



# Asthma: an Increasing Problem in Children?

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Asthma is a major chronic airway disorder and is one of the serious public health problems in countries throughout the world.<sup>1</sup> The epidemiology of asthma has been changing worldwide. Studies from a number of countries suggest that the prevalence of asthma among children and adolescents, including hospitalizations and deaths due to this disease, are increasing.<sup>2-11</sup> The increase in asthma prevalence in developing countries suggests that environmental factors and pollution may be more important than genetic factors for the development of asthma.<sup>12-17</sup> In Thailand, the prevalence of asthma in school age children has increased from 4.29% in 1986<sup>18</sup> to 13% in 1996.<sup>19</sup> According to the International Consensus Report,<sup>20</sup> asthma management programs to control asthma are divided into 6 parts i.e. patients education, assessment and monitoring asthma severity, avoiding or controlling asthma triggers, medication plans for acute and chronic management, and providing regular follow-up

**SUMMARY** The study of asthma trend, nonhospitalized and hospitalized cases, and factors correlated with asthma admissions were carried out at Queen Sirikit National Institute of Child Health (Children's Hospital) between 1986-1995. Asthma OPD visits had increased significantly ( $r = 0.9039$ ,  $p < 0.001$ ). The age distribution of the cases are 0-2, 2-5, 5-10 and  $> 10$  years old group. The number of visits in 0-2 and 2-5 years groups were significantly increased ( $r = 0.908$ ,  $p = 0.000$ ,  $r = 0.904$ ,  $p = 0.000$ ), while in 5-10 and  $>10$  years old groups were not ( $r = 0.054$ ,  $p = 0.137$ ,  $r = -0.565$ ,  $p = 0.089$ ). Although the OPD visits were increasing, there was a decreasing trend in the age-adjusted percentage of admissions ( $r = -0.798$ ,  $p = 0.006$ ). The percentage of admissions was significantly decreased in 0-2, 2-5, and  $>10$  years old groups ( $r = -0.881$ ,  $p = 0.001$ ,  $r = -0.632$ ,  $p = 0.05$ ,  $r = -0.815$ ,  $p = 0.004$ , respectively). The correlation with the environment was observed ( $r = 0.915$ ,  $p < 0.001$ ). There was no correlation with allergic diseases in the family ( $r = 0.2825$ ,  $p = 0.4$ ).

The 2,312 admission charts (86.69% of total IPD cases) were reviewed and there were 1,855 cases of true asthma. Almost 70% of cases were in the under-five age group and the male to female ratio was 1.3:1. The increasing trend in steroid use was observed ( $r = 0.693$ ,  $p = 0.026$ ), while the use of antibiotics was unchanged ( $r = 0.068$ ,  $p = 0.852$ ). The percentage of admissions began to decline in 1989 when the aerosolized beta-2 agonists were introduced in the hospital and declined further in 1991 when increased use of aerosolized therapy and prophylactic drugs was observed. Better patient education and regular follow-up care during the past five years are believed to be one of the major contributions to this reduction in admissions.

care. Among these 6 parts to asthma control, patient education, good doctor-patient relationship and regular follow-up care are important and helpful factors to reduce asthma admissions. The objectives of this study were: 1) to study

trends in asthma, nonhospitalized and hospitalized cases, at Queen Sirikit National Institute of Child

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Health (Children's Hospital) and 2) to find the factors that correlated with asthma admissions.

## SUBJECTS AND METHODS

Annual OPD and IPD cases of asthma at Queen Sirikit National Institute of Child Health (Children's Hospital) between 1986-1995 were analyzed and hospital records of hospitalized children with a diagnosis of asthma, R/O asthma, asthmatic bronchitis and wheezy bronchitis were reviewed to select only true asthma cases.

Criteria for diagnosis of asthma are:- recurrent wheezing  $\geq$  3 times and/or good response to rapid-acting bronchodilators (nebulized  $\beta_2$ -agonist or adrenaline injection).

### Statistical analysis

Pearson Correlation Coefficients were used to determine whether relationships between con-

tinuous variables exist. A  $p$  value of less than 0.05 was considered significant. Statistical analyses were carried out using SPSS® Base 7.0 for Windows™.

## RESULTS

The patients' ages were grouped as 0-2, 2-5, 5-10, and more than 10 years. Asthma OPD visits had increased significantly during ten years, from 7,476 cases in 1986 to 10,256 cases in 1995 (37.19 %) (Fig. 1). The number of visits in the 0-2 years and 2-5 years age group were significantly increased ( $r = 0.908$ ,  $p = 0.000$ ,  $r = 0.94$ ,  $p = 0.000$ ), while in the 5-10 years and more than 10 years age group were not ( $r = 0.504$ ,  $p = 0.137$ ,  $r = -0.565$ ,  $p = 0.089$ ) (Fig.2).

Although the OPD visits were increasing, the number of IPD cases was significantly decreased from 386 cases in 1988 to 141 cases in 1995 (Fig.3), and there was a decreasing trend in the age-

adjusted percentage of admission ( $r = -0.778$ ,  $p = 0.006$ ) (Fig.4). The percentage of admission was significantly decreased in the 0-2, 2-5 and  $>10$  years of age ( $r = -0.881$ ,  $p = 0.001$ ,  $r = -0.632$ ,  $p = 0.05$ ,  $r = -0.815$ ,  $p = 0.004$ , respectively) (Figs.5, 6).

The 2,312 admission charts (86.69% of total IPD cases) were reviewed and there were 1,855 cases of true asthma (80.23%). Other clinical diagnoses were pneumonia 8.69% ( $n = 201$ ), bronchiolitis 5.75% ( $n = 133$ ), bronchitis 4.59% ( $n = 106$ ) and others (chronic lung disease, BPD and croup) 0.74% ( $n=17$ ). About 70% of cases were in the under-five age group, and the male to female ratio was 1.3:1. The correlation with the environment was observed ( $r = 0.915$ ,  $p < 0.001$ ). These included pets, nearby factories, road and building construction and cigarette smoking. There was no correlation with allergic diseases in the family ( $r = 0.2825$ ,  $p = 0.4$ ) (Fig. 7). The

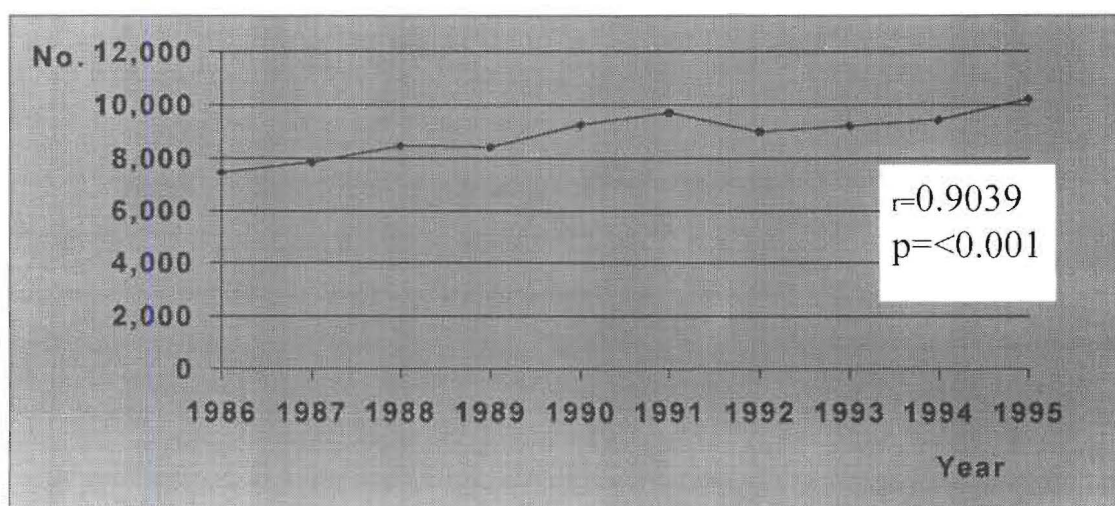


Fig. 1 Number of OPD cases of asthma between 1986-1995.

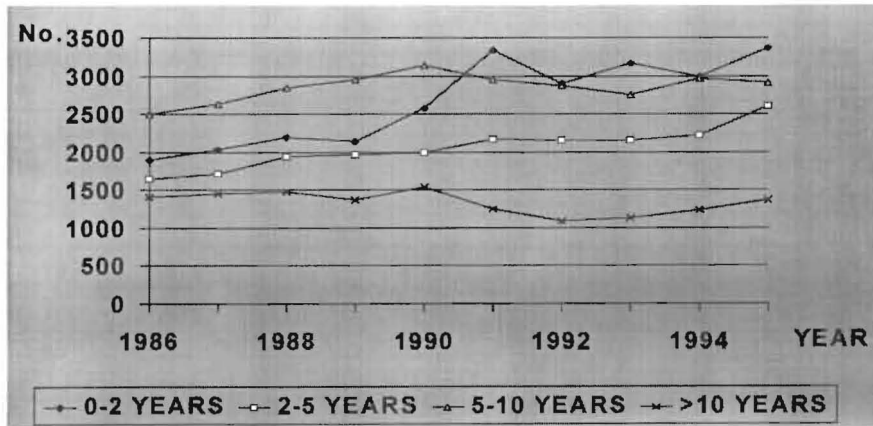


Fig. 2 Age distribution of OPD cases (1986-1995).

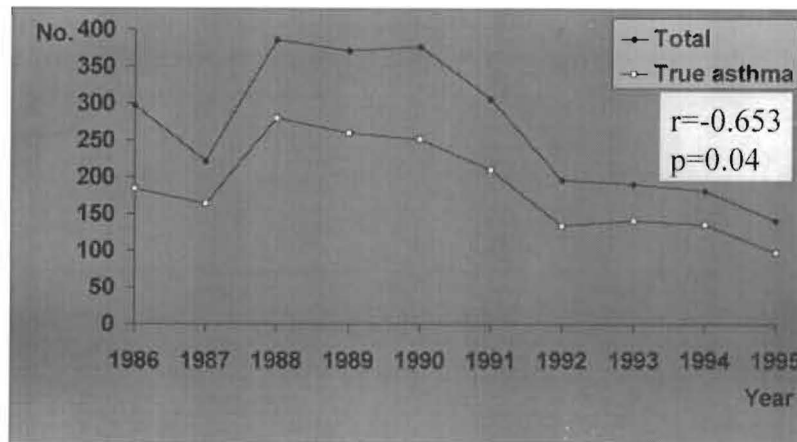


Fig. 3 Number of IPD cases of asthma between 1986-1995.

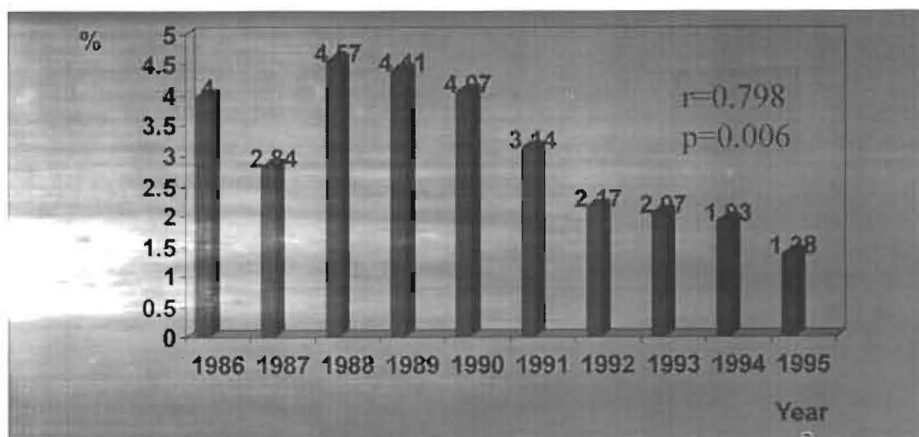


Fig. 4 Age-adjusted percentage of admissions (1986-1995).

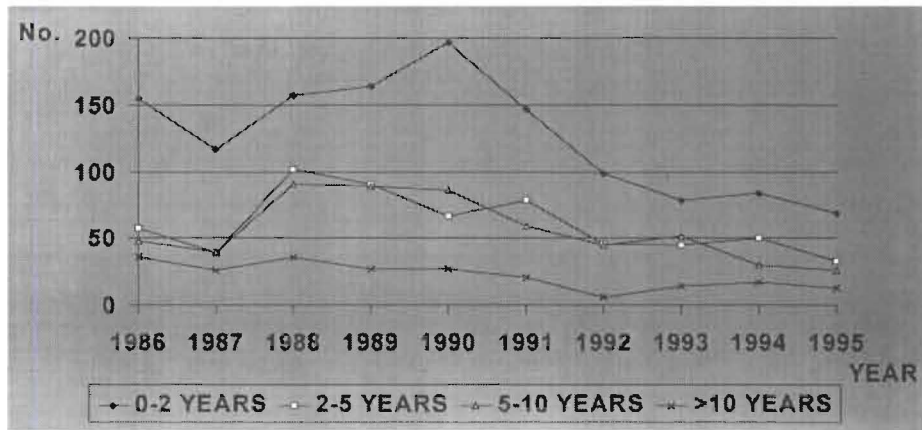


Fig. 5 Age distribution of IPD cases (1986-1995).

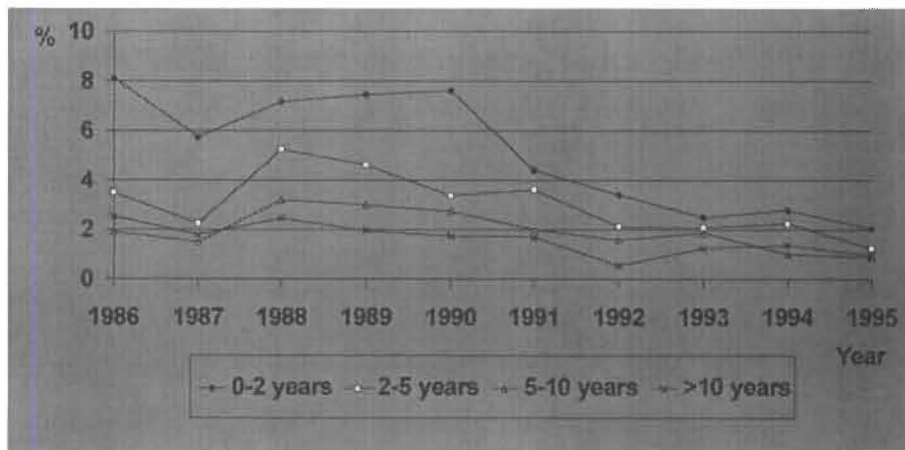


Fig. 6 Percentage of admissions in different age groups.

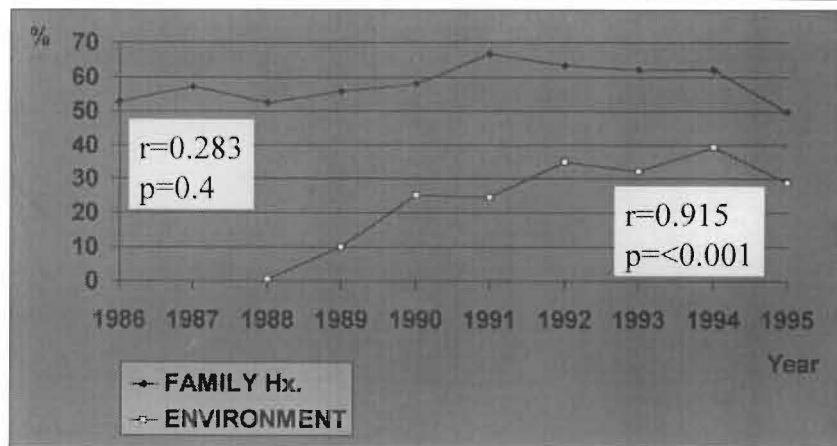


Fig. 7 Percentage of family history and environment (1986-1995).

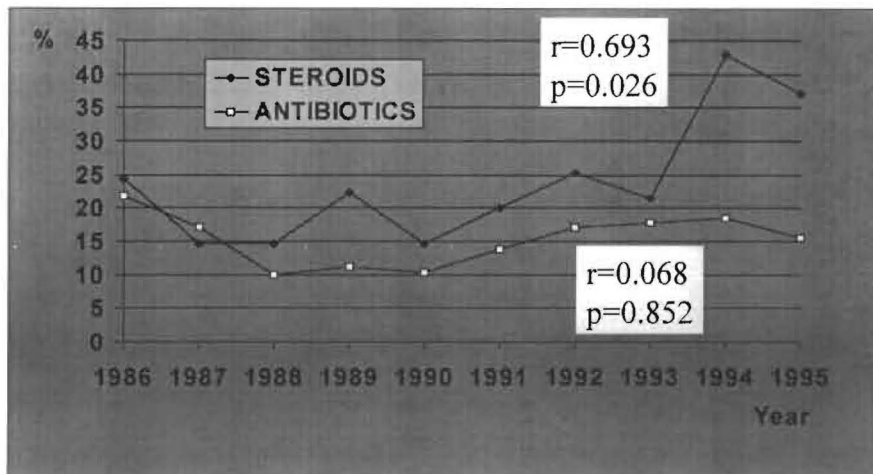


Fig. 8 Percentage of steroid and antibiotic uses (1986-1995).

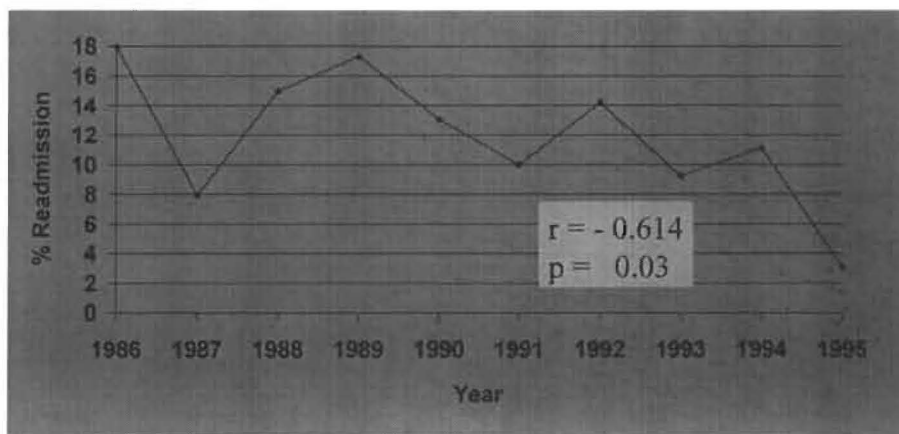


Fig. 9 Percentage of readmission (1986-1995).

mean percentages of children with positive and negative allergic diseases in the family were 58.02% and 27.76%, respectively. The details were 59.64% in parents and siblings, 26.62% in relatives, 33.67% in grandparents, 5.39% in cousins and 3.82% in patients themselves ( more than one allergic person in some families). Asthma was the most common disease while others were allergic rhinitis, urticaria and food allergy.

**Factors that correlated with the decreasing trend in admissions**

Aerosolized  $\beta_2$ -agonists were introduced in the hospital in 1989. The percentage of admissions began to decline in 1989 and declined further in 1991 when there was an increased use of aerosolized therapy and prophylactic drugs, ie. cromolyn sodium and inhaled steroids.

During this 10-year period

there was an increasing trend of steroid use in the hospitalized cases ( $r = 0.693, p = 0.026$ ), while the use of antibiotics was unchanged ( $r = 0.068, p = 0.852$ ) (Fig.8).

The percentage of readmissions was significantly decreased ( $r = -0.614, p = 0.03$ ) (Fig.9). The mean duration in the hospital (3.4 days) and the percentage of respiratory failure cases ( 0.74%) were unchanged ( $r = -0.577, p = 0.081, r = -0.436, p = 0.104$ ).

## DISCUSSION

In this study, the annual asthma OPD visits were increased significantly, especially in the under-five age groups and correlated with environmental pollution. Although the asthma OPD visits were increasing, there was a decreasing trend in the age-adjusted percentage of admissions. The observed declining percentage of admissions was among children in the under-five years and more than 10 years old group. It is possible that this decreasing trend is attributable to the increase use of aerosolized therapy and prophylactic drugs.<sup>20-24</sup>

Aerosolized  $\beta_2$  agonists have been used in our hospital since 1989 and the increased use of prophylactic drugs (cromolyn sodium and inhaled steroids) was observed in 1991. The new technology for drug administration made it easier for physicians and parents to treat and prevent asthmatic attacks: in older children using inhaled medication by metered dose or dry powder inhalers and in young children using nebulization or metered dose inhalers with spacers.

For the hospitalized asthma cases, almost 70% of cases were in the under-five age group and the male to female ratio was 1.3:1, as observed by other studies.<sup>25-29</sup> The correlation with the environment was observed ( $r = 0.915$ ,  $p < 0.001$ ), but there was no correlation with allergic diseases in the family ( $r = 0.2825$ ,  $p = 0.4$ ). This supported the proposition that environmental factors and pollution play a more important role than genetic factors in the development of asthma. Management of the hospitalized cases was reviewed. Nebulized  $\beta_2$  agonists have been used in place of adrenaline injections.<sup>30</sup>

Adrenaline is useful in cases that do not response to nebulized  $\beta_2$ -agonist. Intravenous theophylline is used in the admitted cases and systemic steroids are used to reduce airway inflammation. The increasing trend in the use of steroids was observed ( $r = 0.693$ ,  $p = 0.026$ ). As for the antibiotics, there was no overuse (mean = 15.31 %) and the use was unchanged in the 10 year period ( $r = 0.068$ ,  $p = 0.852$ ), as it was mainly viral respiratory tract infections that precipitated asthmatic attacks. Antibiotics were used only when there was evidence of bacterial infection.

The severity of the hospitalized cases was measured by 2 parameters, ie. length of stay in the hospital and respiratory failure cases that required mechanical ventilators. There was no significant change in the mean duration in the hospital (mean = 3.4 days,  $r = -0.577$ ,  $p = 0.081$ ). The same was observed in respiratory failure cases (mean = 0.74%,  $r = -0.436$ ,  $p = 0.014$ ).

The percentage of readmission was significantly decreased ( $r = -0.614$ ,  $p = 0.03$ ). This decrease correlated with the decreasing numbers of hospitalized children and meant that individuals had better outcomes and better management of asthma at home. Improved asthma outcomes and reduction in asthma hospitalization continue to be important indicators for clinicians in providing good OPD case management, patient education and regular follow-up care.

In conclusion, childhood asthma cases have been increasing in the past ten years, correlated with environmental pollution, but

the severity seemed to be less as reflected in a decrease in the percentage of hospital admissions. Good OPD case management, providing patient education, regular follow-up care and early intervention of prophylactic drugs play major roles in this reduction in admissions.

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