

Allergol Immunopathol (Madr). 1999;27:245-53. - vol.27 núm 5

Adolescents and school asthma knowledge and attitudes.

[Leiria Pinto, P](#)

Publicado en Allergol Immunopathol (Madr). 1999;27:245-53. - vol.27 núm 5

Read in: [Español](#)

Adolescents and school asthma knowledge and attitudes

P. Leiria Pinto*, **M. Cordeiro**** and **R. Pinto***

*Allergy Department. Hospital de Dona Estefânia. **Maternal and Child Health Department. Universidade Nova de Lisboa. Lisbon. Portugal.

Correspondence:

Paula Leiria Pinto

Hospital de Dona Estefânia

Serviço de Imunoalergologia

Rua Jacinto Marto

1150 Lisboa

Portugal

E-mail: hde.imunoalergo@mail.telepac.pt

SUMMARY

Introduction: bronchial asthma is a chronic disease that affects a high percentage of adolescents, with a significant restriction of daily activities, and is a cause of school absenteeism. The relationships between adolescents and asthma disease in school were assessed, with a view to improving knowledge about the asthmatic adolescent.

Methods: a survey was conducted in the Lisbon metropolitan area, covering urban (Lisbon) and rural (Lourinhã) zones and including 1879 students and 81 teachers from the 7th to 9th high school years. The study groups were asthmatic students, their peers, and teachers. A self-administered questionnaire was applied to collect information. The results were compared with a reference group of 91 asthmatic students attending our Department of Immunoallergy-Hospital Dona Estefânia. Cotinine urinary measurements were made in a sample of asthmatics and a control group.

Results: the prevalence of current asthma among students was 10%. Estimates of asthma annual burden among 7th to 9th year students from Lisbon and Lourinhã high schools included 4,307 days missed from school, 4,148 medical consultations and a minimum of 351 hospital emergency care and 80 hospital admissions.

Exposure to passive smoking was not significantly different between asthmatic students and their peers. Cotinine urinary measurements did not discriminate between exposed and non-exposed individuals. Cigarette smoking was almost as common among adolescent asthmatics (5.4%) as it was in non-asthmatic subjects (6.7%). However, 55% of asthmatics mentioned active and passive smoking as an asthma-exacerbating factor.

Asthmatic students, their peers and teachers showed a deficient knowledge about asthma (mean group scores: 17.6; 14.2 and 17.7 of a possible 30), particularly in the areas related to asthma recognition and its management. Asthmatics attending our Allergy Department had the highest scores. All groups showed tolerance in the sense of a positive and understanding attitude toward a person with asthma. However, traditional beliefs about asthma disease (dependence, inferiority...) were confirmed. A positive correlation between knowledge levels and tolerance attitudes was found.

Conclusion: in view of the dimension of the asthma problem in adolescence and its social and economic impact, it is justifiable to assess the need for the implementation of asthma education programs in schools in order to improve asthma management by the adolescents and their schools.

Key words: Adolescents' asthma. Asthma knowledge. Impact of asthma.

RESUMEN

Introducción: el asma bronquial es una enfermedad crónica que afecta un gran porcentaje de adolescentes, con importantes restricciones en su vida cotidiana y causa de absentismo escolar. Con el objetivo de mejorar el conocimiento sobre el adolescente asmático se llevó a cabo un estudio de los adolescentes asmáticos y esta enfermedad en la escuela.

Métodos: se realizó una encuesta en algunos institutos de la zona metropolitana de Lisboa (un municipio urbano y otro rural, Lisboa y Lourinhã) con 1.879 estudiantes de los cursos de séptimo a noveno y 81 profesores. Se definió como grupos de estudio los estudiantes asmáticos, sus padres y profesores. Para la obtención de la información fue utilizada una encuesta en la que los alumnos y profesores respondieron por escrito. Los resultados fueron comparados con los de un grupo de referencia constituido por 91 estudiantes asmáticos atendidos regularmente en la consulta de Alergología del Hospital Dona Estefânia. Se hicieron análisis de cotinina urinaria a una muestra de asmáticos y a un grupo control.

Resultados: la prevalencia del asma actual entre los estudiantes resultó ser 10%. Se pudo estimar que el impacto del asma en los adolescentes del séptimo al noveno año escolar de los institutos de los municipios de Lisboa y Lourinhã, es de 4.307 ausencias en la escuela, 4.148 consultas médicas, un mínimo de 351 intervenciones hospitalares de urgencia y 80 ingresos en el hospital.

La exposición al tabaquismo pasivo no fue significativamente diferente entre los adolescentes asmáticos y sus pares. Los exámenes de cotinina urinaria probaron no ser adecuados para diferenciar los individuos expuestos de los no expuestos al tabaco. Los hábitos de fumador son iguales entre los adolescentes asmáticos (5,4%) y sus padres

(6,7%). Sin embargo, 55% de los asmáticos mencionaron el tabaquismo activo y pasivo como factor "exacerbador" del asma.

Los estudiantes asmáticos, sus padres y profesores presentaron un conocimiento deficiente del asma (puntuación media de los grupos: 17,6; 14,2 y 17,7; máximo de 30) y en particular sobre la identificación de esta enfermedad y tratamiento. Los asmáticos atendidos en la consulta de Alergología obtuvieron los resultados más elevados. Todos los grupos demostraron tolerancia hacia el asmático, denotando una actitud positiva y comprensiva. Sin embargo, algunas creencias tradicionales sobre el asma (dependencia, inferioridad...) se mantienen muy presentes. Se encontró una correlación positiva entre niveles de conocimiento y las actitudes de tolerancia.

Conclusiones: teniendo en consideración la dimensión del problema del asma en la adolescencia y su impacto social y económico, se justifica la necesidad de implantar programas educacionales en las escuelas, mejorando la gestión del asma por los adolescentes y sus escuelas.

Palabras clave: Asma en los adolescentes. Conocimientos del asma. Impacto del asma.

INTRODUCTION

Bronchial asthma is one of the most common chronic diseases among adolescents (1, 2). In recent decades, the prevalence of asthma and morbidity are increasing (3, 4). It is a common cause of school absenteeism and limitation of activity (1, 2).

Recent data from Portugal of ISAAC (International Study of Asthma and Allergies in Childhood) Study, obtained by Rosado Pinto et al, reported a current asthma prevalence of 11.8%, in children aged 13 to 14 years old (5).

The impact of asthma depends on complex interaction between disease severity, reaction of adolescent towards disease, treatment efficiency, social roles, and social environment (6).

Adolescence is a period of transition from childhood to adulthood, where important psychological and physical changes occur (7). The achievement of competent adulthood demands acquisition of autonomy and increased intimacy with peers based on preadolescent experiences. An almost inevitable consequence of this is risk-taking behaviour. Asthma may make it more difficult for adolescents for several reasons. It promotes continued dependency on parents because they customarily share the management of the adolescent's disease (8). Similarly, the limitation of physical activity such as sport and dancing, and the need to take treatment (particularly when it is visible, such as an inhaler) make them different from their peers (9). Cigarette smoking is a common risk-taking activity in teenagers and particularly one of the major ones for young asthmatics. Adolescents with asthma past or present may represent a group particularly likely to take up smoking (10).

Underdiagnosis and undertreatment of asthma are frequent in adolescence (11, 12). This may be partly due to a lack of perception of the disease, underestimation of its severity,

tendency to deny the symptoms and reluctance to seek medical advice (13, 14). Compliance with therapeutic regimens in asthma, especially in adolescence, is low (15). Education has been cited as an important component of any asthma management strategy, by improving asthma knowledge and changing behaviour (1). Knowledge, attitudes, and beliefs are recognized as being major determinants of health behaviour. The aims of the present study were to evaluate the relationships between adolescents and asthma disease; situations and consequences in the school environment. Investigating the effects of exposure to passive and active smoking, assessment of asthma knowledge among adolescents with asthma, their peers and their teachers, assessment of the attitudes of these three groups towards asthma disease and to adolescent asthmatics and evaluation of asthma impact were performed.

METHODS

The study was done in Lisbon high schools between March and May 1997. Eight schools from 2 regions of the Lisbon metropolitan area, the most distant and representative of different environments, urban (Lisbon) and rural (Lourinhã). The selection of schools was randomized and included representative samples of private schools, urban and rural public schools. Completed questionnaires were returned by 1,879 of 2,129 students (89%), from 12 to 16 years old (mean age: 13,6y) and 81 of 207 7th to 9th year teachers (39%). A reference group of 91 asthmatic students in the same age range attended in the Department of Allergy (Dona Estefânia Hospital, Lisbon) was also selected.

A self-administered questionnaire was produced, which included topics on social and demographic characteristics, smoking habits, asthma knowledge, attitudes towards asthma, asthma symptoms, and impact of asthma. The ethics committee of the Dona Estefânia Hospital and the Lisbon Region Department of School Education approved the study. Schools, students, and teachers previously agreed to participate in the study.

MEASUREMENTS

Smoking habits

Active and passive smoking, age of starting, quantity of cigarettes smoked and health risks perception were assessed. Cotinine urinary measurements were made in a sample of asthmatic adolescents (n = 43) and a control group (n = 45) using a radioimmunoassay quantitative test with a double antibody nicotine metabolite in liquid phase (coefficient of variation of 10%), from DPC. This biologic marker is a nicotine metabolite and reflects smoking exposure objectively (16, 17). Levels of cotinine urinary were compared to passive smoking exposure measured by number of cigarettes smoked at home.

Asthma knowledge

Based on Rosado Pinto (18) and M. Bevis and P. Taylor (19) asthma knowledge questionnaires, a 30-item self-administered questionnaire was produced, including the followings assessments: knowledge of asthma, i.e., familiarity with the symptoms and characteristics of the disease; sport and asthma relationship, on impact of asthma in

school; and its treatments. Response options were presented as true/false and unsure. Each question had a score of one (maximum score of 30).

Asthma attitudes

The Gibson et al. questionnaire (15 questions) was used to assess attitudes to asthma in four domains (20). The domains assessed were tolerance towards asthmatics (eight questions), locus of internal control based on the concept of the degree to which a person believes that their own decisions and actions influence their asthma (two questions), locus of external control or "powerful others" based on the influence of important external people such as a doctor or teacher in their asthma management (three questions) and chance (two questions). Responses were presented as four-point Likert scale for students and as six-point Likert scale for teachers, ranging from "strongly agree" (scored as 1), to "strongly disagree" (maximum score). An average score was allocated to each domain. Higher scores represent stronger attitudes in the domains assessed.

Asthma symptoms

A questionnaire including 19 questions evaluated personal history of asthma symptoms, treatments, school absenteeism, and use of health services due to asthma. "Cumulative asthma" was defined by one of the following criteria: "To have asthma as chronic disease" or "To have or to have had asthma" or "prior doctor's diagnosis of asthma". "Current asthma" was defined as combination of 2 or 3 of the following conditions: wheezing in the past 12 months, use of asthma medication for asthma in the past 12 months or prior doctor's diagnosis of asthma.

Statistical analysis

The data was categorized and summarized as percentage and compared using the χ^2 statistic. Results of asthma knowledge questionnaires and asthma attitudes questionnaires were compared using one-way analysis of variance. Associations between variables were examined using Pearson's correlation. Significance was accepted at the $p < 0.05$ level.

RESULTS

Prevalence of asthma

In schools, the prevalence of cumulative asthma was 17% ($n = 307$) and the prevalence of current asthma was 10% ($n = 189$), among students. Significant differences were found of asthma prevalence in different types of schools. There were significantly more asthmatic students in urban public and private schools than in rural schools ($p = 0.002$ and $p = 0.04$).

Impact of asthma

Results showed that 75 percent of asthmatic students had asthma exacerbation in the last year. On average, they had 6 asthma exacerbations. Fifty-three percent of asthmatics had attacks of asthma at school (table I). School absenteeism due to asthma was

reported by 45% of asthmatic students. Limitations of activities at school were reported by more than half of asthmatic students. Fifty-three percent of asthmatics reported having wheezing while playing at school and 60% had asthma induced by exercise. Exposure to smoking (passive and active) was recognized as an asthma-exacerbating factor by 55% of asthmatics. At school, only 29% of asthmatics carry with them their medications (bronchodilators: 83%).

Table I Asthma impact on Lisbon and Lourinhã areas, last year

	N°	%	Mean	Estimated*
Asthma attacks at school	100	53	6	7,178
School absenteeism	85	45	6	4,307
Clinical visits	123	65	4	4,148
Emergency visits (≥ 1)	42	22		> 351
Hospital admissions (≥ 1)	10	5		> 80

*n = 15.952.

Medical clinical visits in the last year were only reported by 65% of asthmatics. During this period 22% of asthmatics received emergency care and 5% had asthma related hospital admissions (at least one).

Asthmatics attended in the Allergy Department had similar results related to school absenteeism, emergency care, and hospital admissions as asthmatic students. These results may reflect differences in severity of asthma with the more severe cases being attended in our Allergy Department.

Smoking habits

Exposure to passive smoking was mentioned by 58% of students. Higher exposure was found in urban schools (public and private) than in rural schools ($p < 0.001$ and $p < 0.001$). Comparing asthmatic students and their peers, no exposure differences were found ($p = 0.26$) (Fig. 1).

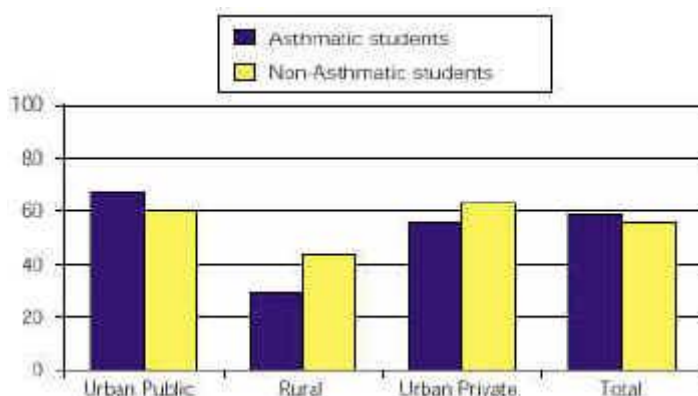


Figure 1.--Exposure to passive smoking in asthmatic students and their peers. Higher exposure was found in urban schools (public and private) than in rural schools ($p < 0.001$ and $p < 0.001$). There are no differences in exposure between asthmatics and non-asthmatic students ($p = 0.26$).

Cotinine urinary measurement did not discriminate between exposed and non-exposed individuals ($p = 0.49$). The asthmatic group showed higher mean cotinine urinary level than the control group ($p = 0.03$). Regarding exposed individuals, asthmatics showed higher mean cotinine urinary level than control individuals ($p = 0.02$). In the non-exposed group, no differences were found between the mean cotinine urinary levels of the asthmatic and the control group ($p = 0.26$) (Fig. 2).

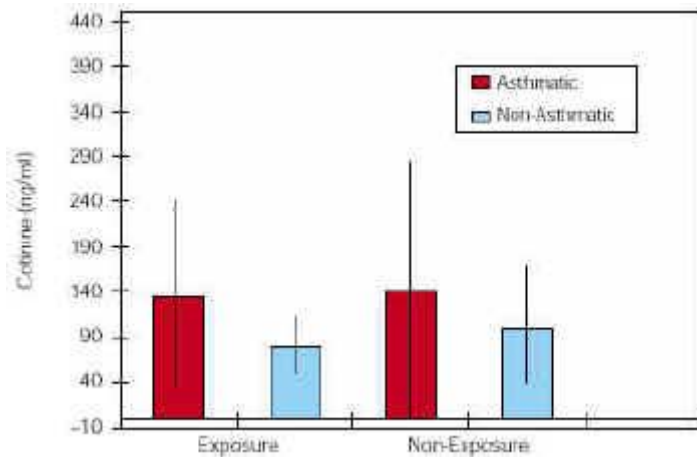


Figure 2.--Results of cotinine urinary measurements expressed as cotinine/creatinine ratio (CCR) in an asthmatic group and in a control group, including passive smoking exposed and non-exposed individuals.

The prevalence of current cigarette smoking was 6.7% and the mean age for the start of the smoking habit was 12.7 years. Cigarette smoking was almost as common among adolescent asthmatics (5.4%) as it was in non-asthmatic subjects (6.7%). Knowledge about health smoking risks was reported by the majority of students.

Comparing current active smokers among asthmatic students, it was found that asthmatics who attended our Allergy Department were less active smokers than asthmatics in the schools ($p = 0.03$).

Asthma knowledge

The asthma knowledge mean score among students was 14.2 (maximum of 30). We found differences of asthma knowledge related to environment, with private schools obtaining higher scores and rural schools the lower ones. Females had significant higher scores than males ($p = 0.015$). Socioeconomic level was positively associated with asthma knowledge among students ($p < 0.0001$). Students with asthma had a mean score of 17.6 and students without asthma 14.2, showing that asthmatics knew significantly more about asthma than their peers ($p < 0.0001$) (Fig. 3). Asthmatics attended in the Allergy Department had a mean score of 19.3, which was significantly higher than the one obtained by school asthmatics. Teachers obtained an asthma knowledge mean score of 17.7. The asthma knowledge score among teachers was similar to that of students with asthma ($p = 0.71$).

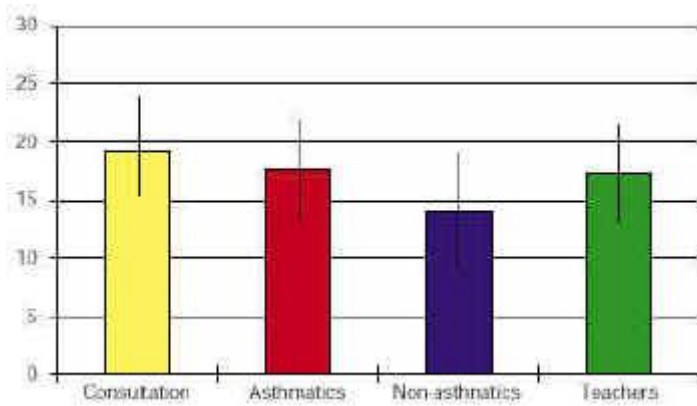


Figure 3.--Asthma knowledge scores (mean \pm SD) - comparison of results. Asthmatics knew significantly more about asthma than their peers (* $p < 0.000001$). Asthma knowledge was significantly higher in asthmatics attended in the Allergy Department than in school asthmatics (** $p = 0.009$).

Self-assessment of asthma knowledge shows that only 31% of students with asthma, 11% of students without asthma and 12% of teachers thought that they knew enough about asthma. These results are in accordance with our assessment. Important knowledge deficits were found in asthma recognition and its management (students and teachers). Almost 60% of the teachers have or have had a student with asthma in a class, 16% had seen an attack of asthma at school, but only one in five reported that they knew how to manage these episodes.

The majority of students and teachers considered that asthmatic adolescents were not different from other adolescents. However, the understanding of the asthma and exercise relationship is poor. In confirmation of this, a low percentage of students and teachers were aware that physical activity provoked wheezing or that it could be prevented by pre-treatment.

Student's asthma knowledge was acquired mainly from the family. Health professionals (medical doctor 71% and nurse 36%) play an important role in transmitting information and increasing the asthma knowledge of asthmatic adolescents. Teachers were considered the source of asthma knowledge by 26% of asthmatic students and 37% of their peers. In order to increase the asthma knowledge level we should carefully take into account the main and more effective information sources (Fig. 4).

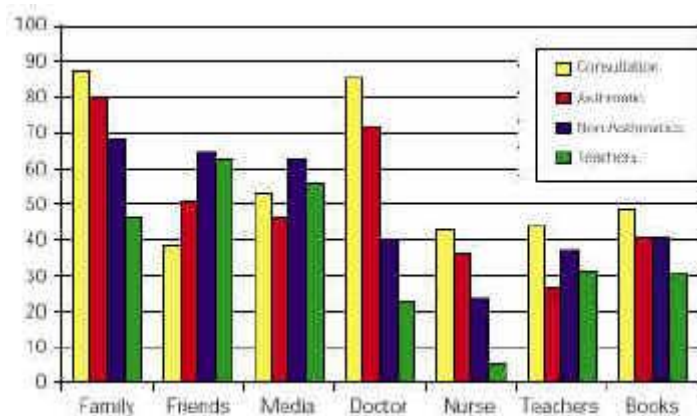


Figure 4.--Source of asthma knowledge in asthmatics attended in the Allergy Department, students with asthma, students without asthma and teachers.

Asthma attitudes

A high degree of tolerance toward adolescent asthmatics was found and there were no significant differences among study groups (Fig. 5). Both teachers and students (asthmatics and non-asthmatics) considered that the dominant control domain was internal control. Asthmatics attended in the Allergy Department had higher scores in internal and external locus of control ($p < 0.05$). Non-asthmatic peers tended to favor external control (for example: teacher and doctors) compared to asthmatic students.

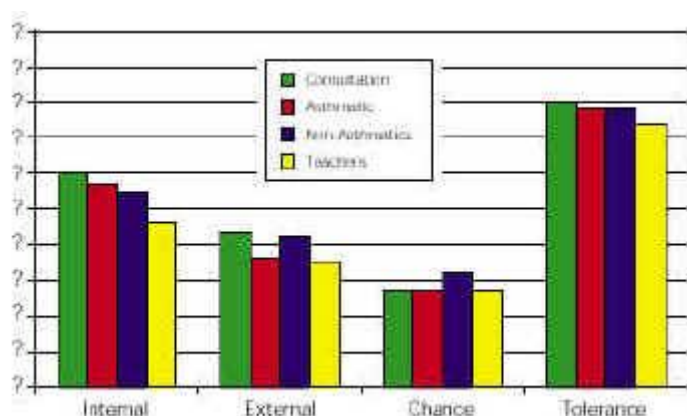


Figure 5.--Attitudes towards asthma in asthmatics attended in the Allergy Department, students with asthma, students without asthma and teachers scored from 1 (strongly disagree) to a maximum of 4 or 6 (strongly agree). The four attitude domains assessed were internal and external locus of control chance locus and tolerance locus; * $p < 0.05$.

However, traditional beliefs about asthma disease were confirmed. Twenty-five percent of respondents agreed with the statement "students are embarrassed about using their inhalers"; 10% agreed with the statement "someone with asthma should not use his/her puffer in class"; 30% did not agree with the statement "students with asthma are just as fit as students without asthma" and 30% considered that teachers were worried about taking students with asthma on school camps or excursions (table II).

Table II Attitudes towards asthma disease and asthmatic students (% of agree)

	Asthmatics %	Non asthmatics %	Teachers %	Consultation %
Someone with asthma should not use his/her puffer in class	11.3	11.8	7.2	13.2
Students are embarrassed about using their inhalers in class	25.8	25.1	31.1	19.8
Students play on their asthma	29.6	24.8	41.0	29.7
There would be fewer problems with asthma at school if students could carry their puffers with them	75.8	80.6	67.5	79.1
Teachers are worried about taking	28.0	31.5	24.1	28.6

someone with asthma on school trips				
Asthmatics are less competent at physical sports	29.6	26.3	16.9	24.2
Teachers have a negative attitude to students with asthma	4.8	5.5	2.4	3.3

Associations

A positive correlation between knowledge levels and tolerance attitudes ($r = 0.18$) was found, meaning that higher asthma knowledge was associated with positive attitudes. No correlation was found between asthma knowledge and locus of "internal control". The relationships between asthma knowledge and locus of "external control" ($r = 0.14$) and "chance" ($r = 0.16$) were negative (table III). This means that asthma knowledge was greater in those individuals who rated chance and external influences (eg: teachers and medical doctors) as less important in control of asthma.

Table III Correlation coefficient between asthma knowledge and attitudes

	Internal C.	External C.	Chance	Tolerance
Consultation	0.12	0.07	0.12	0.42
Asthmatics	0.03	0.18	0.29	0.20
Non asthmatics	0.03	0.10	0.14	0.17
Teachers	0.11	0.16	0.13	0.22

DISCUSSION

In schools, the prevalence of current asthma was 10%. This is similar to the prevalence of asthma recorded in a recent epidemiological survey, by Rosado Pinto et al (21).

The impact of asthma was investigated by the use of certain indicators. Based on this, it was estimated that asthma annual burden among 7th to 9th year students from Lisbon and Lourinhã high schools included 4,307 days missed from school, 4,148 medical consultations, a minimum of 351 hospital emergency care and 80 hospital admissions. These results show the importance of asthma impact in this age group, with a significant social and economic impact for the individual/family, health care system and society.

The school is the place where adolescents are physically more active and have the opportunity to practice sporting activities, so it was not surprising that 50% of the asthmatic adolescents reported having attacks of asthma at school.

Bearing in mind how important it is to recognize asthma attacks and to treat them promptly with a bronchodilator inhaler, it is important to know how the school staffs feel about managing asthmatic students in school.

The majority of teachers (78%) did not know how to manage asthma attacks and schools did not have the appropriate resources, which can mean that asthmatic adolescents having an attack at school will not receive proper support. Although the

teachers" response rate was low, those who did answer showed interest and concern about the problem.

Smoking

The prevalence of current cigarette smoking was 6.7%, and the mean age for the start of the smoking habit was 12.7 years. These results were similar to those obtained in other Portuguese studies (22).

There are studies suggesting that adolescents with a past or present asthmatic condition may represent a group particularly likely to take up smoking (10). However, cigarette smoking was almost as common among adolescent asthmatics as it was in non-asthmatic subjects ($p = 0.59$).

Some authors claim a higher passive smoking exposure among asthmatic children than among controls (23, 24). However, there was no significantly different percentage of individuals exposed to passive smoking among asthmatic students than among their peers.

Cotinine urinary measurements have been used to assess the exposure to environmental tobacco smoke (16, 17). Published data suggests that the levels of urinary cotinine are higher in those individuals exposed to passive tobacco smoking. It was also shown that asthmatic patients have higher values than controls.

Cotinine urinary measurements did not discriminate between exposed and non-exposed individuals. Asthmatic students showed higher cotinine urinary levels, but this does not necessarily mean higher exposure; it may reflect more absorption due to inflammation of the airways. This is similar to the results of Carvalho Marques's study (25), in Funchal (Madeira Island), following a comparable methodology.

Awareness of smoking risks and exacerbation of asthma does not seem to be sufficient to discourage teenagers from smoking. This suggests a need to design effective smoking cessation messages.

Asthma knowledge

Asthmatic students, their peers and teachers showed a deficient knowledge about asthma. Comparative analysis between results of different studies is difficult because they did not use uniform methodologies in asthma knowledge evaluation.

Students with asthma knew significantly more about asthma than students without asthma. The asthma knowledge score among teachers was similar to that of students with asthma. These results contrast with an earlier report of high knowledge among adolescent students (26). However, this is similar to the results recorded in Gibson et al's epidemiological survey (20).

Knowledge self-assessment matches and sustains study results. Important deficits were found in asthma recognition and its management (students and teachers).

Though one would not expect students without asthma to have extensive knowledge about asthma, it seems important that asthmatic students and teachers should have greater knowledge. Therefore, it is quite likely that many asthmatic students are not receiving adequate asthma management in school.

Teachers' understanding about asthma and sports reflects the widespread belief confirmed in this study, that asthmatic students' performance was lower than that of their peers. This indicates a need for more structured information and training of teachers if their observations during play or games periods are to help identify undiagnosed asthma in teenagers.

These are some thoughts that point out a need for educational programs to improve asthma management in school.

Attitudes

Attitudes toward adolescent asthmatics denoted tolerance, in the sense of a positive and understanding attitude to a person with asthma. Both teachers and students considered that dominant control of the illness should remain with the individual. These findings indicate that the school environment is receptive to intervention concerning asthma.

Asthmatics attended in the Allergy Department had the greatest internal and external control scores. This high degree of external influence may reflect dependence.

It was found that the attitudes of peers towards asthma were clearly different from those of the students with asthma. The non-asthmatic peers tended to favor a greater role for external influences such as teachers, doctors, and chance in determining health outcomes in asthma.

However, traditional beliefs about asthma disease were confirmed (table II).

Associations

A positive correlation was found between knowledge levels and tolerance attitudes. This is consistent with the concept that improved knowledge of a health problem promotes greater understanding and tolerance of individuals with that illness.

FINAL CONSIDERATIONS

The current social-cultural environment emphasizes the "Image" concept in different forms, such as perfection, beauty and fitness. This fact contributes to the denial of asthma disease and to non-compliance with the treatment in this age group.

The dimension of the asthma problem in adolescence and its social and economic impact justifies assessing the need for the implementation of asthma education programs in schools. By improving asthma knowledge, clarifying wrong beliefs and promoting the organization in schools of basic medical care in asthma exacerbation, we are certainly contributing to the full integration of asthmatics in school and to reducing the social and economic costs of asthma.

Finally, in order to allow comparative analysis between results of different studies it is important to go forward with the standardization of methodologies used in the assessment of asthma knowledge and attitudes towards asthma.

ACKNOWLEDGEMENTS

The authors would like to thank all adolescents, parents, and teachers who participated in the survey. The authors also thanks DPC for supplying the cotinine kits used in this study.

REFERENCES

1. Sheffer AL, et al. Global strategy for asthma management and prevention NHLBI/WHO workshop report, 1993. National Institutes of Health 1995;95:3659.
2. Forero R, Bauman A, Young L, Larkin P. Asthma prevalence and management in Australian adolescents: results from three community surveys. *J Adolesc Health* 1992;13:707-12.
3. Peat JK, Van Den Berg RH, Green WF, Mellis CM, Leeder SR, Woolcock AJ. Changing prevalence of asthma in Australian children. *BMJ* 1994;308:1591-6.
4. Burney PG, Chinn S, Rona RJ. Has the prevalence of asthma increased in children? Evidence from the national study of health and growth 1973-1986. *BMJ* 1990;300:1306-10.
5. Rosado Pinto J, et al. Prevalence of asthma and rhinitis in Portuguese teenagers (ISAAC). *Eur Respir J* 1996;9 suppl 23:233S.
6. Taylor WR, Newacheck PW. Impact of childhood asthma on health. *Pediatrics* 1992;90:657-62.
7. Organisation Mondiale de la Santé. Les jeunes et la santé: défi pour la société- Rapport Technique 731. Organisation Mondiale de la Santé 1986; Genève.
8. Price J. The transition of management from childhood to adolescence. *Eur Respir Rev* 1997;7:19-23.
9. Lenney W, Wells NEJ, O'Neill BA. Burden of childhood asthma. *Eur Respir Rev* 1994;4:49-62.
10. Brook U, Shiloh S. Attitudes of asthmatic and nonasthmatic children towards cigarettes and smoking. *Clin Pediatr* 1993; 32:642-6.
11. Forrero R, Bauman A, Young L, Larking P. Asthma prevalence and management in Australian adolescents: results from three community surveys. *J Adolesc Health* 1992;13:707-12.

12. Bicho A, Damas L, Chieira ML. Asthma in adolescence. *Paediatric Asthma, Allergy and Immunology* 1992;6:197-203.
13. Castanheira JL. Utilizaçã o dos Centros de Saúde pelos Adolescentes - um estudo em Lisboa. *Rev Port Pediatr* 1987;18: 379-84.
14. MORI. Young adults with asthma - a qualitative study. Report of a research study for the National Asthma Campaign, 1991.
15. Taggart VS. Implementation of the guidelines: a patient's perspective. *Eur Respir Rev* 1995;5:112-5.
16. Ehrlich R, Kattan M, Godbold J, Saltzberg DS, Grimm KT, Landrigan PJ, Lilienfeld DE. Childhood asthma and passive smoking. Urinary cotinine as a biomarker of exposure. *Am Rev Respir Dis* 1992;145:594-9.
17. Chilmonczyk BA, Salmun LM, Metathlin KN, Neveux LM, Palomaki GE, Knight GJ, et al. Association between exposure to environmental tobacco smoke and exacerbation's of asthma in children. *N Engl J Med* 1993;328(23):1665-9.
18. Rosado Pinto JE. Asma e escolaridade. *Saúde e escola* 1991; 8:42-5.
19. Bevis M, Taylor B. What do school teachers know about asthma? *Arch Dis Child* 1990;65:622-5.
20. Gibson PG, Henry RL, Vimpani, Halliday J. Asthma knowledge, attitudes and quality of life in adolescents. *Arch Dis Child* 1995;73:321-6.
21. Rosado Pinto J, Drummond Borges F, Carlos Nunes C, Lopes dos Santos J, Chieira L, Correia M. Documento Português do ISAAC - Resultados dos inquéritos efectuados em escolas dos Centros de Lisboa, Porto, Coimbra, Portimã o e Funchal - a crianças dos 6-7 anos e 13-14 anos no âmbito do International Study of Asthma and Allergies in Childhood (ISAAC).
22. Catford JC, Nutbeam D, Woolaway M. Effectiveness and costs benefits of smoking education. *Community Med* 1984; 6:264-72.
23. Luis H. Estudo dos hábitos tabágicos em adolescentes escolarizados. *Revista Portuguesa de Saúde Pública* 1988;6:49-55.
24. Chilmonczky BA, et al. Associations between exposure to environmental tobacco smoke and exacerbation's of asthma in children. *N Engl J Med* 1993;328:1665-9.
25. Carvalho Marques A. In: Ambiente e asma, prevenção ambiental secundária e estilos de vida na criança. Tese de Mestrado em Patologia do Aparelho Respiratório. Faculdade de Ciências Médicas de Lisboa. Universidade Nova de Lisboa, Lisbon; 1998. p. 70.
26. Brook U, Kishon Y. Knowledge and attitude of healthy high school students toward bronchial asthma and asthmatic pupils. *Chest* 1993;103:405-7.

Leiria Pinto, P