

Prevalence of asthma and respiratory symptoms in childhood in an urban area of north-east Italy

D.G. Peroni*, G.L. Piacentini*, M.G. Zizzo**, A.L. Boner*

ABSTRACT: *Prevalence of asthma and respiratory symptoms in childhood in an urban area of north-east Italy. D.G. Peroni, G.L. Piacentini, M.G. Zizzo, A.L. Boner.*

In the present study we have assessed the prevalence of asthma-related symptoms in school children resident in the urban area of Verona, in the north east of Italy, as part of the International Study of Asthma and Allergies in Childhood (ISAAC).

The entirety of the population of children aged 6–7 yrs (total 2,350, from 64 schools) and 13–14 yrs (total 2,500 from 42 schools) living in the area was selected. A questionnaire was distributed at school. This was addressed to the parents of the younger population and distributed directly to the older children. In the two groups 2,091 (89%) and 2,179 (87%) questionnaires were returned, respectively.

The results obtained show a more frequent history of "wheezing ever" in the younger population compared to the older group (23.2 versus 7.9%, respectively) ($p < 0.001$). There was no difference in the prevalence of wheezing in the last 12 months (7.3 and 7.4%, respectively), and of asthma (4.6 and 3.5%, respectively). In the older group there was a higher incidence of exercise-induced wheezing (12.0 versus 3.2%), which was particularly significant in the females compared to males (14.2 versus 10.0, respectively; $p < 0.01$).

Our data confirm that there is a marked variation in the prevalence of asthma and asthma-related respiratory symptoms in different centres throughout the world, since we obtained a lower percentage of reported symptoms in comparison to other ISAAC centres.

Monaldi Arch Chest Dis 1998; 53: 2, 134–137.

Keywords: *Asthma, childhood, epidemiology, wheezing.*

*Clinica Pediatrica Università di Verona, Verona, Italy. **Settore Materno Infantile Verona, Verona, Italy.

Correspondence: A.L. Boner, Clinica Pediatrica, Policlinico Borgo Roma, 37134 Verona, Italy.

Received: March 21 1997; accepted after revision November 3 1997

The prevalence of a history of wheezing and asthma varies widely in Western countries from 7–23% [1, 2]. Recent studies have shown that there is a justified concern for an increasing morbidity and mortality, associated with allergic diseases in childhood [3–5]. In recent years increases in the rates of hospital admissions and in the numbers of patient consulting their general practitioner, have supported this hypothesis [3]. Knowledge of the prevalence of asthma is important *per se* as a means for generating hypotheses about the aetiology of the disease, and thus deriving a more complete understanding of the different risk factors.

Potential risk factors for the development of atopy seem to include the environment and the life-style of those living in industrialized societies [6]. Since comparison between previous studies has been hindered by the lack of common definition of the respiratory symptoms, the International Study of Asthma and Allergies in Childhood (ISAAC) has been developed [7], in order to maximize the value of epidemiological research into asthma and allergic diseases. This provides a standardized methodology, which facilitates international comparison. As part of the ISAAC investigation, we have assessed the prevalence of asthma-related symptoms in an urban area of north east Italy.

Materials and methods

Subjects

All school children aged 6–7 yrs (total 2,350, from 64 schools) and 13–14 yrs (total 2,500, from 42 schools) resident in the urban area of Verona, in the north east of Italy were selected. These two age groups were chosen by the ISAAC Steering Committee, since the younger group gives a reflection of the early childhood years, when wheezing is common; the older age group reflects the period when mortality caused by asthma is more common.

A questionnaire was issued during the winter of 1993 to all the schools in the urban area. These were distributed to the parents of the younger children and administered directly to the older children who completed them at school.

Questionnaire

The original English ISAAC questionnaire was translated into Italian. This version has been retranslated to English for validation. The case-definitions and severity were established by asking about cardinal symptoms and not by reference to labels or diagnoses. The questionnaire concentrated on wheezing or

whistling in the chest and on asthma in three categories: as a medical label; ever; and during the previous 12 months. It includes questions on the frequency of attacks, sleep disturbance, wheezing severe enough to limit speech and wheezing during or after exercise. In the distributed questionnaire a further page has been added regarding parents' smoking habits and the presence of pets at home.

The written approval of the local Ethics Committee was obtained prior to the start of the study.

Statistical analysis

Questionnaire responses were coded and entered into a database on a computer. The statistical package SAS (SAS Procedures Guide, Release 6.03; SAS Institute, Cary, NC, USA, 1988) was used to categorize and analyse the data. The Chi-squared test was used to assess the differences in the prevalence rates.

Results

A total of 2,091 (89%) and 2,179 (87%) questionnaires were returned and used for the statistical analysis in the 6–7 and the 13–14 yr old populations, respectively. The responders were males in 51% of the younger and 52% of the older population.

Table 1 shows the questionnaire responses and

table 2 describes, according to gender the differences in the respiratory symptoms. The 6–7 yr old group reported a more frequent history of wheezing ever (23%) than the older population (17.9%) ($p<0.001$) (table 1). This was particularly significant when males in the 6–7 yr old age group were compared with males in the 13–14 yr old age group (24.8 *versus* 16.6%, $p<0.001$). The same comparison made in females yielded a nonsignificant result (21.6 *versus* 19.2%; NS) (table 2). No difference between the groups was found in the occurrence of wheezing in the last 12 months (7.3 *versus* 7.4%, respectively) (table 1). A history of asthma ever was equally distributed in the younger (11.7%) and in the older population (11.9%), as well as asthma in the last 12 months (4.6 *versus* 3.5%, respectively) (table 1). Males presented a history of asthma ever more frequently than females, both at 6–7 yrs of age (13.1 *versus* 10.2, respectively; $p<0.05$) and at 13–14 yrs (13.5 *versus* 10.3%, respectively; $p<0.05$). The 13–14 yr old children presented a higher incidence of exercise-induced wheezing than the younger population (12 *versus* 3.2%; $p<0.001$). In the 13–14 yr old age group exercise-induced wheezing was more common in females than in males (14.2 *versus* 10.0%; $p<0.01$) (table 2).

Of the population studied 5.9% of the 6–7 yr old age group and 3.0% of the 13–14 yr old age group had attended at least one medical consultation and had a treatment schedule for their asthma.

Table 1. – Respiratory symptoms in the two groups of school children

	Age 6–7 yrs (n=2091)		Age 13–14 yrs (n=2179)		Total		p-value
	n	%	n	%	n	%	
Wheeze ever	482	23	377	17.9	859	20.6	$p<0.001$
Wheeze in the last 12 months	153	7	156	7.4	309	7.3	NS
Attacks of wheezing (in the last 12 months)							
none	5	0.2	10	0.4	15	0.3	NS
1–3	109	5.2	100	4.7	209	5.0	NS
4–12	25	1.2	31	1.4	56	1.3	NS
>12	11	0.5	11	0.5	20	0.4	NS
Asthma ever	243	11.7	251	11.9	494	11.8	NS
Dry cough at the night (in the last 12 months)	334	16.1	325	15.5	659	15.8	NS
Exercise-induced wheezing (in the last 12 months)	67	3.2	253	12.0	320	7.7	NS

NS: nonsignificant.

Table 2. – Respiratory symptoms according to sex

	Age 6–7 yrs					Age 13–14 yrs				
	Male (n=1058)		Female (n=1033)		p-value	Male (n=1126)		Female (n=1053)		p-value
	n	%	n	%		n	%	n	%	
Wheeze ever	260	24.8	220	21.6	NS	81	16.6	193	19.2	NS
Attacks of wheeze (in the last 12 months)	87	8.2	65	6.3	NS	77	7.0	78	7.7	NS
Asthma ever	138	13.1	104	10.2	p<0.05	147	13.5	104	10.3	p<0.05
Dry cough at night (in the last 12 months)	182	17.3	151	14.8	NS	159	14.6	164	16.3	NS
Exercise-induced wheezing (in the last 12 months)	35	3.3	32	3.1	NS	109	10.0	143	14.2	p<0.01

NS: nonsignificant.

In the 6–7 yr old and in the 13–14 yr old populations 36.2 and 37.0% of fathers and 27.0 and 28.0% of the mothers, respectively were smokers. Of the parental smokers in the younger group, 53 and 58% of the fathers and mothers, respectively admitted to smoking inside the home. In the older age group, the school children indicated that 45 and 58% of the fathers and mothers, respectively usually smoke at home.

Indoor pets were more common in the 13–14 yr old age group compared to the younger age group (47.2 versus 21.3%, respectively; $p < 0.01$). However, when the relationships between respiratory symptoms and all the variables were investigated no significant correlation was found.

Discussion

In the present study, we have obtained epidemiological data on the prevalence of asthma and respiratory-related symptoms in children living in an urban area of Italy. There was a more frequent history of wheezing ever in the 6–7 yr old age group compared to the 13–14 yr old children. This difference was related according to gender, as it was shown that at a younger age significantly more males than females presented symptoms of wheezing. However, no statistical difference was observed in the occurrence of wheezing in the last 12 months. In the younger population there was evidence of a low 1 yr prevalence in exercise-induced wheezing. This could be explained by either a low rate of parental perception or a real low number of incidences. Indeed, in the younger population minor physical activity may lead to a differing in the perception of symptoms.

In the present study the 1 yr prevalence rates of wheezing in the urban area of Verona was much lower (7.3%) compared to other ISAAC centres in the UK (29%), Australia (30%) and Germany (20–27%) [8, 9]. This difference was maintained for the wheezing ever history and also for the doctor-diagnosed asthma. However, similar low prevalence rates were reported by other groups in different countries [10, 11, 12]. Our results are consistent with those reported by SENNHAUSER *et al.* [12] in a Swiss population, where a more frequent wheezing in 7 yr old males compared to females was reported.

Even in the ISAAC study, where a standardized questionnaire has been adopted, the comparison of different prevalence data may present differences that could be explained by the different definitions of asthma and of the asthma-related symptoms in different languages. Other reasons explaining the wide ranging differences in prevalence rates include environmental factors, asthma severity and difference in community awareness. The urban area of Verona is industrialized, and the traffic levels high. Thus the respirable particulate air pollution is considerably high. Recently VON MUTIUS *et al.* [11] using a self-administered questionnaire and allergy skin-prick tests demonstrated that in the former West Germany there was a significant increased prevalence of atopic disease in comparison to the former German Democratic Republic. The reasons for this increase are unknown, but may be related to the Western lifestyle, associated with factors such

as declining family size and crowding, improvements in house-hold amenities and prevention of viral infectious disease in childhood [11].

The urban area of Verona is comparable in terms of industrial activity, traffic, air pollution and lifestyle to Munich and the prevalence ratio of the investigated parameter is indeed quite similar to that observed by the German investigators [11]. In contrast, a much higher prevalence of wheeze and asthma were reported in Australian studies [8, 9]. The present questionnaire was not designed to evaluate the degree of awareness of asthma severity and, therefore, re-mains an open issue. In a previous study, however, we observed that, although the perception of the airways status is generally good among asthmatic patients, there is a tendency to underestimate bronchospasm, mainly in children whose asthma was more severe and of longer duration [13]. The influence of the genetic determinants in the prevalence of the asthmatic disease should also be considered. However, recent studies have shown that South East Asian immigrants developed asthma after arrival in Australia [14]. Furthermore, the South East Asian children born in Australia presented with the same high prevalence of wheeze as the other children from different ethnic origins. This suggests a possible key role for environmental factors in determining disease [14].

In conclusion, the present study confirms that relevant differences may be observed in wheezing and asthma prevalence in different areas of the world. This supports the opportunity for further local investigation and the use of validated questionnaires. These will allow a more comprehensive analysis of the actual prevalence of the disease as well as risk factors in paediatric populations established.

Acknowledgement: The authors would like to thank the personnel of the "Settore materno infantile" of Verona for their helpful support in distributing and collecting the questionnaires in the schools and Glaxo, Italy for supporting the data analysis.

References

1. Robertson C, Heycock E, Bishop J. – Prevalence of asthma in Melbourne schoolchildren: change over 26 years. *Br Med J* 1991; 302: 1116–1118.
2. Clifford RD, Redford M, Howell JB, Holgate ST. – Prevalence of respiratory symptoms among 7 and 11 year old schoolchildren and association with asthma. *Arch Dis Child* 1989; 64: 1118–1125.
3. Evans R, Mullaly DI, Wilson RW. – National trends in the morbidity and mortality of asthma in the US: prevalence, hospitalization and death from asthma over two decades: 1965–84. *Chest* 1987; 91: 65S–74S.
4. Bloomberg GR, Strunk RC. – Crisis in asthma care. *Ped Clin North Am* 1992; 39: 1225–1241.
5. Strachan DP, Anderson HR, Limb ES, O'Neil A. – A national survey of asthma prevalence, severity, and treatment in Great Britain. *Arch Dis Child* 1994; 70: 174–178.
6. Bjorksten B. – Risk factors in early childhood for the development of atopic diseases. *Allergy* 1994; 49: 400–402.
7. Asher M, Keil U, Anderson HR. – International study of asthma and allergies in childhood (ISAAC): rationale and methods. *Eur Respir J* 1995; 8: 483–491.

8. Robertson C, Bishop J, Sennhauser FH, Mallol J. – International comparison of asthma prevalence in children: Australia, Switzerland, Chile. *Pediatr Pulmonol* 1993; 16: 219–226.
9. Pearce N, Weiland S, Keil U. – Self-reported prevalence of asthma in children in Australia, England, Germany and New Zealand: an international comparison using the ISAAC protocol. *Eur Respir J* 1993; 6: 1455–1461.
10. Pekkanen J, Remes ST, Husman T, Lindberg M. – Prevalence of asthma symptoms in video and written questionnaires among children in four regions of Finland. *Eur Respir J* 1997; 10: 1787–1794.
11. Von Mutius E, Martinez FD, Fritzsch C. – Prevalence of asthma and atopy in two areas of West and East Germany. *Am J Respir Crit Care Med* 1994; 149: 358–364.
12. Sennhauser FH, Kuhni CE. – Prevalence of respiratory symptoms in Swiss children: is bronchial asthma really more prevalent in boys? *Ped Pulmonol* 1995; 19: 161–166.
13. Boner AL, DeStefano G, Piacentini GL. – Perception of bronchoconstriction in chronic asthma. *J Asthma* 1992; 29: 323–330.
14. Leung R, Carlin J, Burdon J. – Asthma, allergy and atopy in Asian immigrants in Melbourne. *Med J Aust* 1994; 161: 416–425.