Fig. 4).

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Table 1 Asthmatic Deaths in the Patients treated at our Hospital (JAN.1975 ~)

Case	No.	Sex	Age (yrs)	Date of death	Place of death	
	‡	1	f	3	'75. 10. 7	Hospital
†		2	f	11	'76. 7. 26	Home (entrance)
	‡	3	m	5	'77. 9. 28	Hospital
†		4	m	14	'77. 10. 29	Privately-owned car
†		5	f	12	'78. 10. 30	Home
†		6	m	13	'80. 8. 24	Home
		7	f	5	'80. 9. 3	Home
†		8	m	15	'81. 9. 13	Home (lavatory)
†	‡	9	f	16	'84. 5. 25	Taxi
		10	m	10	'85. 8. 4	OPD (clinic)
		11	m	12	'85. 10. 25	OPD (clinic)
		12	f	14	'87. 8. 15	Home
		13	m	16	'87. 10. 4	Privately-owned car
†		14	f	26	'88. 5. 6	Home
†	‡	15	m	14	'88. 9. 24	OPD (University Hospital)
†		16	f	10	'89. 5. 5	Privately-owned car
†		17	m	26	'90. 8. 11	Privately-owned car
†		18	m	9	'91. 7. 30	Privately-owned car
†		19	m	24	'93. 8. 13	Home
†		20	f	25	'93. 11. 30	Hospital
†		21	m	23	'95. 5. 17	Privately-owned car
†		22	m	19	'96. 6. 15	Home

male 14, female 9, average 15.5±7.2 years old † : institutional therapy, ‡ : autopsy, OPD: outpatient department

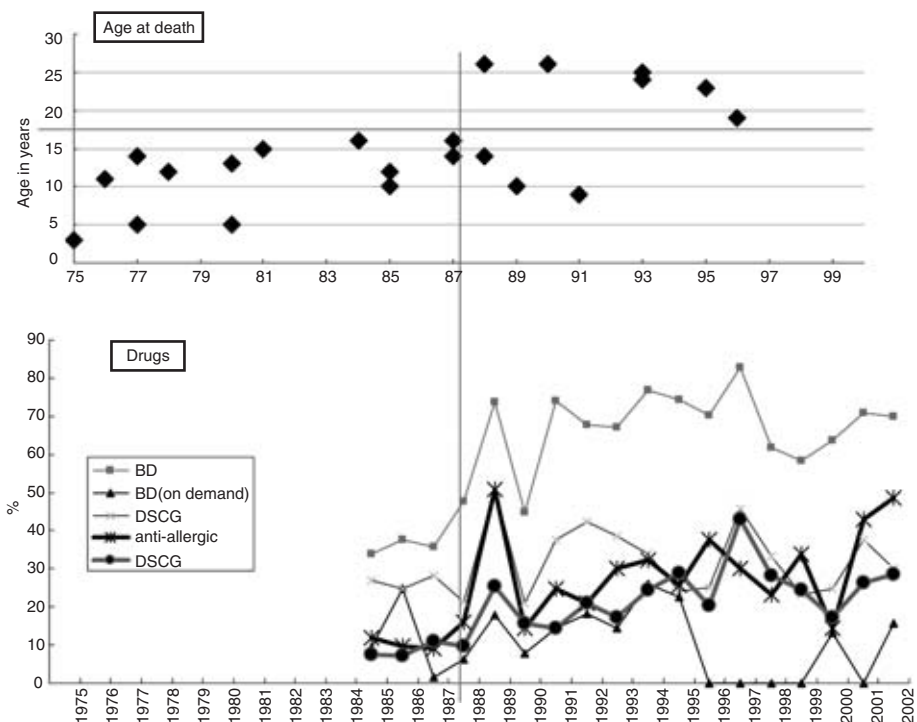


Fig. 1 Age at death and drugs prescribed in asthmatic children who had attended summer camp. BD : bronchodilators (round the clock), DSCG : disodium cromoglycate

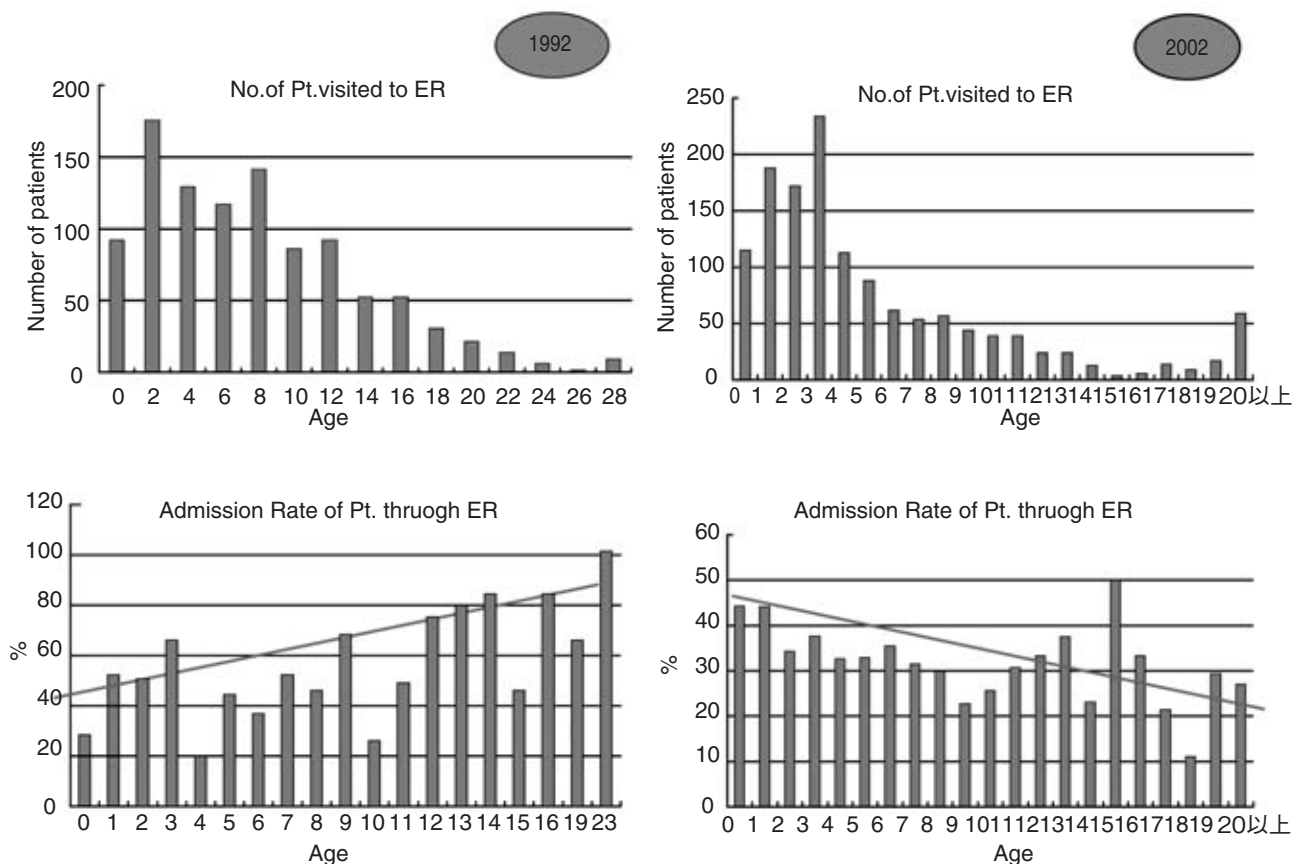


Fig. 4 Number of patients who visited the ER and admission rate

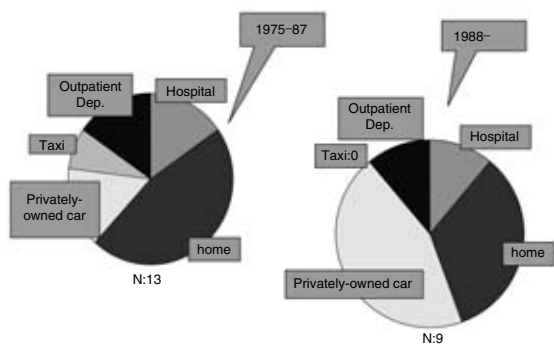


Fig. 2 Place of death

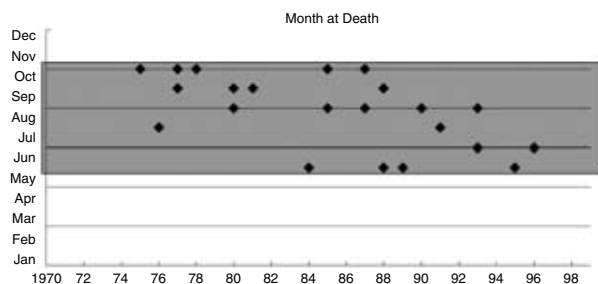


Fig. 3 Calendar months in which fatalities occurred

In 1992, there was a difference in the number of patients visiting the ER and those who were subsequently hospitalized. Namely in 1992, the patients in puberty visiting to ER had a severe attack to be hospitalized. There was no such a tendency in 2002.

Figure 5 shows the age distribution of acutely hospitalized asthmatic patients in 1977 (a), 1987 (b), and 1997 (c), in the Department of Pediatrics, National Fukuoka Hospital, with (□) or without (■) concomitant infection.³ These data suggest that in 1992 patients in puberty were not controlled adequately. This conclusion was also indicated by the data from the study about the near-fatal cases mentioned below.

CLINICAL SIGNIFICANCE OF NEAR-FATAL CASES IN OUR HOSPITAL

In this paper, a near-fatal case means a rescued case that could not have been rescued if treatment had not been given early enough or fatal cases that could have been prevented had treatment been given early enough. Figure 6 shows the age distribution of the fatal cases (reported to the Japanese Society of Pediatric Allergy and Clinical Immunology (upper figure)) and near-fatal cases treated in our hospital. Fatal cases peaked in puberty, but the peak of near-death

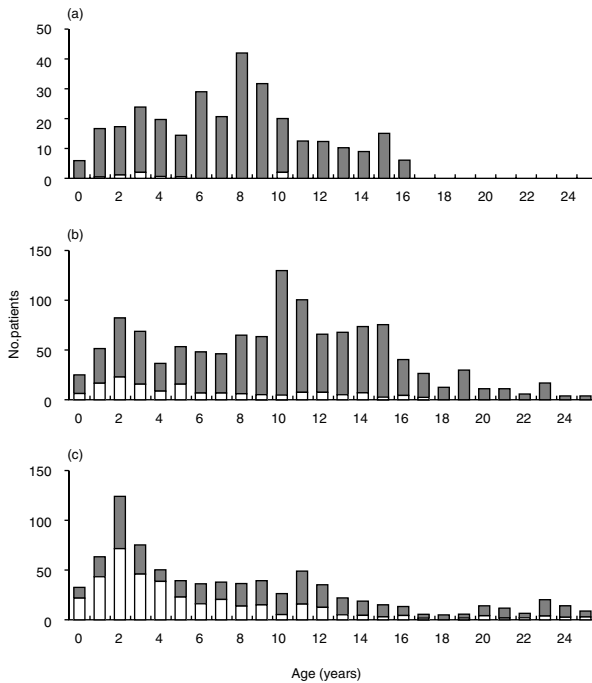


Fig. 5 Age distribution of acutely hospitalized asthmatics in (a) 1977, (b) 1987 and 1977 (c), Division of Pediatrics, National Minami Fukuoka Chest Hospital, with (□) or without (■) concomitant infection.

cases was in puberty, infancy and early childhood. This finding suggests that there are more dangerous factors in puberty than in infancy or early childhood.

Figure 7 shows the prescription rate of theophylline, ICS, and beta-stimulants. The prescription rate was calculated as follows: (number of days of use indicated by the calculation of the number of puffs of the prescribed drug/number of days on which this drug should be used in a year) ×100. The ideal result should be 100%.

As shown in Figure 7, ICS observed low level of compliance in patients aged 15 or more who had regularly visited our out patient department (OPD). A failure of management, often observed among young patients, may be one of the important factors for the mortality in asthma.⁴

Figure 8 indicates the responses to the question “when do you visit the OPD?”, and shows that patients in puberty do not visit the OPD regularly, especially in boys.

Figure 9 shows that the patients in puberty had many inhalations during attacks before visiting the OPD. This tendency might delay the beginning of the next step of treatment for severe attacks.

When asked if patients have someone who can take them to the hospital when they have attacks male patients were found to have nobody (Fig. 10).

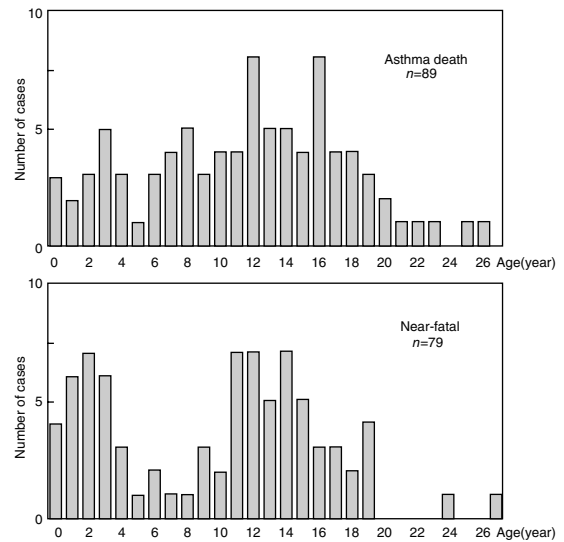


Fig. 6 Age distribution of asthma death and near-fatal cases

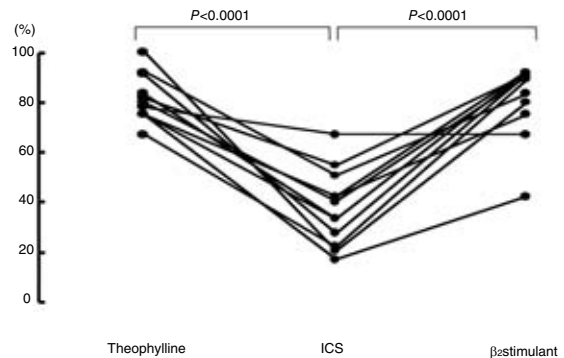


Fig. 7 Prescription Rate of theophylline, inhaled corticosteroid(ICS), and β_2 stimulant in patients aged 15 years or more with regular use of ICS

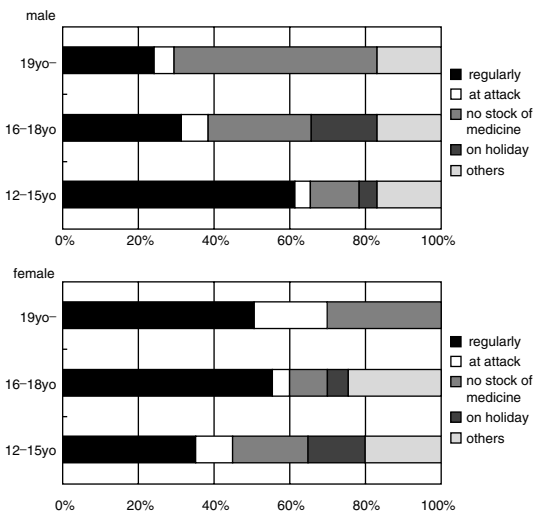


Fig. 8 When do you visit OPD?

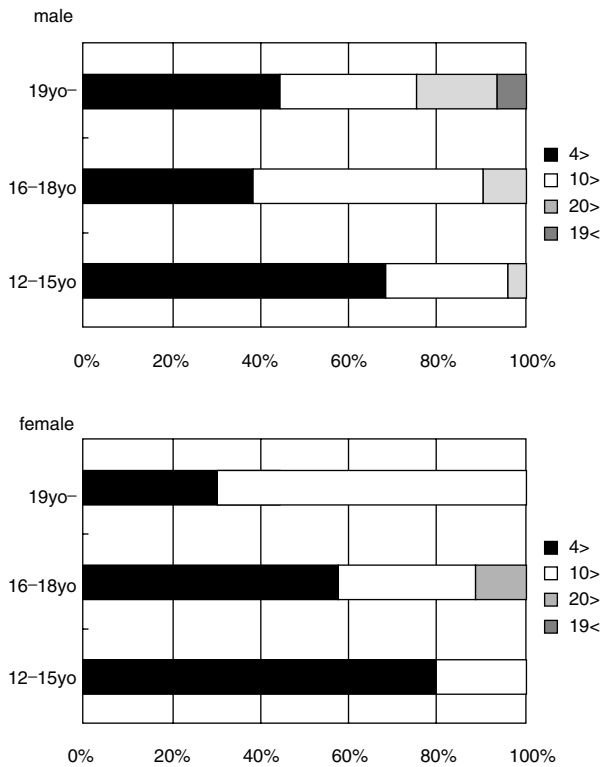


Fig. 9 How many times do you use the inhaler on severe attacks?

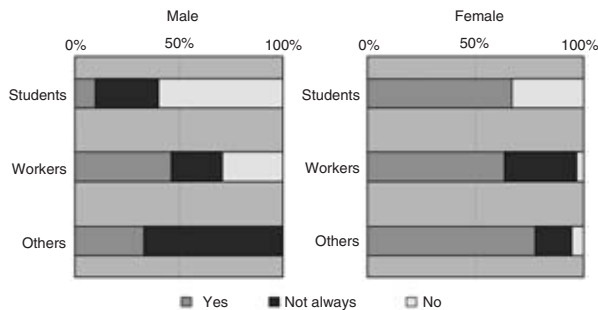


Fig. 10 “Do you have someone who can take you to the hospital?” (Subjects : patients with history of hospitalization, 20-30 years old)

These data provide some reasons why male asthmatic patients are at higher risk of asthma death than female.⁵

CASE OF NEAR-FATAL DEATH

CASE 1 : 10-YEAR-OLD BOY

One month before our summer camp, for which he had applied, his %FVC was 50%. However, both the patient and his mother said that his condition was normal.

On the first day of camp, severe dyspnea developed and he suffered respiratory arrested. He was rescued

by ventilation, intravenous drip, sulbutamol, hydrocortisone, and aminophylline. We continued intravenous drip for 4 days then the patient was admitted to our hospital after camp.

After one year of drug therapy and exercise, his lung function became normal and he was discharged. Currently, the patient is in good condition and visits his local doctor several times per year.

CASE 2 : 14-YEAR-OLD GIRL

The patient was hospitalized for 1 year when she was in third grade in elementary school. She was asymptomatic after entering junior high school, but symptoms returned when she discontinued complementary medicine that she started for atopic dermatitis.

The patient was given DSCG+β-agonist which she used every hour (3 times more frequently than instructed) when she had attacks. The patients developed severe dyspnea and was brought to our clinic by ambulance, with mouth to mouth artificial respiration by her father. Although she was rescued, discontinuation of inhalation therapy quickly worsened the condition. β-agonist dependence, β-blockade condition was suspected. It took 3 months for her to recover from this condition.

CASE 3 : 18-YEAR-OLD BOY

The patient had had severe asthma since he was in elementary school and was treated by a local hospital. While he was playing a video game, he had an asthma attack and used his meter-dose inhaler (MDI) in several times. After a while he asked his sister to call an ambulance.

When she returned from phone, he had respiratory arrest, with the MDI in his mouth. After he had entered high school, oral steroids and MDI had been prescribed by a local doctor. Drug compliance was poor. Underestimation of severity was suspected.

CASE 4 : 17-YEAR-OLD BOY

One day, the patient told his teacher he would go home early. His family called that night saying that the patient was not home yet. Next morning, the patient was found dead in the school toilet room, with his MDI in his mouth. Neither teachers nor friends knew that he had asthma. If he had not hidden his condition and used the MDI in the classroom, he might have been saved.

DISCUSSION ABOUT PROBLEMS IN ABOVE CASES

In case 1, the patient’s family underestimated the severity. Since dyspnea is a subjective feeling and becomes severe gradually, it is difficult to estimate the severity. The family did not understand that dyspnea must be treated immediately.

In Case 2, the patient’s family said the asthma was well controlled. Although there are many asthma

Table 2 Causes of near-fatality

I . Problems with the whole disease
1. Disease itself is severe
① β -blockade
② Adrenocortical insufficiency
③ Airway hypersensitivity
2. Above conditions falsely classified as mild
II . Medical problems such as diagnosis and treatment
1. Underestimation of severity (patients and their family)
① They thought that attacks had to appear "violent"
② They are used to attacks, as they experienced many attacks
③ Insufficient knowledge about attacks
2. Delay in visiting hospital when patients have attacks
① Underestimation of severity of attacks
② MDI over-use
③ The feeling that they can contain the symptoms since they were able to last time
④ They did not use an ambulance
3. Inadequate usage of drug
① Over-use for attacks (do not proceed to the next step when they should) They think they can contain it (Fig. 1)
② Under-use for attacks (do not use when they should)
i) Underestimation of severity
ii) Severity is not recognized by the doctor
iii) Not enough drugs (irregular visits)
iv) Concern about others in their surroundings make them miss the proper timing for taking drugs
③ Under-use of preventive drugs
i) No drug
ii) Forgot
iii) Care about others in their surroundings and miss the proper timing for taking drugs
III . Psychological, sociological, and economical factors
1. Too busy, working too hard
① Working too hard at work or school and delay in treatment
2. Delay in primary treatment
① Nobody is around when patients have attacks (living alone)
② They do not want to take medicines in front of other people (hiding the conditions)
IV . Others

death reports concerning mild asthmatic patients, the severity might have been underestimated in this case. Complementary medicine can be dangerous. It has been known for a long time that some patients acquire resistance to β -agonists. This patient would have died if her father had not practiced artificial respiration, suggesting the importance of early action.⁶⁻⁹

In Case 3, poor drug compliance during adolescence and insufficient follow up after discharge were the problems. The patient underestimated the severity and tried to contain the symptoms with MDI. Since symptoms improve, at least slightly, immediately after inhalation, it is difficult for patients to know

when to visit to emergency services (Fig. 11).

This is a danger of inhalation therapy. Over-use of β -stimulant should be very important factor for the mortality.^{10,11} As in case 2, symptoms suddenly worsen.¹²

Case 4 suggests problems about hiding the disease.

Table 2 summarizes these problems. The suspected reasons why patients do frequent inhalation and delay visiting the ER are shown in Figure 11.

Therefore, it is important to teach them how dangerous the frequent use of MDI is, and to make the OPD have an atmosphere easy to visit for patients.

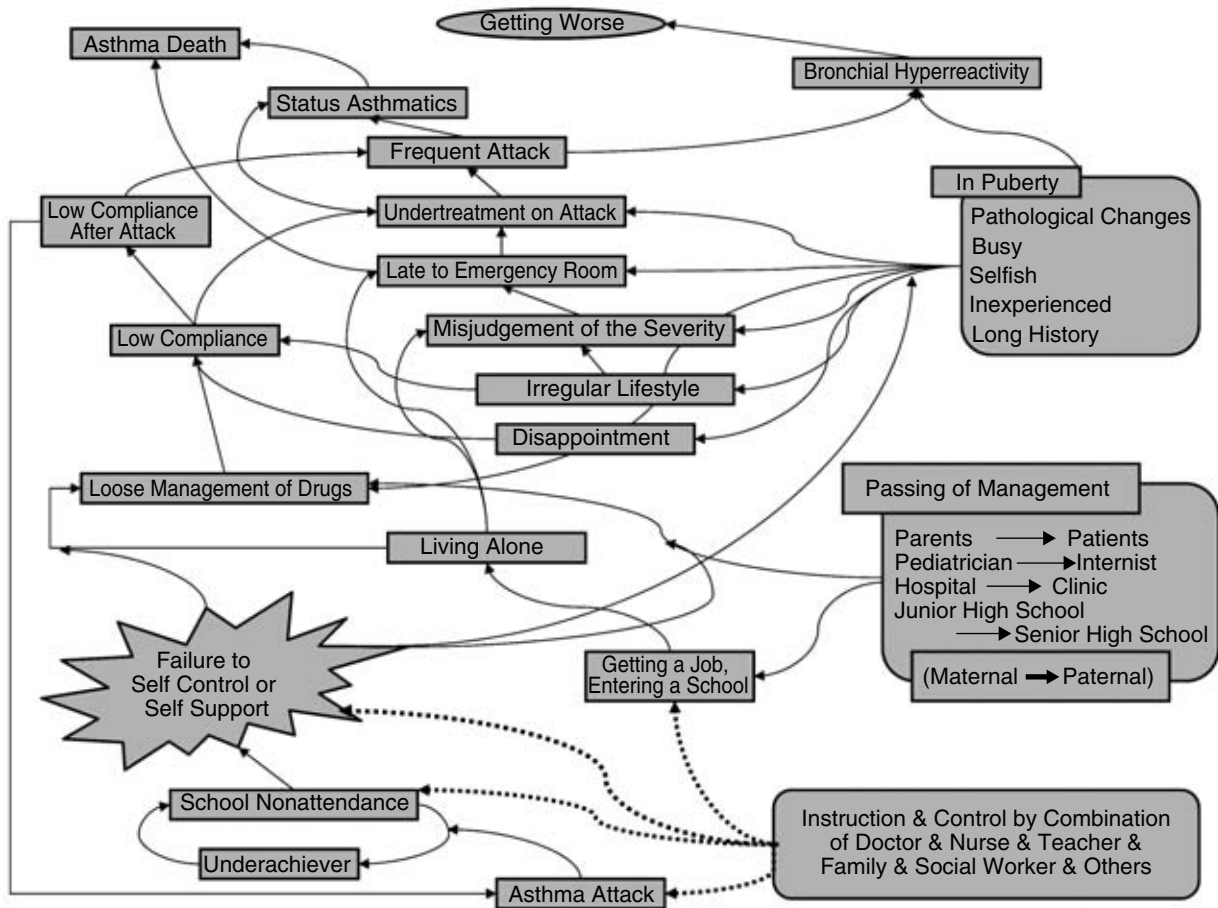


Fig. 12 Problems of adolescent asthma.

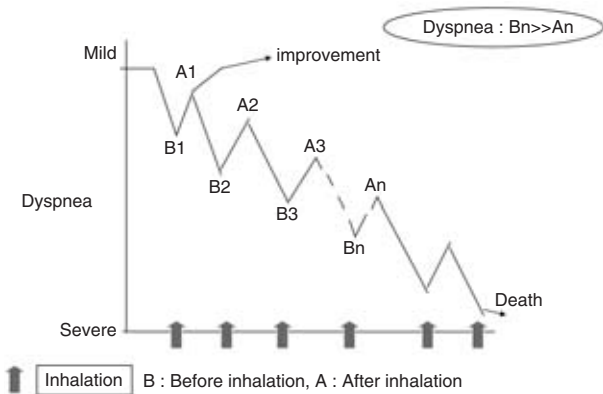


Fig. 11 Dyspnea before and after inhalation of β -agonist (Why do they think they can continue to use its.) After any time of inhalation, the severity of dyspnea before inhalation is stronger than that after inhalation.

We show a list of required actions and cautions in Table 3. Almost all fatal cases were in puberty or elder by age. In adolescents, many sociological/economical/educational problems are present (Fig. 12).³ We should take action and be cautions before puberty to prevent and resolve these problems, if even a little.

CONCLUSION

In early childhood and puberty, asthmatic patients are at high risk of near-fatal asthma, and, in puberty, at high risk of asthma death.

We conclude the clinical importance of the following in order to decrease asthma deaths :

(1) In puberty, improvement of drug compliance, adequate estimation of severity of asthmatic attack, and eliminate delays in visiting hospital.

Good relationship between patients and society, not to hide his asthma.

(2) Early childhood is high risk age for asthmatic death.

Families of patients in early childhood have little experience or ability to evaluate the severity of asthmatic attack or when to visit the ER.

Table 3 Treatment for near-fatal cases

1. Acute attacks

- ① Administer sufficient oxygen and treat for status asthmaticus
{Continuous inhalation of isoproterenol should be performed at high concentration with sufficient oxygen (watch for cardiac complications)}.
- ② Admit the patients even when the symptoms appear to have subsided
- ③ Consider near-fatal attack experiences to be good chances for reviewing previous asthma treatment and patient education, and inform the patients and their families that treatment and education will be reconsidered

2. After patients have been rescued from severe condition

- ① Evaluate dependence on drugs (if they are dependent on drug, slowly decrease doses)
 - i) β -agonists
 - ii) Steroids
 - iii) Others
- ② Evaluate drug compliance
 - i) Evaluate reasons why low-compliance in bad case
 - ii) Review drugs in good case
- ③ Evaluate drug allergy

3. After patients have recovered from attacks(when the patients do not have attacks)

- ① Review treatment plans
 - i) Review patient/family education
(especially understanding concerning severity of attacks and understanding attacks must be prevented)
 - ii) Review lifestyle. When sociological, economical, and psychological factors are involved, those factors should be reviewed as well
(Have someone who can take the patients to the hospital. Perform after estimation if understanding about the disease can be obtained at school or workplace)
 - iii) Review drug therapy
- ② Review pathology
 - i) Re-test for allergens, evaluate severity of allergy
 - ii) Evaluate airway hypersensitivity, exercise-induced asthma
- ③ Consider long-term hospitalization
- ④ Follow-up after discharge
- ⑤ Confirm relationship between hospital-general practitioner, doctor-family, school-teacher, work office

4. Others

- Have someone who can perform artificial respiration among family members.
Make it possible to perform cardiopulmonary resuscitation in ambulance

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