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REPORT OF THE MEETING ON THE IMPLEMENTATION OF THE ISAAC STUDY IN DEVELOPING COUNTRIES

4 - 5 October 1993

WHO Headquarters

Geneva

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Preface

The International Study of Asthma and Allergies in Childhood (ISAAC) is an international collaborative study designed to be conducted in three phases. Phase I will examine geographic variations in the prevalence and severity of asthma and allergic disorders in defined populations. Phase II will investigate possible etiological factors, particularly those suggested by the findings of Phase I. Phase III will be a repetition of Phase I to permit examination of trends.

Although a large international study of asthma prevalence in adults is underway, there is still only limited data allowing valid comparisons of the prevalence and severity of asthma and allergic diseases in childhood within and between countries and over time. Such geographical and temporal comparisons may be of value as pointers to determinants of disease operating at a population level which may be overlooked by studies of diseased and non-diseased individuals within a single population.

The ISAAC study has been organised on a collaborative basis by asthma researchers in a number of countries. It developed from two separate initiatives by Professor Ulrich Keil and Dr Stephan Weiland in Bochum, Germany and Dr Innes Asher in Auckland, New Zealand. The contact addresses for the members of the Steering Committee are listed in Annex 4.

Some funding will be available for the central coordination of the ISAAC study, but all participating centres will have to raise the funding for their own data collection.

Phase I is designed to obtain an overview of the international distribution of the prevalence and severity of asthma and allergies in childhood. It has been designed to be as simple and inexpensive as possible in order to encourage participation from a large number of centres in as many countries as possible.

It involves conducting studies of prevalence and severity of asthma and allergies in 13-14 year olds; sampling in 6-7 year olds is also strongly recommended. In each age group, the survey will involve compulsory core questions on asthma, rhinitis and eczema; the core questionnaires can be supplemented by additional questions of interest to each centre. Each questionnaire is simple, occupying one page of text, and is designed for self completion by parents of the 6-7 year olds and by the 13-14 year olds themselves.

The use of a simple video questionnaire is also strongly recommended for the 13-14 year olds. This shows symptoms and signs of asthma audiovisually in an attempt to minimise bias from interpretation or translation of terms such as wheezing.

In international version of the video questionnaire has recently been developed which has video scenes of children from different ethnic groups. The international video contains no written or spoken word, rather the research worker who administers the questionnaire reads the instructions in the local language and the children complete the questionnaire which has been translated.

It is the objective of the ISAAC coordinators to encourage as many centres from as many countries as possible to participate.

In order to promote the implementation of Phase I of the ISAAC study in developing countries and to explore areas of mutual interest and various ways of working together, a small informal meeting was organized by the WHO Programme for the Promotion of Environmental Health (PEH) in collaboration with the ISAAC Steering Committee and financial support from the Government of Sweden. Participants included representatives from a number of WHO programmes whose various areas of work concern asthma and allergies in children, special guests with expertise in undertaking studies in developing countries, and members of the ISAAC Steering Committee. The list of participants is in Annex 1 and the meeting programme is in Annex 2. A brief summary of the meeting is presented in the next section.

For the PEH, the focus of collaboration with ISAAC is on the implementation of Phase I of the study in areas of severe air pollution in order to obtain preliminary information on the association of childhood asthma and air pollution. Many asthma-producing allergens have been identified and until recently, air pollution has not generally been considered an important determinant of asthma. Much still is unknown about the role of air pollution in asthma, as well as the importance of interactions among different airborne agents in producing the illness. Some evidence shows that the effects of pollutants can vary, depending on the allergic condition of the patient. The possibility that changes in air pollution mix in industrial urban areas could be related to a worsening of asthma cannot be ruled out. The determination of the role of outdoor air pollution, though a less important factor than others, is very relevant from a public health perspective.

WHO has recently adopted a new Global Strategy for Health and Environment. The establishment and support of a new research agenda which concentrates on the promotion and conduct of applied research on environmental factors, physical and social, affecting health, forms a key element of the new strategy. A major objective of WHO's efforts is to improve the capacity of governments, institutions, enterprises and agencies to carry out such investigations. Collaboration with ISAAC offers a unique opportunity to participate in a major international study, that collects data in a consistent and innovative manner, on the prevalence of asthma in children.

Executive Summary

The participants were welcomed to WHO by Dr W. Kreisel, Executive Director, Health and Environment. Dr Kreisel stated that there were a number of WHO programmes who consider asthma and allergies in children an important health issue and were interested in this international collaborative effort. The environmental health programmes welcomed the opportunity to explore areas of mutual interest and various ways of working together.

Dr I. Asher, chairperson of the ISAAC Steering Committee Executive, presented an overview of the background of the ISAAC study, its revised organizational structure and a study progress report. Progress reports on implementation of ISAAC in developing countries were presented by each of the Regional Coordinators for their respective areas. In addition reviews of epidemiological studies of relevance to ISAAC within Asia, South America and Brazil were presented by Drs Lai, Mallol, and Stein respectively. The reports focused on cause and prevention of asthma and allergic diseases including what is known about various risk factors. The background papers are printed in full in Annex 3.

Issues concerning designation of study centres, study areas, sampling strategies and data collection were discussed. Although study centres are not chosen randomly, schools within the geographic study area are and all children within the target age group participate in the study. The overall aim is a representative sample of children in a defined study area. The age and gender of children attending school in some developing countries many pose a problem with meeting the criteria of the study protocol. In selecting study sites various cultural issues will have to be taken into consideration. These include public perception or stigma associated with asthma and certain allergic diseases, e.g. eczema, length of questions, concept of yes/no, and local terminology. The adaptations needed in urban areas will be much less than in rural areas and thus, it was recommended in some countries to initially limit the study to city areas. In order to maintain the control required for international comparisons, the ISAAC Steering Committee decided against producing a separate manual for developing countries. The ISAAC methodology can be used and adapted, but in order to participate in ISAAC strict adherence to the ISAAC protocol is required. Cultural issues and implementation problems will be dealt with through the registration questionnaire and the use of pilot studies to test the questionnaire and use of the video encouraged. Additional questions can be added to the questionnaire after the core set of questions.

Mr E. Ginsburg, WHO/PEH, presented a brief overview of the Global Environmental Monitoring/Urban Air Pollution Monitoring and Assessment Programme and other sources of ambient air data. It was recommended that the registration document include general questions on monitoring in the study area or vicinity. It was emphasized that the quality of data should always be investigated and the difficulty in obtaining data on a local level appreciated. While the ISAAC study is not designed to address the relationship between air pollution and asthma, it may identify areas of high asthma prevalence for future studies and help formulate hypothesis regarding specific factors associated with the disease etiology or episodes. The ISAAC protocol could be used in combination with other questionnaires which directly target the issue of air pollution. At present the objective is to enrol a few good study centres in given areas to assure quality control rather than soliciting a large number of participants.

A presentation was made by Professor A.L. de Weck concerning the activities of International Association of Allergology and Clinical Immunology (IAACI). Every year the IAACI organizes a large international meeting based on a theme. The theme for the next meeting in June 1994 will be Allergy and Environment. IAACI supports standardization of methodology and sponsors workshops and Prof. de Weck stated several possible ways in which assistance may be given to ISAAC: advertisement of ISAAC in their official journal, joint sponsorship with WHO of an open meeting, educational projects through the UCB Institute of Allergies.

Various ways in which WHO may collaborate with ISAAC were discussed. While WHO does not have the financial resources to directly support the implementation of studies, it can promote and facilitate the implementation of ISAAC in a number of ways. WHO can provide access to a network of public health epidemiologists, an expertise missing to date in ISAAC. On a case by case basis as study centres are enroled, WHO can provide a list of public health contacts in the study area from the Global Environmental Epidemiology Network (GEENET) and other sources. The WHO Control of Acute Respiratory Infections programme (ARI) can also provide a list of contacts from their network of investigators. WHO will also assist in obtaining information concerning the availability of air monitoring data for individual study sites. An article informing readers on ISAAC could be produced in a future issue of the GEENET Newsletter and a member of the ISAAC Steering Committee will be invited to attend and make a presentation at the next meeting of the WHO Scientific Group on Asthma.

MEETING ON IMPLEMENTATION OF ISAAC STUDY
IN DEVELOPING COUNTRIES
Geneva, 4-5 October 1993

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Annex 2

Programme for meeting on implementation of ISAAC study in developing countries

4-5 October 1993
WHO Headquarters, Geneva

4 October

Introduction to ISAAC — 1h00

Chairman, Dr J.A. Stober — Rapporteur, Dr S. Weiland

Welcome to WHO
Background to ISAAC study and progress report
ISAAC in developing countries

Progress to-date in developing countries — 1h45

Latin America
Eastern Europe
Western Pacific
South-East Asia
Africa
Other developing countries

Coffee break — 3h30

Phase I sampling — 4h00

Chairman, Dr B. Bjoerksten — Rapporteur, Dr F. Martinez

General organization of data collection, definitions of study areas, sampling strategy
Recruitment of new centres/pilot studies
Production of a supplement to the phase I manual for developing countries

Close — 6h00

5 October

Phase I instruments — 8h30

Chairman, Dr F. Martinez — Rapporteur, Dr N. Pearce

General cultural issues in international comparisons
Translation of written questionnaires
International video questionnaire

Coffee break — 10h30

Cont'd | 5 October

Phase I risk factor information	11h00

Chairman, Dr I. Asher   Rapporteur, Professor R. Anderson

Review of relevant studies in Asia
Review of relevant studies in Latin America
Centre questionnaire

Lunch	12h30
Phase I air pollution data	1h30

Chairman, Dr S. Weiland   Rapporteur, Dr I. Asher

Presentations by -
Dr R. Etzel, CDC Atlanta,
Drs J.A. Stober and T. Kjellström, WHO/EHE
Professor R. Anderson, ISAAC

Coffee break	3h00
The future	3h30

Chairman, Dr N. Pearce   Rapporteur, Dr B. Bjoerksten

Structure of ISAAC in developing countries
Possible WHO/EHE involvement
Possible CDC involvement
Possible IAACI involvement
Funding

Close	5h30

- Asthma and allergic diseases in Asia: prevalance & risk factors
  Dr Christine Douglass &
  Dr Christopher K.W. Lai

- Prevalance of asthma in school children from South America
  Dr Javier Mallol

- Prevalance of asthma in children in Brazil
  Dr Renato T. Stein

ASTHMA & ALLERGIC DISEASES IN ASIA: PREVALENCE & RISK FACTORS

Christine Douglass, MPhil
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and

Christopher K W Lai, DM, FRCP (Edin)
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CHINA

Prevalence

Over one-third of the population in Beijing have a history of allergic disease (1).

Asthma

The prevalence of asthma in children and young adults ranges between 1-2.4% (2, 3), whereas the prevalence in the general population varies from 0.69% in urban Shanghai, to 1.32% in rural Shanghai and to 5.29% in Beijing (1, 3).

Predisposing factors

1. Genetics

A parental history of asthma is a risk factor for the development of bronchial hyperresponsiveness (BHR), the severity of which, in turn, is closely related to diagnosed asthma (2). Subjects with asymptomatic BHR have an increased risk of developing asthma - 45% with a histamine $PD20 \leq 3.2$ μmol developed asthma in within 2 years (4). Atopy is also a risk factor for BHR (2).

2. Gender

No sex difference exists in young adults (11-17 years) but a male preponderance occurs in younger children (< 14 years) with a male:female ratio of 1.43:1 (2, 3).

Risk factors

1. Indoor aeroallergens

House dust mite is found throughout China, and is commonly associated with allergic diseases. Southern China has a higher incidence of house dust mite than the north, presumably due to climatic conditions in the south favouring growth (1). *D. pteronyssinus* and *D. farinae* are the dominant species of mite found in industrial and residential settings in China (5). In urban Guangzhou the most common allergen is *D. pteronyssinus*, whereas in the rural area, hay dust, pollen and feathers predominate. Cockroach sensitivity is also high in southern Chinese children, being present in 73.3% of atopic children (1).

2. Outdoor allergens

Hay fever is not as common in China as in the west. There is no ragweed pollen in China. However, a number of potent allergenic pollens have been identified. *Artemisia* (a kind of sage) causes autumnal hay fever in north China (1). In Shanghai, pollens of *castor bean* and *platanus* tree can precipitate hay fever. In northwestern China *Achnatherum splendens* (a type of grass) has led to allergic reactions, particularly in those migrating to the area from other parts of China.

Hay fever attacks usually commenced 3-6 years after immigration. In Beijing, sensitivities to pollens from sunflower, Indian corn, *Humulus*, *Cannabis*, etc. have been reported (1).

Airborne moulds are present almost everywhere in China throughout the year. Because of the warmer and more humid climate, southern China has a greater incidence of moulds than the north. Seasonal allergy to moulds is not as clear cut as pollen allergy. Peak mould counts occur from June to September in Beijing, and in May, June, September and October in southern China.

Contributing factors

1. <u>Respiratory infections</u>

Early childhood respiratory infection represents a significant risk for the development of BHR. In children with atopy, early respiratory infection or parental asthma will further increase the risk (2).

2. <u>Area of residence</u>

No difference exists between the prevalence of asthma or BHR in children living in urban and rural areas. Although there are higher concentrations of total suspended particles and sulphur dioxide in urban areas, outdoor temperature, humidity and lifestyles are similar in these areas (2).

3. <u>Seasonal variations</u>

Children born in autumn are more likely to develop allergy and asthma than those born at other times of the year (6).

Triggers

1. <u>Respiratory infections</u>

Acute respiratory infections frequently induce asthma exacerbations in children aged under 14 years (3).

2. <u>Weather changes</u>

Wheezing occurs more often in winter and autumn (3).

HONG KONG

Prevalence

Allergic diseases are common in Hong Kong, with 44.5% of schoolchildren and 58% of university students having at least one allergic symptom ever (1, 2).

1. Asthma

The cumulative prevalences of diagnosed asthma are 7.2-8% in schoolchildren (1, 2), 4.8% in university students (3), and 4.2% in the elderly (unpublished data). Wheeze has slightly higher prevalence rates, ranging from 8.6% in young adults (3) to 15.3% in children (1).

2. Nasal allergy

Rhinitis is the most common symptom, occurring in 29.8% of children (1), 24.3% of young adults (3) and 14.3% of a general population (4).

3. Dermatological allergy

Eczema is the most common allergic symptom in the general population, with a prevalence rate of 23% (4), compared with 19.1% in children (1) and 18.3% of young adults (3).

4. Atopy

57.7% of schoolchildren are atopic as determined by skin prick tests (1).

Predisposing factors

1. Genetics and Atopy

Hong Kong Chinese babies have a higher incidence of cord IgE levels (7.5%) than Swedish babies (5.3%), except in Hepatitis B-carrier mothers (3.7%) (5, 6). Whether this represents a racial predisposition for atopy or possibly an increased incidence of parasitic infestations, is not clearly established. Interestingly, immigrants from Hong Kong and other Asian countries demonstrate an increased ability to recognise grass antigens by having a 3-fold increase in the prevalence of hay fever and pollen allergy when they reside in Australia (1). Atopic children have a risk 2.2 times higher than their non-atopic counterparts of developing allergic symptoms, and children with a positive family history of allergy have a risk 6.8 times higher than those with a negative history. When both factors are present together, they increase the risk to 18 times (1). Only 13% of young adults with a doctor's diagnosis of asthma have a parental history of the same disease (2).

2. Gender

The male/female ratio for asthma is about 3:2 in children and young adults (1, 3).

Risk factors

1. Indoor allergens

Almost all atopic children can be identified by skin prick tests with the 3 allergens - *D. pteronyssinus*, cockroach and mould allergens (1).

a. House dust mites

Allergy to house dust and house dust mites are particularly common in Hong Kong. *D. pteronyssinus* is the species most frequently found in bedding dust (7) and almost all atopic subjects demonstrate positive skin tests to this species and/or house dust mix (1, 3, 7, 8). Sensitization to this allergen is not only present in 78.9% of asthmatics, 73.9% of those with rhinitis but also in 45.3% of children with no allergic symptoms (1).

b. Animal allergens

Cat sensitivity is present in 75% atopic university students (3) and has a high predictive value for the presence of BHR (3). High prevalence of sensitization to animal allergens has been reported by Pickering et al (80%) (8), but a substantial lower prevalence is seen in children (21.8%) (1). Cockroach and mould (*Alternaria, Aspergillus, Hormodendrum* and *Penicillium*) allergy are frequent in children (44.6% and 40.6% respectively).

2. Outdoor Allergens

Pollen allergy is not common in Hong Kong, occurring in only 11% of atopic subjects (3). Occupational asthma is uncommon.

Contributing factors

1. Air pollution

Circumstantial evidence suggests air pollution may be an important contributing factor. University students in Hong Kong living in 2 areas with high levels of air pollution had a significantly greater incidence of BHR, symptoms of rhinitis and atopy, than those living in less polluted areas (2).

2. Seasonal exacerbations

A clear bimodal distribution occurs in symptom worsening and hospital admissions for asthmatic subjects (3, 10), with an autumn wave and a smaller spring wave. Changes in temperature and humidity, and the use of mite-infested blankets during the cooler weather (7) may partly account for this observation.

Triggers

Air pollution may be an important trigger of asthma exacerbation as a recent study has shown a significant correlation between the quantity of total suspended particles and asthmatic hospitalization rates for children aged 4 years or less (9).

INDONESIA

Prevalence

1. Asthma

The reported prevalence of childhood asthma ranges from 2.3% to 8.2% (1, 2).

2. Nasal allergy

10.2% of children have allergic rhinitis near central Jakarta (2).

Risk factors

Aeroallergens

94.6% of adult asthmatics are sensitized to *D. pteronyssinus*, 88.4% to house dust, 80.6% to dog fur, 78.3% to bird feathers, 76.6% to cat fur, 71.3% to kapok, 45% to *Aspergillus fumigatus* and 39.5% to pollen (3)

JAPAN

Prevalence

1. Asthma

Two separate studies in 1992 have shown an increase in the prevalence of childhood asthma since 1982 with cumulative rates of 4.6% and 11% (1, 2).

2. Nasal allergy

The prevalence of nasal allergy is 32.7% in young adults (3).

Predisposing factors

1. Genetics

A family history of allergic disease is associated with a higher incidence of childhood asthma (1, 2).

2. Gender

A male preponderance for asthma exists (5.6% in males vs 3.5% in females) (1).

Risk factors

Aeroallergens

In subjects with nasal allergy, the main allergens are house dust and Japanese cedar with sensitization rates of 66.4% and 51% respectively (3). The perennial pollen species that have been reported are cedar, cypress, pine, birch, beech, grass, ragweed, mugwort, and Japanese hops (4).

Contributing factors

1. Respiratory infections

A history of respiratory infection during infancy is associated with the development of childhood asthma (1, 2).

2. Area of residence

Children living in urban areas are more likely to develop asthma (1). The prevalence rate for asthma was reported as 13.3% in these children with a family history of the disease.

Contributing factor

Air pollution

Atopic children exposed to high levels of air pollution have a higher incidence of cough, phlegm and wheezing. Following anti-pollution measures, a reduction in respiratory symptoms occurred (5, 6).

Triggers

Weather changes

High temperature, high humidity and high barometric pressure are associated with increased numbers of emergency clinic attendance. The direction of wind may also influence the occurrence of asthma symptoms (7).

MALAYSIA

Prevalence

Asthma

The cumulative prevalence of asthma, defined as doctor's diagnosis and/or persistent wheeze is 13.8% in schoolchildren (1).

Predisposing factors

1. Genetics

The pattern of asthma observed by Ross is that of later onset (only 22% had onset before 20 years of age) and a reduced association with family history of allergy, thus implying that asthma in Malaysia may be an acquired defect rather than familial (2). However, the later onset of asthma is not a consistent finding (1, 3)

2. Gender & Race

A significant prevalence of asthma in boys has been reported (1). Interestingly racial differences in sex prevalence have also been observed, with the sex difference (male > female) being most marked in Chinese (3:2:1) and almost nonexistent in Indians (1.1:1) (3). Malaysia has a non-homogenous population in relation to race, language and culture. Malay children have the highest prevalence of asthma (10.1%), followed by Chinese (7.9%) and Indians (7.1%) (1). Chinese also have lower hospital admissions for asthma (2), whether this is due to racial differences or socio-economic differences is unclear.

Risk factors

Aeroallergens

The most common skin prick reactions by asthmatics are to house dust and house dust mite (2). *D. pteronyssinus* has been identified as the most prevalent species in house dust (4). Almost half of the asthmatics are sensitive to animal danders and around one-third to moulds and fungi. Approximately 15% are sensitive to pollens (2).

Triggers

1. Weather

Asthma exacerbations have been reported to be more common during wet periods (2). However, a more recent study has not been able to support this finding but reveals that a cooler temperature is associated with a higher attendance at emergency department with acute asthma (5).

2. Respiratory infections

Respiratory infections have been reported to account for 79% of asthma exacerbations in children (3).

3. Foods

Foods have been reported to account for 27% of asthma exacerbations in children (3).

SINGAPORE

Prevalence

Asthma

In 1972, the prevalence rates of diagnosed asthma in schoolchildren were 1.6% for current asthma and 3.9% for lifetime occurrence (1). More recently a higher rate of 13.7% has been reported (2). Hospital admissions for asthma are also increasing in Singapore (3).

Risk factors

Aeroallergens

House dust and house dust mite are the most common allergens, with more than 90% of asthmatic adults sensitized to these allergens (4). Other common allergens in adults include:

Mixed feathers	78%
Cat fur	78%
Dog hair	78%
Human hair	62%
Cotton flock	62%
Kapok	60%
Tree pollens	54%
Aspergillus	42%
Flower & Shrub pollens	32%
Alternaria	28%

TAIWAN

Prevalence

Three epidemiological studies in Taiwan over a 17-year period (1974, 1985 and 1991) in the same schools, season, children of the same ages and using the same methodology have shown an increasing prevalence in allergic diseases (1, 2). The age of onset of allergic diseases in 1984 was much greater than those born in 1976, suggesting that environmental factors may play a role in the development of these diseases (2).

1. Asthma

The prevalence of childhood asthma increased from 1.3% in 1974, to 5.07% in 1985 and to 5.8% in 1991, representing a 4.5-fold increase throughout this period (1,2). At the same time, the severity of asthma also increased, with the frequency of attacks, defined as > 12/year, increased from 9.2% in 1974 to 19.4% in 1991 (2).

2. Nasal allergy

The prevalence of allergic rhinitis increased from 7.84% in 1985 to 20.67% in 1991 (1,2).

3. Atopic eczema

The prevalence of atopic eczema increased from 1.43% in 1974 to 6.79% in 1991 (1, 2).

Predisposing factors

1. Genetics

A history of allergy in at least one parent is a significant risk factor for the development of asthma in Taiwanese children (3). There is also an association between HLA-DQw2 and childhood asthma (4).

2. Gender

Asthma and rhinitis affect slightly more boys than girls but no sex difference is seen with atopic eczema (2).

Risk factors

Aeroallergens

In asthmatic children, sensitivity occurs most frequently to house dust (93.4%) and house dust mite (90.2%) (5). Other sensitized allergens include:

Cotton	37.5%
Candida	34.2%
Rice straw	32.2%
Moulds	16.7-26.7%
Ragweed	22.8%
Cockroach	17.9%
Food	<10%

D. pteronyssinus is most frequently isolated from dust samples in Taipei. Mite counts peak from August through November and are lowest in July (6). Grass and rice pollens are prevalent in the atmosphere in autumn, and tree pollens in spring.

Contributing factor

Respiratory infections

In a study of 35 children with a history of pneumonia in infancy, 37% developed asthma. Whilst genetic factors were identified as important, infection might be even more important because even in non-family-allergy children the occurrence of asthma with a history of pneumonia was higher than the prevalence for age-matched controls (3).

Air pollution

The increase in the prevalence of childhood asthma from 1974 to 1986 was associated with reductions in atmospheric smoke, sulphur dioxide and nitrogen dioxide, suggestion that air pollution might not be an important factor in the induction of this disease (1).

Prevention

Dietary manipulation

The value of dietary manipulation in the prevention of allergic diseases is unclear. In a study involving 33 high risk, normal full-term newborns, 15 babies were fed with breast milk and/or hypoallergenic infant formula for the first 6 months of life and the remaining were fed with regular formula. A higher incidence of moderate to severe atopic dermatitis and allergic rhinitis were seen in those fed with regular formula although the differences did not reach statistical significance. No difference was seen between the incidence of wheezing in the two groups (7).

THAILAND

Prevalence

1. Asthma

The cumulative prevalence of asthma in Thai children aged 6-12 years was 4.3% in 1987 (1).

2. Nasal allergy

The cumulative prevalence of allergic rhinitis in children was 18% in 1987 (1).

3. Dermatological allergy

The cumulative prevalence of atopic dermatitis in children was 18% in 1987 (1).

Predisposing factors

1. Genetics

In a study of 2,000 asthmatic children, a positive family history of allergic disease was observed in 79.3% of cases (2, 3), suggesting that genetic factors may play an important causative role in asthma.

2. Gender

A male/female ratio of 3:2 has been reported for childhood asthma (2, 3).

Risk factors

1. Indoor allergens

Most asthmatic children (74.9%) are sensitized to house dust (2,3).

2. Outdoor allergens

In Bangkok, grass pollens are the commonest aeroallergens and are present throughout the year with peak counts in winter. Weed pollens are also present with a peak in August, tree pollens exist to a lesser degree (4).

Many fungal spores have been identified. *Cladosporium* predominates, comprising 70% of spores and peak level occurs in winter. Other spores such as *Helminthosporium* and *Alternaria* are also present (4).

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Triggers

Viral upper respiratory tract infections, climatic changes and exercise are the most common precipitants for asthma exacerbations in Thai children (5).

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PREVALENCE OF ASTHMA IN SCHOOLCHILDREN FROM SOUTH AMERICA

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SUMMARY

Many children suffer from asthma in developing countries but its prevalence is virtually unknown. In the last few years, there have been numerous reports on asthma prevalence in children from developed, or more industrialized countries (1-9). The published information regarding the prevalence of asthma in South American children, as well as the related risk factors is very few.

The reported prevalence of asthma in South American children goes from 4.6% to 33% (11-20). However, there are wide variations in methodology, i.e., definitions, questions, study design, etc. between those studies, so the results are difficult to be compared. Furthermore, many of those studies have important methodological bias, therefore, much of the given information could not be reflecting the actual prevalence of the disease. Thus, the existence of true variations in the prevalence of asthma in children from different countries or communities in South America remains very uncertain.

There is recent information indicating that a serious effort is being done in this region for determining the prevalence of asthma in children (12) and the influence of air pollution on the airway responsiveness to methacholine at that age (13).

In one of those studies (12), undertaken in the urban area of a non-polluted city (La Serena) in Chile, the lifetime prevalence and the last 12 months prevalence of asthma in schoolchildren aged 6 to 18 years, were assessed by using exactly the same questionnaire as that recently employed for a similar survey in Melbourne, Australia (9). The lifetime prevalence of asthma and the last 12 months prevalence for that random sample of 7.000 Chilean schoolchildren were 45% and 21%, respectively. Those figures were very similar to those reported to occur in the Melbourne's schoolchildren (9).

In the other study, the prevalence of airway hyperactivity to methacholine assessed in schoolchildren from two Chilean cities, Santiago (smog) and Los Andes (non-polluted city), was found to be 26.4% and 22.3%, respectively, and the difference was not statistically significant (13). Although there are many anecdotal information regarding the effect of air pollution on the prevalence of asthma in children from the countries of the region, there is no published information specifically looking at that matter in South America. There is one study from Cuba relating acute respiratory diseases and bronchial asthma in children with air pollution and air temperature (22). The authors found that there was an increased number of asthma consultations with higher levels of air pollution and also they reported higher rates of acute respiratory with lower air temperature. There is another study published, from Rio de Janeiro, Brazil (23), that suggests a direct relationship between air pollution and infantile mortality due to pneumonia. Unfortunately, no information regarding other respiratory diseases is provided by the authors.

The risk factors for asthma in children from the region also vary from one country to another depending on climate, social- economical conditions and cultural background. The risk factors for larger rates of asthma prevalence reported by the authors cited in this summary are: crowded house, tobacco smoke, use of kerosene or wood stoves, use of fan turned on for sleeping, living in coastal and humid areas, helminthic infection,

sudden temperature changes, weather changes, viral respiratory infections, family history for the disease and smog (16,18,19,20,22). However, the magnitude and the capability of each of these risk factors in altering the prevalence of asthma in South American children from different communities in unknown.

The surprisingly few information published regarding the prevalence of asthma in children from Latin America and other developing regions of the world. The latter, indicates the need to undertake collaborative studies directed to determine the true prevalence of asthma in children from these regions and to study the actual effects that air pollution, respiratory infections, and other risk factors, inherent to each region, have on that prevalence.

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PREVALENCE OF ASTHMA IN CHILDREN IN BRAZIL

A review of some published papers

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Most of the epidemiologic studies in asthma done in the previous years in Brazil were small surveys published in national journals. Most of these studies have important methodologic problems, but can give us an idea of what is happening with asthmatic children in the country.

One study (1) reviewed epidemiological aspects of asthmatic attacks in children in the city of Santo André, state of Sao Paulo, from 1975 to 1984. The population studied were the children who had pediatric consultation at two public health facilities and one public hospital. Asthma incidence was looked for in this group, per 10.000 children from 0 to 12 years old. Data from atmospheric pollution were analyzed from 78 to 84: SO_2 and particulate matter. Values for average monthly temperature and relative humidity were also registered. The results showed increased incidence of asthma consultations along the years studied (in 1984 the monthly average incidence was twice the one found in 1975: 42.3 per 10000). The incidence of hospital admissions had a significant increase in 1980, being more important from 1982 on. The comparisons of this data and the SO_2 monthly average rates did not show any correlation once SO_2 levels decreased during this period. Some geographic areas showed increased levels of particulate matter, but when compared with the incidence data found, did not show definitive conclusions.

Other study (2) was done in a slum ("favela") from the city of Rio de Janeiro and published in 1988. The authors visited all houses in this poor neighbourhood and did home interviews; they interviewed 2556 people representing 93.6% of the population. The results showed 19.1% positive answers to the question: Have you ever had asthma? Of those, 48.6% still had asthma.

Another study (3) looked for prevalence of asthma in school children in the city of Porto Alegre. Children 10 to 18 years old (total 1169) from 3 schools were interviewed. This information was compared with prevalence of asthma in the same setting 8 years before. In 1980 the prevalence was of 6.7% and in 1983 the rate had a significant increase to 16.5% (cumulative asthma) and 10.9% (active asthma).

A chart review of pediatric consultation (4) in a general hospital in the city of Curitiba for one given year showed asthma prevalence rates of 4.6%.

Asthma mortality from 1980 to 1991 was reviewed in the state of Sao Paulo for children 8 to 19 years old (5). There was a significant decrease in number of deaths from asthma in all these ages (1.21/10000 to 0.41/10000 in 1991). Another paper presented in an abstract form in the proceedings of a meeting (6) describes mortality rates for the country as a whole from 1981 to 1986. The data shows a decrease in mortality rates in the age group below 4 years old. Although the mortality was not high in the other ages, it did not show a significant decrease. It is important to know that the state of Sao Paulo is the most industrialized in the country with the highest income.

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