

Short communication

Prevalence of asthma and asthma symptoms in a general population sample from northern Italy

*European Community Respiratory Health Survey - Italy. Prevalence of asthma and asthma symptoms in a general population sample from northern Italy.

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European Community Respiratory Health Survey - Italy

The European Community Respiratory Health Survey is an international survey of the general population which aims to establish whether there are significant variations in the prevalence of asthma among European countries. The present paper reports the prevalence of asthma and asthma-like symptoms in a sample of subjects living in three areas of northern Italy: Turin, Pavia, and Verona. Samples of residents 20-44 years old (3000 subjects in Turin and Verona and 1000 in Pavia) stratified by sex (M:F = 1:1) were randomly selected from local health authority lists in the three participating areas. To correct the observed prevalence estimate for nonresponse bias, a method proposed by Drane was applied. Of the sampled subjects, 86% (6031) participated in the survey. Two different definitions of asthma were adopted: 1) prevalence of asthma attack in the last 12 months; 2) prevalence of asthma attack or treatment with antiasthmatic drugs, or both wheezing apart from the common cold and wheezing with shortness of breath. This combination of symptoms has been called current asthma. According to these definitions, the prevalence of asthma attack was 3.47% (3.74% in men and 3.14% in women), and the prevalence of current asthma was 5.01% (5.07% in men and 4.90% in women). The lowest prevalence was found in Pavia; the highest in Turin. Our findings support the hypothesis that the difference in prevalence reflects the difference in mortality.

Key words: asthma; asthma symptoms; epidemiology; prevalence.

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The frequency and severity of asthma seem to be increasing in several countries, although the true ex-

tent of the problem is somewhat biased by changes in diagnostic habits, that is, the trend to diagnose asthma instead of alternative disorders, and by the extreme variability in epidemiologic tools used for case identification (1, 10, 12-14, 16-18, 19, 21). The absence of a standard definition of asthma and non-homogeneity of information make it very difficult to compare results over time and between geographic areas (3, 4, 11, 20, 24, 25). If these variations were shown to reflect real differences in prevalence rates, they could highlight the importance of environment and local lifestyle in the origin of the disease.

The European Community Respiratory Health Survey (ECRHS), a multicenter survey, aims to as-

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sess the variations of asthma in different EEC countries, measure the association of asthma with risk factors, and estimate differences in the management of asthma in different parts of Europe (5–8, 15, 17, 22, 23).

The present paper reports the prevalence of asthma and asthma-like symptoms in a sample of subjects living in three areas of northern Italy.

Material and methods

The three areas, Turin, Pavia, and Verona, are located in the plain of northern Italy and have a temperate climate. Turin is a large urban area (977 366 residents); 50% of its work force is engaged mainly in manufacturing industry (Fiat car factories). Pavia's industry is mostly concerned with goods and services (183 876 residents, 45% in urban, 35% in semirurban, and 20% in semirural areas). Verona has an intermediate situation (298 985 residents, 80% living in urban areas, its work force engaged in tourism and service industries).

The highest pollution level was registered in Turin; in Pavia, the pollution was primarily caused by traffic and heating. Environmental measurements always revealed pollution levels that were below risk levels, with seasonal fluctuations. Verona is in an intermediate position. From a health-care point of view, the three areas present quite diverse conditions: general mortality rates, those for respiratory diseases and for asthma, as well as those for all preventable causes of death, show a decreasing trend from Turin to Verona to Pavia (Table 1).

Samples of residents (3000 in Turin and Verona, 1000 in Pavia) stratified by sex (M:F = 1:1), 20–44 years of age, were randomly selected from local health authority lists. The self-administered ECRHS questionnaire was used in the first stage of the survey. This short questionnaire (SQ), developed by an international group of experts (2), comprises seven questions on respiratory symptoms, asking whether at any time in the last 12 months: 1) the subject experienced *whoezing* or *whistling* in the chest; 2) woke up with a feeling of *tightness* in the chest; 3) was awakened by an attack of *shortness of breath*; 4) was awakened by an attack of *coughing*; 5) had an attack of *asthma*; 6) was currently taking *medicine for asthma*; 7) suffered from any nasal allergy including *"hay fever"*. Three other items were included relating to the date the form was filled out, and the date of birth and sex of the interviewee. The validity and reproducibility of the questionnaire were tested in an international study (4). The questionnaire and a letter explaining the aims of the ECRHS program were mailed to a total sample of 7000 people between October 1991 and March 1993. It was emphasized in the letter that both subjects with and

Table 1. Proxy indicators of risk factors in three areas

	Pavia*	Verona**	Turin***
Air pollution			
SO ₂	16.6	15.5	32.7
NO ₂	56.7	63.2	86.0
O ₃	46.8	39.9	51.1
Benzene	10.9	39.4	14.5
Toluene	53.6	105.0	37.9
Formaldehyde	10.9	—	—
HNO ₂	2.5	—	—
Avoidable death indicators			
Asthma	0	83	101
Respiratory disease	45	57	63
Tuberculosis	101	96	128
SUMAD	76	65	206
Average deaths % of total deaths	4.5	6.1	6.9

* Data from Istituto di Igiene

** Data from "Settore Ecologia del Comune di Verona".

*** Data from "Laboratorio di Sanità Pubblica-Azienda USL 1 di Torino".

SUMAD = magnitude of excess "avoidable mortality" calculated as sum of no. of standard deviations ($\times 10$) by which each indicator exceeds expected (100) for each of following conditions: tuberculosis, malignant neoplasm of cervix and body of uterus, Hodgkin's disease, chronic rheumatic heart disease, all respiratory diseases, asthma, appendicitis, abdominal hernia, cholecystolithiasis, cholecystitis, hypertension, and all cerebrovascular diseases.

without respiratory symptoms were asked to participate in the program.

A postage-paid envelope was enclosed with the letter in order to encourage the return of the completed questionnaire to the study center. For non-responders to the first contact, a different strategy was adopted in the three cities according to previous local experience with conducting surveys: in Pavia and Turin, the subjects were administered the questionnaire by telephone, while in Verona two more mailings and a final telephone call were attempted to reach the remaining nonresponders. Dropouts (subjects who died or moved) were replaced with subjects from a reserve list. An advertising campaign in the local and medical press explaining the purpose of this international research program preceded the start of the survey. Local television and radio, as well as posters, were also involved in spreading this information.

To correct observed prevalence estimates for "nonresponse bias", a method proposed by Drane (9) was used. The effects of center, sex, and age on symptom prevalence were analyzed through a multiplicative logistic model, controlling for contact, in order to take into account nonresponse bias. Age was divided into 5-year groups and treated as a categorical variable. Contact was a two-level factor contrasting responders to first contact with late responders.

Table 2. Prevalence rate of asthma and other respiratory symptoms (rate%) by contact

	First contact	Second contact
Wheezing	11.37	8.44
in presence of dyspnea	2.68	2.74
and absence of common cold	7.96	5.66
Tightness in chest	9.80	6.29
Awakening for breath shortness	7.75	6.43
Awakening for coughing	29.59	29.20
Asthma attack	4.42	3.02
Drugs for asthma	2.40	1.62
Hay fever	18.31	13.29

Results

Of the subjects sampled, 86% participated in the survey. The lowest response rate was registered in Pavia (82%) and the highest in Verona (90%). The prevalence of symptoms was always higher in early than late responders: a self-selection operated in the sample so that late responders and probably also nonresponders had a lower prevalence than early responders (Table 2). To correct the selection bias, the rates were adjusted by Drane's method, which was developed in a previous work (6-8). According to Drane's method, on the assumption of a linear trend in prevalence across subsequent contacts, the prevalence in nonresponders was extrapolated by fitting a linear regression model to the observed prevalence at each contact (9).

Two different definitions of asthma were adopted: 1) presence of asthma attack in the last 12 months (asthma attack); 2) presence of asthma attack or treatment with antiasthmatic drugs, or both wheezing apart from the common cold and wheezing with shortness of breath (current asthma).

According to these definitions, 3.47% of the subjects stated that they had experienced an asthma attack within the last 12 months, with an excess among men (3.74%) (Table 3). By the definition of current asthma, 5% of the sample was affected by

Table 3. Prevalence of asthma and other respiratory symptoms (rate% and SE adjusted according to Drane's model)

Symptoms	Men	Women	Total
Asthma attack	3.74 (0.36)	3.14 (0.34)	3.47 (0.25)
Current asthma	5.07 (0.42)	4.90 (0.42)	5.01 (0.30)
Wheezing	10.56 (0.59)	8.09 (0.52)	9.37 (0.40)
~ with shortness of breath	2.54 (0.31)	2.89 (0.33)	2.71 (0.23)
~ apart from cold	7.12 (0.49)	5.58 (0.43)	6.39 (0.33)
Tightness in chest	6.90 (0.49)	8.05 (0.51)	7.42 (0.35)
Shortness of breath	5.76 (0.45)	8.06 (0.52)	6.85 (0.35)
Cough attack	25.85 (0.86)	33.11 (0.92)	29.29 (0.63)
Asthma drug	1.74 (0.24)	1.99 (0.27)	1.87 (0.18)
Hay fever	15.05 (0.69)	14.69 (0.68)	14.90 (0.48)
At least one symptom	43.73 (0.97)	45.96 (0.97)	44.79 (0.69)

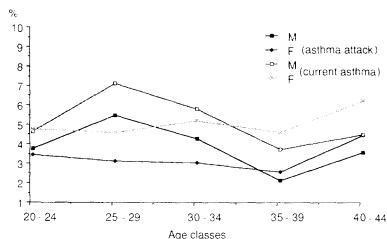


Fig. 1. Prevalence of asthma by age and sex.

the condition, with no substantial differences between the sexes.

Of the subjects with current asthma, 33% suffered from at least two of the above mentioned symptoms and 12.8% showed all three of them.

The prevalence of all the other respiratory symptoms registered on the SQ shows that the ones most frequently declared were the nonspecific symptoms related to other nonasthmatic conditions: nearly a third of the subjects mentioned attacks of coughing, with an excess among women, and 15% said they suffered from hay fever. The prevalence of tightness in the chest and shortness of breath was slightly higher than that of asthma, with higher values being registered among women.

When all respiratory symptoms were considered, 44.79% of the sample claimed to have at least one of them, with a small excess among women. Prevalence rates for asthma were higher among men in the youngest age groups (under 34 years old) and among women over 35 years of age (Fig. 1).

The prevalence of asthma showed an increasing trend from Pavia (2.58%) to Verona (3.54%) to Turin (3.65%) for both men and women with respect to Pavia, in agreement with the evidence regarding mortality data for asthma as well as for the other causes and air pollution (Table 4). Multivariate analysis with logistic regression confirmed sex as a

Table 4. Prevalence of asthma by area (rate% and SE adjusted according to Drane's model)

Symptoms	Pavia	Verona	Turin
Asthma attack			
M	3.86 (1.04)	3.68 (0.52)	3.75 (0.55)
F	1.26 (0.59)	3.34 (0.50)	3.50 (0.58)
T	2.58 (0.60)	3.54 (0.36)	3.65 (0.40)
Current asthma			
M	4.08 (1.05)	4.29 (0.57)	6.13 (0.71)
F	2.82 (0.85)	4.66 (0.59)	5.81 (0.75)
T	3.48 (0.68)	4.52 (0.41)	6.00 (0.52)

Table 5. Odds ratio (OR) and confidence interval (CI) estimated by logistic regression model

Factors	Asthma attack			Current asthma	
		OR	CI (95%)	OR	CI (95%)
Sex	M	1		1	
	F	0.75	0.57–0.98*	0.88	0.70–1.10
Age (years)	20–24	1		1	
	25–29	1.12	0.74–1.69	1.17	0.82–1.68
	30–34	1.05	0.69–1.61	1.21	0.84–1.74
	35–39	0.64	0.40–1.05	0.83	0.56–1.24
	40–44	1.09	0.71–1.66	1.11	0.76–1.61
Area	Pavia	1		1	
	Verona	1.38	0.86–2.23	1.22	0.81–1.84
	Turin	1.57	0.97–2.53	1.80	1.19–2.65**

* $P < 0.05$; ** $P < 0.001$.

risk factor in the sense that women had significantly lower rates of asthma attack ($OR = 0.75$), and geographic areas as a risk factor in the sense that OR values increased from Pavia to Verona to Turin. In the case of current asthma, the OR for Turin (1.80) was significantly higher than that of Verona (1.22) and Pavia (Table 5).

Discussion

Data on asthma morbidity must always be considered with caution because of the already mentioned lack of a clear definition of asthma itself. As a consequence, it is difficult to establish whether differences in asthma prevalences between different areas are real or simply reflect methodologic differences. This survey was conducted, according to the same protocol, in three different areas of northern Italy; therefore, the research methodology and the definitions employed were the same.

On the basis of the results, it is possible to express several considerations that emerge from the first stage of the survey. The first important finding from our analysis is that the nonresponse process is not random: a self-selection operates in the sample so that late responders and probably nonresponders as well have a lower prevalence than early responders. Nonresponse is usually the rule in epidemiologic surveys, but little attention has been paid until now to the methodologic implications of nonresponse in comparative studies. The ECRHS Italy survey has made it possible to evaluate this bias and propose a correction. The second finding is that asthma involved about 5% of the population between 20 and 44 years old, with an excess among men, especially when asthma attack predominated, in which case the figure was statistically significant. The reasons for this excess are still not clear: it may be attributable to factors such as a greater exposure of men to environmental risks, smoking, genetic predisposi-

tion, and atopy. As far as age is concerned, the age groups most often involved were those of 25–34 years in men, and over 40 in women. These results seem to confirm the prevalence trend by age and sex reported in the current literature. Although these data were obtained by a cross-sectional study, they appear to reflect the natural history of the disease.

The prevalence rates for all the symptoms registered increased from Pavia to Verona to Turin. In the case of current asthma, the rate was significantly higher in Turin than in Pavia and Verona ($P < 0.001$). The higher degree of industrialization and urbanization in Turin might suggest the risk of a greater degree of pollution as well as a higher occupational risk. Prevalence rates had the same trend as mortality rates. This finding seems to be in agreement with the hypothesis that differences in prevalence could explain differences in mortality data. Our data reflect only a few aspects of the epidemiology of asthma and shed light mainly on the role played by age, sex, and degree of urbanization. Other important information is expected to come from an analysis of data on all the other variables investigated; we hope that the second stage of the survey will permit us to clarify some of these findings.

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