

# Original Article

## Compliance with environmental control measures in the homes of children and adolescents with asthma\*

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### ABSTRACT

**Objective:** To determine, through home visits, the rate of compliance with environmental control measures in the homes of children with asthma. **Methods:** This study involved 98 asthma patients between the ages of 4 and 15. The parents of those children and adolescents received instruction in how to carry out environmental control measures and were encouraged to perform such measures continuously for a period of 90 days. Home visits, which included direct inspection of the domicile and administration of a questionnaire, were made before and after this 90-day period. In cases of noncompliance, parents were asked to explain why they did not carry out the control measures. Statistical analysis was performed using the McNemar test. **Results:** Overall compliance with the various items studied was 11.1%, ranging from -4.1% (for curtain control,  $p = 0.63$ ) to 22.6% (for stuffed toys,  $p < 0.001$ ). Passive smoking was reduced to 9.7% ( $p = 0.02$ ). Among the families studied, the mean monthly income was 2.5 times the national minimum wage. When asked why they had not adopted the recommended measures, noncompliant parents gave, among others, the following explanations: "economic hardship" (60.1%); "the measures were too difficult to carry out" (6.1%); "nonparticipation of the father" (4%); and "lack of time on the part of the mother" (4%). **Conclusion:** Environmental control measures were carried out sporadically, possibly reflecting the influence of socioeconomic and cultural factors.

**Keywords:** Asthma; Allergens; Environmental exposure; Hypersensitivity/prevention & control; Compliance

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## INTRODUCTION

Asthma is a disease caused by the interaction of genetic and environmental factors.<sup>(1)</sup> Despite scientific advances, there is evidence that asthma prevalence and mortality are increasing.<sup>(2)</sup> One possible explanation for this increase is greater exposure to aeroallergens and home pollutants (such as dust, mites, mold, cigarette smoke, contact with furry animals, and exposure to chemical irritants).<sup>(3)</sup> One principal focus in asthma treatment is the control of allergen exposure. Therefore, environmental control measures are recommended for all patients with asthma.<sup>(4)</sup>

In accordance with the Global Initiative for Asthma,<sup>(5)</sup> a document drawn up by various international authorities, asthma prevention is achieved through environmental control measures, use of medication, psychological support, and health education (for patients and their families). The factors that hinder compliance with environmental control measures are various and complex, including socioeconomic conditions, as well as cultural, psychological, and individual aspects, together with doctor-patient relationships and factors related to the treatment of asthma.<sup>(6-9)</sup> International studies have shown that the rate of compliance can vary from 17% to 46%.<sup>(9)</sup> In Brazilian studies, the rate of compliance has ranged from 37% to 42%.

In two controlled clinical studies,<sup>(10-11)</sup> researchers found rates of compliance of 17% and 39%, respectively. In another study<sup>(12)</sup> evaluating 57 children and adolescents between the ages of 1 and 18 with hard-to-control asthma, a smoker in the home was found to be an aggravating factor (present in 40% of the cases evaluated). A work group of the American Academy of Asthma, Allergy and Immunology<sup>(13)</sup> published a review article on this topic, in which they stated that the rate of compliance might rise to as high as 48% if there were continuous education of the whole family. In two Brazilian cross-sectional studies of children and adults with asthma,<sup>(14-15)</sup> questionnaires were administered during medical visits (never in the home). The authors of those two studies found the rates of compliance with environmental control measures to be 42% and 37%, respectively.

The appropriate management of asthma requires the reduction of exposure to allergens, dust in particular, in the home.<sup>(16)</sup> Since the beginning of the 19th century, it has been known that there is a

relationship between allergy symptoms and specific characteristics found in the homes of patients (mold and dust). However, environmental control measures were only considered important after the isolation and identification of home allergens, especially mites.<sup>(17)</sup> Establishing this causal relationship between symptoms and exposure to allergens has underscored the importance of such measures.<sup>(18-19)</sup> Nevertheless, some authors have called into question the importance of the environment for the onset of asthma and other allergic diseases. Some authors<sup>(20)</sup> have concluded that early exposure to endotoxins in the home leads to a lower prevalence of allergic sensitization. Another author postulated that exposure to environmental allergens is a significant factor only after the disease has become established.<sup>(21)</sup>

In a meta-analysis<sup>(22)</sup> of 23 environmental control studies, no evidence was found to justify the recommendation that environmental control measures be routinely taken (neither changes in spirometric parameters nor improvement of clinical symptoms). The authors reported that most of the studies included in the meta-analysis had few participants. There was only one randomized study, and most of the studies included no control groups. The authors of another review study<sup>(23)</sup> concluded that there was evidence that exposure to allergens is a significant factor for the etiology of asthma and in the determination of its severity. Therefore, there is a reason for environmental control as a strategic procedure for the prevention and management of asthma.

In the home, the following are recommended: good ventilation; floors without carpets and on which little dust can accumulate; proper coverings for mattresses and pillows; no smoking; no use of chemical products; and no pets. Efficacious environmental control can result in the attenuation of symptoms and a decrease in the use of medications, whether used as a prophylactic measure or to treat asthma attacks.

The objective of the present study was to determine the level of compliance with environmental control measures in the homes of children and adolescents with asthma prior to and after the recommendation of such measures.

## METHODS

A cohort study, including an educational program, was carried out by both the Pediatrics

Department and the Social Medicine Department of the Federal University of Minas Gerais School of Medicine in association with the Family Health Program. The study was conducted in the cities of Araxá, Pirapora, and Ibiaí, all located in the state of Minas Gerais, Brazil. The population under study resided in central districts of those cities. In the city of Araxá, the population resided in a standardized district with brick houses, each of those with seven rooms, two of which were bedrooms. The survey was carried out from January 1998 to December 2000. The homes of the 98 participants were visited prior to and after the environmental control measures had been recommended.

The selection of the 98 children and adolescents was conducted by a medical team through the use of criteria for the classification of the disease. Inclusion criteria were as follows: being from 4 to 15 years of age; having mild or moderate persistent asthma, according to the criteria recommended by the Global Initiative for Asthma;<sup>(5)</sup> and absence of concomitant diseases, both in the respiratory system and in other systems. Only patients whose parents or guardians were literate (able to read and understand texts) were included. In addition, patients from families with an average monthly income below the minimum wage were excluded. In addition, patients with intermittent asthma were excluded, as were those outside the predetermined age bracket. Other exclusion criteria were mean monthly family income smaller than one national minimum wage and illiterate parents. A pilot study was carried out in 12 homes, randomly chosen, at the site of the study, as practice for the visitation of homes and completion of the compliance questionnaire. In addition, the pilot study was used to establish the duration of the visit (maximum of 40 minutes).

Regarding the selection method, health agents initially recruited 567 children and adolescents with respiratory symptoms. All were submitted to physical examination. In addition, a form was used to collect the following information: personal data; socioeconomic and cultural status; number of attacks in the past 12 months; medication used during attacks; positive or negative response to beta agonists (symptom improvement); interval between attacks; clinical profile between attacks; number of hospitalizations due to acute asthma; and history of asthma in the family. The medical

team then selected 98 children and adolescents (17.2% of the total sample) who met the inclusion criteria and were therefore eligible for the study. These patients and their families received printed guidelines with instructions on environmental control. Compliance with the instructions was determined at the study outset and again after 90 days. The guidelines were based on the III Brazilian Consensus for Asthma<sup>(1)</sup> and on those established in the Global Initiative for Asthma.<sup>(5)</sup>

Compliance was evaluated through visits to the homes of patients for objective, in locus verification (using a questionnaire which included the verification of the recommended measures, such as the use of impermeable covers on mattresses and pillows), as well as for checking whether there were any pets, smokers, curtains or stuffed toys in the homes. During such visits, the interviewer checked all the rooms in the home, examining the bedrooms in detail, giving special attention to the bed of the asthma sufferer in terms of whether (or not) there are covers on the mattress and pillow. A smoker in the home was defined as any smoker living at the residence, even if that individual did not smoke inside the home. Patients were visited immediately after the clinical diagnoses and again at approximately 90 days after the first home visit. Patients were visited twice with no previous warning by the same examiner. The same items were checked in both visits. A total of twenty surprise visits were carried out by a different health agent, randomly, in order to confirm the data obtained in the two previous evaluations. During the visits, noncompliant families were asked to explain why they did not comply with the environmental control measures.

Regarding statistical aspects, the parameters for the calculation of the sample size were estimated compliance rate of 15%, the available population of patients with persistent asthma (98 children and adolescents), 1% margin of error, and alpha error set at 5%. We determined that 97 patients were necessary for the study. Since the number of patients available was quite close to the required number, we opted to include all the patients in the study. The statistical analysis included frequency distribution, McNemar chi-square test, and 95% confidence interval for proportional differences between paired samples. The level of significance was set at  $p < 0.05$ . The Research Ethics Committee of the Federal University of Minas Gerais approved the study.

## RESULTS

Table 1 shows the general characteristics of the study population. Of the 98 children and adolescents included in the study, there was a predominance of males (61.2%), of 4- to 7-year-olds (58.2%), and of mild persistent asthma (76.5%). Mean maternal level of education was five years of schooling, and most (61.2%) of the mothers were homemakers. Of those who were employed, 19.4% were housemaids.

TABLE 1

Descriptive characteristics of the population under study (n = 98)

Variable	n	%
Gender		
Males	60	61.2
Females	38	38.8
Age bracket (years)		
4 a 7	57	58.2
8 a 11	28	28.6
12 a 15	13	13.2
Classification of asthma		
Mild, persistent	75	76.5
Moderate, persistent	18	18.4
Severe, persistent	5	5.1
Educational level of the mother (years of schooling)		
1 - 3	25	25.5
4 - 6	43	43.9
7 - 11	30	30.6
Where the mother works		
Inside the home	60	61.2
Outside the home	38	38.8

The mean monthly income - in Brazilian reais (R\$) was R\$600 (2.5 times the minimum wage), ranging from R\$240 to R\$2000. The mean ratio between the number of dwellers in the home and number of rooms was 1:1. The mean number of rooms was 2.3, ranging from 2 to 6 rooms per residence.

Table 2 shows the comparison between the compliance rate prior to and after families received the recommendations on environmental control measures. As can be seen, there was already, intentionally or unintentionally, some sort of environmental control in some homes, occasionally even reaching reasonable levels. For example, in 60 (61.2%) of the homes, there were no carpets.

By the study endpoint, overall compliance with the items studied had increased by only 11.1%. There was no improvement in measures to minimize curtain dust. Statistically significant differences were found in the compliance rates for the following items: stuffed toys ( $p < 0.01$ ); carpets ( $p < 0.01$ ); furniture polish use ( $p < 0.01$ ); floor wax use ( $p < 0.02$ ); smoking ( $p = 0.02$ ); appropriate mattress covers ( $p < 0.01$ ); and appropriate pillow covers ( $p = 0.02$ ). There was no statistically significant difference in the rate of compliance based on educational level ( $p = 0.7$ ), mean monthly income ( $p = 0.8$ ), or asthma severity ( $p = 0.7$ ). There was lower amplitude in the 95% confidence interval (from 4% to 18%), since basal levels already signaled some level of compliance, whether voluntary or not. However, this amplitude was within the mean rate of compliance (11.1%), revealing a tendency, albeit slight, toward compliance with the recommendations.

TABLE 2

Environmental measures in the homes of patients with asthma (n = 98 visited homes)

Variable	Prior to recommendations		90 days after recommendations		increase in compliance %	McNemar p	95% CI	
	n	%	n	%				
Sem bicho de pelúcia	62	63,1	38	39,5	22,6	8,4	< 0,01	16 a 32
Sem tapete	38	38,8	20	20,4	18,4	10,3	< 0,01	9 a 26
Sem lustra-móveis	38	40,4	23	23,7	16,7	9,4	< 0,01	11 a 29
Com capa no colchão	9	9,4	24	24,5	14,1	9,4	< 0,01	8 a 24
Sem cera	53	54,6	40	41,2	13,4	4,8	0,02	-3 a 13
Com capa no travesseiro	10	10,3	22	23,4	13,1	5,3	0,02	10 a 24
Sem fumante	58	59,2	48	49,5	9,7	1,4	0,02	2 a 14

95% CI: 95% confidence interval for the paired difference between two proportions

## DISCUSSION

Although all 98 families received the same instructions, the parents or guardians of 27.8% of the children and adolescents included in this study followed none of the preventive measures. However, some sort of environmental control, intentional or otherwise, was already being carried out for 44.1% of the variables studied. This pre-existing environmental control may have been due to actions carried out by the local health centers, knowledge acquired from other sources of information (such as the communication), and the poor socioeconomic situation, which resulted in the lack of resources for the acquisition of chemical products and other household items such as carpets and curtains.

Most of the patients in the study had mild persistent asthma. However, there was no significant difference among the three types of asthma. The mean monthly income was R\$600. However, no greater degree of compliance was found in homes with higher incomes ( $p = 0.8$ ). When mothers were asked why they had not followed the recommendations, the most common reasons given were as follows: economic hardship (36.5%); the measures were too difficult to carry out (9.1%); lack of time (4%); nonparticipation of other family members (4%); (use of carpets) because the floor was cold (3%); unemployment (2%); and the home was being built or remodeled (2%). Socioeconomic difficulties have been reported as reasons for noncompliance in other studies.<sup>(24)</sup> The same socioeconomic factors prevent, for example, families from buying a plastic cover for the mattress. However, these factors also contribute to the improvement of the home environment by preventing families from buying carpets, for example.

Lack of time to perform environmental control measures on the part of the mothers did not seem to be a very relevant factor, since 61.9% of the mothers were unemployed. Pet control showed no statistically significant variation ( $p < 0.05$ ), probably due to the perceived interference with the family routine. Asthma control was less effective among children living with smoking parents. There were smokers in 59.2% of the homes prior to the recommendations and in 49.5% of the homes after the recommendations.

The rate of compliance improved more when the measure was easy to be implemented and

inexpensive, such as, for example, carpet and stuffed toy control. Curtains were not removed, perhaps because it was difficult to find another option to protect the privacy of the family members. The final, overall compliance with environmental control measures increased by 11.1%, which was lower than the 15% predicted in the study and also lower than that reported in international studies, in which compliance ranged from 17% to 39%, as previously mentioned.<sup>(10-11)</sup>

The objective of the prospective design was to make possible the direct, in locus observation of each item studied. However, smoking in the home was registered as reported to the health agents during the visits and could not be truly confirmed. A subjectivity bias might have existed when the questionnaire was filled out during the evaluation carried out by the health agents, since the study involved three distinct cities and various teams from the Family Health Program. The objective of random visits carried out by different health agents was to make the collected data more reliable. There was 100% concordance between these data and those collected during other visits.

This study showed, for the items studied, a mean percent of overall compliance of 44.1% prior to the recommendations, and of 55.2% after. The difference was 11.1%, which was lower than that reported in international studies (95% confidence interval ranging from 4% to 18%).

In conclusion, the results of the present study suggest that an immediate, albeit limited, change in behavior is possible. However, due to the limited duration of the study, we cannot be sure that this change would be maintained over the mid- or long-term. Since asthma is a chronic disease, longer-term prospective studies of compliance with environmental control measures should be stimulated.

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