

Recognition of asthmatic symptoms in the pediatric age group

Grech V, Agius-Muscat H, Montefort S, Lenicker H. Recognition of asthmatic symptoms in the pediatric age group. *Pediatr Allergy Immunol* 2001; 12: 49–53. © Munksgaard, 2001

Asthma produces substantial morbidity in childhood. Under-diagnosis may lead to inappropriate treatment and prolonged periods of illness and absence from school. The results of a recent International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire study in Malta showed a higher prevalence of wheezy symptoms in the Central North Region. The present study was carried out to test the null hypothesis that there is no correlation between potential exposure to pediatricians (measured as pediatric private clinics/1000 childhood population/week) and percentage of children aged 13–15 years of age responding positively in the questionnaire to having had wheezy symptoms. A significant, positive correlation was found between potential exposure to pediatricians and percentage of children aged 13–15 years responding positively to having had wheeze in the previous year ($p=0.009$). A negative correlation was also found for severity of asthma (>12 attacks in the previous 12 months) and potential exposure to pediatricians ($p=0.01$). This is the first report of potential exposure to pediatricians influencing the regional incidence of asthma on a national basis. This skew may be caused by the greater exposure of pediatricians to patients with severe forms of asthma in a hospital setting, and hence a higher index of suspicion for the milder forms of the disease. Asthma may be less severe in regions where there are a greater number of pediatricians because of recognition of the condition with appropriate treatment and/or prophylaxis.

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Key words: asthma epidemiology;
asthma diagnosis; pediatric

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Accepted 11 July 2000

Asthma and other allergic conditions cause considerable morbidity as they affect a substantial proportion of the population. The principal aim of the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire was to provide comparable data on the prevalence and severity of allergic conditions in children, by using identical methodologies in different countries and thereby allowing the assessment of baseline trends (1).

Malta is an ideal country for such epidemiological studies because of the small and relatively closed nature of its population. The area of Malta is ≈ 300 km², with a total population of ≈ 370 000 and a childhood population (≤ 14 years of age) of ≈ 80 000 (2). There is one large regional Hospital (St. Luke's), which serves

practically all of the population except for the smaller, sister island of Gozo, which was excluded from this study.

ISAAC Phase 1 was recently completed in Malta. Subjects were chosen by assigning questionnaires to school classes in randomly selected church and state schools. Data was collected by means of a questionnaire. The 13–15-year age-group completed their own questionnaire (3).

Analysis of the questionnaires showed a higher rate of asthmatic symptoms in the Central North Region (3). Many Maltese pediatricians live, and also have private clinics, in this region. The aims of the present study were to determine whether private practice carried out by pediatricians in Malta influences the prevalence or severity of perceived wheeze in childhood. This was carried

out by correlating data from ISAAC with the degree of potential exposure to pediatricians, using pediatric private clinics in different regions of Malta as a proxy for degree of potential exposure to pediatricians.

In Malta, parents with children who suffer from asthma or other allergic conditions may opt to have their children followed-up at the Children's Out-patients Department at St. Luke's on the National Health Service, at a private general practitioner, or at a direct and self-referred, private consultation with a pediatrician. All registered doctors in Malta may perform private practice. The fee for consultation with a private general practitioner is $\approx$ \$6 and that for a private pediatrician is $\approx$ \$8, both of which fall well within the reach of virtually all of the population of Malta. The treatment of asthma is free from the National Health Service, on application, for all diagnosed children.

Materials and methods

Regional data

Children were retrospectively allocated to one of 10 regions according to their home address. These regions were based on a geographical distribution devised by the Department of Health Information.

ISAAC questionnaire

In the original data set, the questionnaire was administered to 4718 children aged 13–15 years of age, and 4184 completed the questionnaire. The overall response rate was 88.7%, with no significant differences between regions (3). The questionnaires and methodologies used in ISAAC have been reported previously (1). As English is taught in schools as a second language from the early school years, children were given the option of answering the ISAAC questionnaire in either Maltese or English (3). The percentages of children with wheeze in the 10 regions described above were collected from the ISAAC data (3). With regard to asthma, the questionnaire had been phrased such that wheezy episodes were sought, rather than diagnosed attacks of asthma, in order to capture all episodes suggestive of asthma, even if not diagnosed as such by a doctor (3).

The percentages of children in the 13–15-year age-group who answered 'yes' to the questions in Table 1 were also tabulated by region. (Questions are numbered as on the original questionnaire.) Question 3 allowed a 'severity' score to be assigned and this was analyzed separately (>12 attacks of wheeze in the previous 12 months).

Pediatrician and childhood population data

A pediatrician was defined as a hospital Consultant in Pediatrics or hospital Senior Registrar with MRCP or equivalent higher medical qualification. Fourteen doctors in Malta fitted these criteria and were performing private practice at the time of the study (1995). These individuals were questioned to ascertain the number and location(s) of their private clinics in 1995, on a weekly basis. The 1995 Malta census was used as the source of childhood population in the regions mentioned above (2). Clinics per region were divided by the total childhood population in that region to obtain clinics/1000 childhood population. Clinics/1000 childhood population/week was used as a proxy for 'degree of exposure' to pediatricians. Home visits could not be quantified and were therefore not included.

Software and statistics

Excel was used for tabulations and calculations of totals and rates along with 95% confidence limits using the quadratic equations of Fleiss. SPSS (Chicago, IL, USA) was used to calculate non-parametric correlations by means of Spearman's rank correlation. A p-value less than 0.05 was taken to represent a statistically significant result.

Results

A highly significant correlation was found between pediatrician clinics/1000 childhood population/week in 1995 and percentage of children in the 13–15-year age-group responding positively when having had wheeze in the previous 12 months (question 3: $r_s=0.77$, $p=0.009$; Fig. 1, Table 2).

The 13–15-year age-group was analyzed in further detail, with regard to whether individual children had ever been told that they had asthma (question 6; Table 3). Although a positive correlation was observed with exposure to pediatricians, this was not statistically significant ($p=0.08$).

Table 1. Portion of the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire analyzed in relation to asthma symptoms

Question	
3	Number of attacks of wheezing in the previous 12 months
4	Any nocturnal wheezy attacks in the previous 12 months
5	Wheeze so severe as to limit speech to only one to two words at a time between breaths in the previous 12 months
6	Ever told that had asthma.
7	Any episodes of wheeze during or after exercise in the previous 12 months

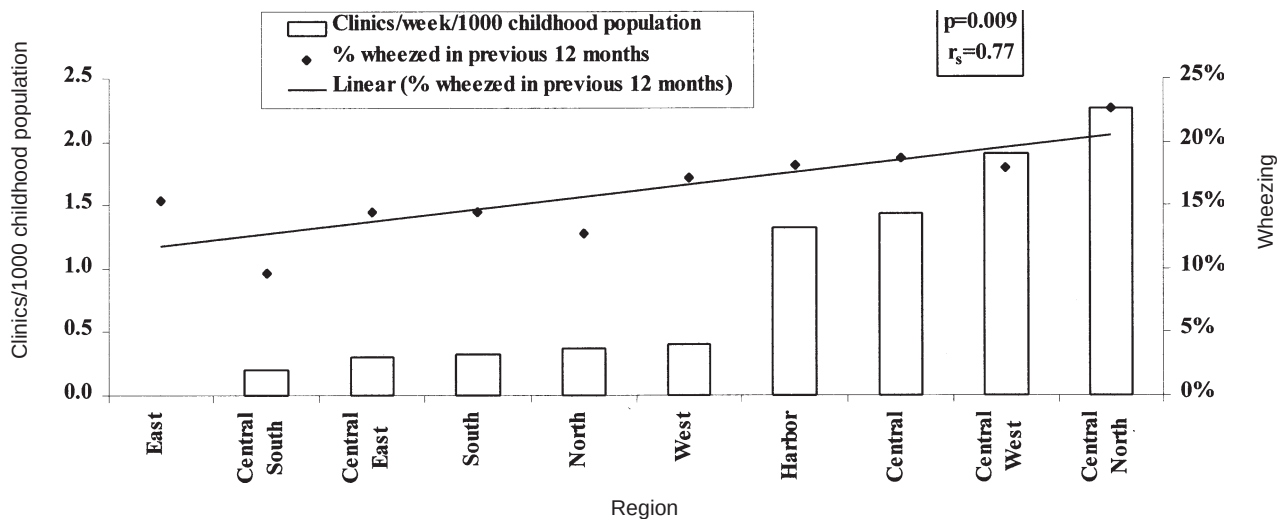


Fig. 1. Correlation between percentage wheezing in the 13–15-year age-group and regional weekly pediatric private clinics/1000 childhood population.

Children who had had wheeze in the previous 12 months were analyzed further by symptomatology (questions 3–5 and 7; Table 3). Severe asthma (question 3; Table 3) was significantly negatively associated with pediatrician exposure ($p=0.01$). Sleep disturbance, wheezy episodes limiting speech, and exercise-associated wheeze were not associated with pediatrician exposure (Table 3).

Discussion

Asthma is the commonest chronic disease of childhood. Screening tests have been proposed (4) but results of such tests have been shown to be unreliable and non-reproducible (5). It is claimed that questionnaires which ask about diagnosis or symptoms of asthma are more reliable (6,7). Such studies are important not only for epidemiological purposes and the establishment of trends, but also for the planning of health services.

It is important for asthma to be accurately diagnosed in childhood as a correct diagnosis avoids inappropriate treatment, while satisfactory control of asthma decreases morbidity and improves attendance at school (7). Until quite recently, asthma was undiagnosed and under-treated in up to 90% of the childhood population (8,9). The rate of diagnosis for asthma has, however, improved in more recent years, with only $\approx 6.4\%$ of childhood cases remaining undiagnosed until screening is performed (10). Under-diagnosis of asthma has also been shown to occur in adolescent school children (11).

The Central North Region is an affluent part of the Island – it is urbanized, lacks heavy industries, and attracts numerous professionals (2). In 1999, almost 50% of all Maltese pediatricians lived in this region, and these tended to have private clinics close to residences, as shown by the clinic data. Being a more affluent part of the island, this area probably tends to have fewer aeroallergens,

Table 2. Correlation between pediatrician clinics/1000 childhood population/week and percentage of 13–15-year-old children with symptoms of wheezing in the previous 12 months

Region	Clinics/1000 childhood population/week	Wheeze* 13–15 years (%)	Lower 95% confidence limit	Upper 95% confidence limit
East	0.00	15.4	12.6	18.6
Central South	0.20	9.6	6.6	13.8
Central East	0.30	14.4	11.2	18.4
South	0.33	14.5	11.4	18.2
North	0.37	12.7	10.0	16.0
West	0.40	17.1	12.8	22.4
Harbor	1.32	18.2	14.0	23.3
Central	1.43	18.7	15.0	23.1
Central West	1.91	17.9	13.8	22.9
Central North	2.27	22.6	19.2	26.4

* $r_s=0.77$, $p = 0.009$.

Table 3. Correlation between pediatrician clinics/1000 childhood population/week and percentage of 13–15-year-old children with asthmatic symptoms

Region	Clinics/1000 childhood population/week	Q3. Severe: >12 attacks of wheeze in last 12 months	Q4. Wheeze with sleep disturbance in previous 12 months	Q5. Wheeze with speech limited to one to two words in previous 12 months	Q6. Ever been told that suffered from asthma	Q7. Wheezy with/after exercise in previous 12 months
East	0.00	2.1%	2.9%	5.0%	14.2%	24.7%
Central South	0.20	1.8%	5.8%	2.5%	12.2%	15.7%
Central East	0.30	1.8%	6.5%	5.8%	14.3%	30.4%
South	0.33	1.0%	3.1%	1.7%	7.9%	14.8%
North	0.37	2.4%	3.7%	3.0%	9.8%	26.4%
West	0.40	1.0%	5.0%	3.0%	11.5%	19.7%
Harbor	1.32	1.8%	4.6%	4.3%	10.7%	18.2%
Central	1.43	0.8%	2.7%	3.1%	9.4%	16.3%
Central West	1.91	0.9%	2.8%	1.8%	10.1%	16.6%
Central North	2.27	0.8%	4.7%	7.4%	9.7%	20.2%
Spearman	r_s	−0.74	−0.17	−0.60	−0.57	−0.20
	p	0.01	0.6	0.9	0.08	0.6

such as pollutants, which have been shown to increase the risk of precipitating asthma (12). Moreover, the presence of a higher proportion of parents in higher social classes implies a lower proportion of parents who smoke, with less childhood exposure to cigarette smoke in this region and better overall housing standards (2). Despite all of these factors, this region had the highest proportion of children in the 13–15-year age-group with wheezing symptoms, and the lowest rate of severe asthma (>12 episodes of wheeze in the previous 12 months). A factor which may offset the above effects is that children from affluent areas would probably tend to have fewer infections in infancy, which may increase the risk of wheezy episodes. This hypothesis is not supported by the finding that more frequent episodes of asthma occur in less affluent areas. The lack of significant correlation between pediatrician exposure and children actually knowing that they suffer from asthma may be explained by the fact that the children themselves filled in the questionnaires, and may therefore not have actually remembered such a discussion between doctors and their parents.

This study indicates that the recognition of symptoms which may be attributable to asthma in children appear to be directly related to potential exposure to pediatricians. This may be the result of under-diagnosis of asthma by general practitioners or over-diagnosis of asthma by pediatricians. Moreover, while the more severe asthmatics would tend to be referred to pediatricians, this would not explain the observed trend.

An earlier study has shown that poorer control of asthma with associated school absence is found to be higher in children attending hospital clinics, rather than general practitioner clinics (7). A more probable explanation in this setting is that once

attention is drawn to the possibility of asthma and its related symptoms, affected children and parents are more likely remember symptoms of the condition and answer positively to a questionnaire regarding symptoms.

Conclusion

This is the first report to indicate that the recognition of symptoms which may be attributable to asthma in children are related to potential exposure to pediatricians. Owing to their ongoing hospital experience, pediatricians have greater experience in treating the more severe spectrum of asthma, and hence may be more adept at recognizing and treating the milder forms of asthma than general practitioners.

Acknowledgments

Work was carried out at, and should be attributed to, St. Luke's Hospital, Guardamangia, Malta and the Department of Health Information, Guardamangia, Malta.

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Pediatr. Allergy Immunol 1998; 9: 44–48.

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