Prevalence of Asthma in Adolescents in Various Parts of France and its Relationship to Respiratory Allergic Manifestations

Simone Perdrizet, M.D.; Francoise Neukirch, M.D.; Jacqueline Cooreman; and Renata Liard

Six studies have been carried out in France and French Polynesia to investigate the prevalence of asthma in adolescents attending secondary school and in Paris university students (68,179 subjects overall). All the studies used the same questionnaire, self-administered in the classroom, and interviews administered to students during the university's preventive medicine examination. An epidemiologic definition of asthma was considered an affirmative answer to the question, "Have you ever had attacks of asthma?" The prevalence of asthma ranged from 4 to 12 percent, most often higher in boys with a tendency to increase with age. The relationship between asthma and other allergic respiratory conditions was studied. Some recommendations are made here to improve the validity of data and to increase knowledge about the etiology of asthma.

Since 1976, several epidemiologic studies on asthma have been conducted in France and French Polynesia by INSERM, Unit 179. The objective of those surveys was to study the prevalence of asthma in well-defined populations and to research the relationship between asthma and other allergic respiratory diseases.

All the surveys carried out in secondary schools used an identical data collection system. A self-administered questionnaire was completed in class, without any comment from the teachers. Students of Paris University were asked the same series of questions without any comment, during the university's preventive medicine (UPM) examination. Forty-three doctors were involved in the administration of these examinations.

Table 1—Surveys Carried out from 1976 to 1981 in France and French Polynesia Among Pupils in Secondary Schools and Paris University: Prevalence of Asthma According to Sex

<table>
<thead>
<tr>
<th>Area/city</th>
<th>Dates</th>
<th>No. of subjects</th>
<th>Male (%)</th>
<th>Mean age (yrs)</th>
<th>Prevalence of asthma (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bas-Rhin</td>
<td>May-June 1976</td>
<td>29,138</td>
<td>48</td>
<td>15.9</td>
<td>Males 4.9, Females 3.4, Total 4.1</td>
</tr>
<tr>
<td></td>
<td>May-June 1979</td>
<td>7,093</td>
<td>47</td>
<td>16.2</td>
<td>Males 7.0, Females 5.4, Total 6.1</td>
</tr>
<tr>
<td>French Polynesia</td>
<td>April-June 1979</td>
<td>3,870</td>
<td>46</td>
<td>16.0</td>
<td>Males 11.1, Females 11.9, Total 11.5</td>
</tr>
<tr>
<td>Paris</td>
<td>September 1978</td>
<td>2,272</td>
<td>43</td>
<td>14.9</td>
<td>Males 8.4, Females 5.6, Total 6.8</td>
</tr>
<tr>
<td></td>
<td>October 1978</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bordeaux</td>
<td>April-June 1981</td>
<td>15,247</td>
<td>47</td>
<td>16.5</td>
<td>Males 10.5, Females 8.5, Total 9.4</td>
</tr>
<tr>
<td>University of Paris</td>
<td>January-April 1982</td>
<td>10,559</td>
<td>45</td>
<td>21.2</td>
<td>Males 6.3, Females 4.6, Total 5.4</td>
</tr>
</tbody>
</table>

Table 2—Prevalence of Asthma among Parisian Students According to Sex and Age Group (%)

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Under 18</th>
<th>19</th>
<th>20</th>
<th>21 to 20</th>
<th>Over 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>6.9</td>
<td>7.0</td>
<td>7.2</td>
<td>6.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Female</td>
<td>4.2</td>
<td>4.2</td>
<td>3.8</td>
<td>5.9</td>
<td>3.0</td>
</tr>
<tr>
<td>p</td>
<td>0.04</td>
<td>0.004</td>
<td>0.0001</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

The questions asked concerned cough, breathlessness on exertion, wheezing and asthma. Asthma was defined as an affirmative answer to the question, "Have you ever had attacks of asthma?" These questions were derived from the questionnaires designed by the British Medical Research Council and World Health Organization.

Populations Studied

Five surveys concerned adolescents attending secondary school and one studied Paris University students (Table 1). Overall, 68,179 people were studied. The response rate was very satisfactory: 88 to 96 percent. There were slightly fewer boys than girls. The average age ranged from 14.9 to 16.5 years in secondary schools and was 21.2 years in university students.

Results

The prevalence of asthma in the six surveys described in Table 1 ranged from 4 to 12 percent. Boys tended to have a higher rate than girls. Among students, this was apparent only in those aged less than 20 years (Table 2). According to studies carried out in Bas-Rhin in 1976 and 1979, prevalence of asthma has increased over time, but the difference is not statistically significant. In French Polynesia, where a second study is in progress among 6,450 pupils aged 10 to 19 years (data collected in 1984, five years after the first study), the prevalence of asthma was higher—15.2 percent in boys and 13.5 percent in girls.

A study of 8,140 Parisian students was conducted 14 years earlier, according to the same methods. The prevalence of allergic conditions studied had significantly increased between 1968 and 1982; from 3.3 to 5.4 percent for asthma, from 3.8 to 10.2 percent for allergic rhinitis, and from 3.5 to 6.0 percent for eczema.

It was found that there was a male predominance for asthma (6.3 vs 4.6 percent in females) and for allergic rhinitis (11.5 vs 9.1 percent in females).
percent in females), and a female predominance for eczema (7.0 in females vs 4.8 percent in males). About half the asthmatic subjects had asthma alone; the others had asthma associated with seasonal or perennial allergic rhinitis, eczema or other allergies (Table 3). Mean age at the time of the first asthmatic attack was 8.0 years for males and females in 1968 and 1982. Age at the time of the first attack of allergic rhinitis (12.2 years) also had not changed over time. Among the students with allergic rhinitis, the proportion with seasonal rhinitis was similar in 1968 and 1982 (64 and 66 percent, respectively).

In the two populations studied in 1968 and 1982, family histories of allergy were reported by 41 and 39 percent of those who had one or more allergies. In 1982, 1.4 percent of the whole population studied still had asthma attacks.

In the five studies implemented in teenagers attending school, there were close relationships between asthma and respiratory symptoms (ie, usual cough, chronic cough, breathlessness on exertion and wheezing) (Table 4).

In the survey carried out in Bas-Rhin in 1976, the frequency of asthma was higher in urban areas (5.0 percent) than in rural areas (3.0 percent) and school absenteeism was more frequent in asthmatic (26.0 percent) than in non-asthmatic subjects (13.7 percent). The month of birth of asthmatic subjects was significantly different from that of non-asthmatic subjects: 56 percent of the 1,208 asthmatic subjects were born from May to October, whereas that proportion was 49 percent in non-asthmatic subjects. These differences were significant (P<0.01).

In the survey in Bordeaux, the prevalence of asthma was significantly higher in upper socio-professional categories, but such an association was not constant in all the studies.

**DISCUSSION**

The prevalence of asthma in France varies according to the region, urban or rural area and sex, but is always lower than 10 percent. In French Polynesia, the rate was higher. The increase of allergic diseases found in Parisian students could be due to overestimation following increasing publicity about these diseases. But there are two arguments against that hypothesis: the consistency of the mean age of onset of asthma or allergic rhinitis, and the consistency of the proportion of family history of allergy among asthmatic subjects.

The increase in the prevalence is worrying. Michel has hypothesized that natural selection will favor individuals with a highly efficient system against immunologically foreign agents. Populations are becoming increasingly hyper-allergic and as a result allergic conditions may become increasingly prominent health problems.

The very simple definition of asthma adopted for the studies presented here is generally not recognized by clinicians. The misunderstanding is due to a different use of the term. Clinicians want to obtain as precise a diagnosis as possible for each patient. They choose the criteria most relevant to the individual patient as part of the process of determining the appropriate treatment. Epidemiologists have a different objective. They want to identify, in a simple, rapid and standardized way, a homogeneous group of subjects who have the same characteristics. These characteristics are defined as an affirmative answer to one or more standardized questions. The conclusions of epidemiologic studies are applicable to groups of people with those characteristics. Some epidemiologists require an affirmative answer also to the question, “Was the diagnosis of asthma confirmed by a doctor?” In the age group we studied that confirmation seems unnecessary. Pratter found that the clinical diagnosis of asthma may be less reliable than generally thought.

Validity of the mode of data collection and of the answers obtained was studied by the participation rate, from the proportion of non-responses to the questions, from the likelihood of the answers based on the existence of relations between asthma and other respiratory troubles and from the consistent relations between the frequency of respiratory symptoms (cough, breathlessness and wheezing) and pupils’ smoking habits. The responses obtained from self-administered questionnaires were logical and likely: asthmatic subjects had respiratory symptoms more often than non-asthmatic subjects, wheezing was much more often reported by asthmatic subjects, and school absenteeism due to respiratory diseases was more frequent than among nonasthmatic subjects. No relation was found between asthma and smoking habits.

In the 1978 Parisian survey of secondary school students, spirometric lung function tests were implemented in a random sample of the pupils (random sample stratified by age, sex and smoking habits). In those with breathlessness, FEV₁ (forced expiratory volume in 1 sec) was significantly diminished; in those with wheezing, FEF₂₅₋₇₅ (maximal midexpiratory flow rate) was significantly diminished.

**Table 4—Degree of Significance of Positive Relations between Asthma and Other Respiratory Troubles in Adolescents Attending Schools**

<table>
<thead>
<tr>
<th>Area/city</th>
<th>Usual cough</th>
<th>Chronic cough</th>
<th>Dyspnea on exertion</th>
<th>Wheezing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bas-Rhin</td>
<td>p&lt;0.001</td>
<td>not asked</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>French</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Polynesia</td>
<td>p&lt;0.001</td>
<td>not asked</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Paris</td>
<td>p=0.02</td>
<td>p=0.03</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Bordeaux</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>
wheezing.

The prevalence of asthma in France was studied from different surveys, both in groups of children aged six to ten or 12 years, and in a group of young adults. Among children, according to the results of the PAARC survey carried out in different towns, the prevalence of asthma ranged from 4 to 5 percent in Lyon, Marseille, Rouen and Toulouse. In Bordeaux, prevalence was 7.5 percent in children aged six to 12 years. In a survey carried out under the auspices of the European Community in the seven French centers, 1 to 4 percent of the children had at least one attack of asthma during the last 12 months. As for adults, in a study implemented in the Selection Center of the Army in Tarascon among 26,604 young men (most of them aged 17 to 19 years), 14.8 percent had wheezing in the chest, 9.7 percent had attacks of shortness of breath with wheezing in the chest and 7.4 percent had asthma; 3.6 percent gave affirmative answers to all three items. The high prevalence of wheezing in the chest may be explained by the highly statistically significant relationship between this symptom and smoking. In a study carried out at the University of Strasbourg among 9,365 students (mean age 21 years), 3.5 percent were asthmatic. Although the results of the different surveys are not always comparable, the prevalence of asthma in France appears to be between 4 and 8 percent.

**CONCLUSION**

A review of these studies prompts some comments and recommendations, mainly about the definition of asthma to be used in epidemiologic studies, data collection, the contents of questionnaires and their assessment.

All these studies used the same simple and arbitrary definition. Such a definition does not permit the identification of every case of asthmatic disease, but, however, a population group with a positive answer to the question concerning asthma reflects an asthmatic condition that can determine the cumulative prevalence of asthmatics. For epidemiologic surveys, the cumulative prevalence (reflecting an asthmatic condition) is more useful than the point or annual prevalence. If the patient treats himself soon enough to avoid an attack of asthma, he will give a negative answer to the question and the prevalence will be underestimated. For the same reason it is difficult to appreciate the frequency and severity of attacks. Questionnaires about asthma can be improved, but it must be kept in mind that a modification of the definition of the asthmatic condition diminishes the opportunities to compare data. So it is desirable that the same definition is adopted for all cross-sectional surveys.

To ensure that observed variations of prevalence (according to sex, country, and region) are real, rigorous methods of data collection must be applied; hence, standardization is very important. It is necessary to test questionnaires in a population comparable with those to be studied and to validate the answers by examining their relationship with the answers to questions concerning cough, dyspnea, and wheezing. It is important to develop methods permitting the evaluation of the reproducibility of answers.

Care must be taken in translating questionnaires to account for local habits. When data are collected by interview, this task must be performed by well-trained investigators to avoid biased answers. Surveys must be carried out in collaboration with all specialists concerned with asthma. In order to increase knowledge about the etiology of asthma, to elaborate and test hypotheses, and to demonstrate variations in prevalence according to different factors, comparable multiple cross-sectional surveys should be carried out in different countries.

**REFERENCES**

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International Workshop on Etiology of Asthma