INTRODUCTION

Smoking is a major public health issue due to its direct and indirect effects on health outcomes.1,2 It has been demonstrated that exposure to passive smoking (tobacco smoke) increases the incidence of coughing and otitis, as well as generating childhood asthma and bronchial hyper-responsiveness, acute bronchiolitis, lower respiratory tract infections and pneumonia.1,4,5,6 The number of smokers in the home and the quantity of cigarettes consumed has been correlated with the abovementioned health problems. In addition, a linear correlation has been shown between smoking mothers and respiratory disease in children.2

Passive smoking may affect children directly, by decreasing pulmonary function, or indirectly7,8 by increasing their exposure to infectious diseases, since smokers have a higher incidence of respiratory infections.1,2

Three cohort studies have demonstrated an increase in the frequency of respiratory diseases and hospital admissions among toddlers whose parents smoke. In Israel, a survey of 10,762 children aged less than one year old revealed 9.5 admissions due to bronchitis and pneumonia per 100 children whose mothers were non-smokers, in comparison with 13.1 admissions per 100 children with smoking mothers.

British researchers conducted a follow-up study on 2,205 children for 5 years and showed that the incidence of lower respiratory tract infection was increased in children of smoking mothers in comparison with children of non-smoking mothers. This incidence increased considerably when both parents smoked, even after adjusting for the number of members in the family, socioeconomic status and birth weight.2

A third cohort study conducted in New Zealand, with 1,265 children followed up for 3 years, exhibited the following results: maternal smoking was strongly related to bronchitis/pneumonia in the first year of life, and an increase of 5 cigarettes per day resulted in an increment of 2.5 to 3.5 cases of bronchitis/pneumonia for every 100 children at risk.3

The presence of smoking adults in the family increases the lengths of time spent in bed and activity restrictions among children. Disease duration (in days) increased according to the number of cigarettes smoked in the family.1

The aim of this work was to study the association between parents’ smoking habits and the incidence of respiratory infections and asthma attacks during the preceding 3 months, among children who were attending a kindergarten and elementary school with linkages to an university, in relation to their socioeconomic status, positive response rate to skin tests for allergies, breastfeeding history, atopic disorders among their parents, presence of pets at home and time spent at school.

METHODS

Design. Descriptive study.

Setting. The study was undertaken at the kindergarden and elementary school of Universidade Federal de São Paulo, a public institution.

Participants. 183 children aged 4 to 9 years from kindergarten and elementary school of São Paulo, Brazil.
old, during the months of May through July 1996.

Procedures and main measurements. The parents (or whoever was responsible for the children) filled out a standardized questionnaire consisting of 31 items that inquired about smoking characteristics (such as who smokes, how many people smoke, how many cigarettes per day) and also ex-smokers’ characteristics (why they quit the habit). The other covariates considered were the presence of siblings; their ages; whether they were breastfed or not; the frequency of respiratory infections during the last 3 months; the presence of asthma/bronchitis and its characteristics (how many attacks, age of onset of disease and regularity or treatment); and any history of atopic disorders in parents. In the last part, a socioeconomic evaluation was attempted, verifying housing conditions, number of rooms and number of people living in the household, head of family, educational level, family income and number of housing utilities, according to the criteria.16

Skin tests for allergies were performed on 88 children, following these steps: 1) sterilization of the forearm using alcohol; 2) scarification using a disposable thin blade, at 8 different places in the forearm; 3) application of 1 drop of allergen (home dust with Dermatophagoides, tobacco, cotton, fungi, dog hair and epithelium), a positive control (histamine) and a negative control (saline); 4) after 20 minutes, the reading was performed: (-) negative test: no papule or erythema in comparison with the negative control, (+/-) dubious test: papule less than 5 mm with moderate erythema, (+) weakly positive: papule with a diameter of 5 mm and moderate erythema, (+++) strongly positive test: papule 5-10 mm, without pseudopodia and with moderate to strong erythema, (+++) strongly positive papule of 10 mm or more, with pseudopodia and significant erythema. Tests were considered positive when the readings were weakly, moderately or strongly positive. For the allergy tests, we excluded children under 4 years old and children whose parents had not given permission for the tests to be performed.

This study was approved by the Medical Ethics Committee of UNIFESP (Universidade Federal de São Paulo).

Statistical methods.

Pearson Chi-Squared and Fisher exact tests were performed (when at least one expected frequency was less than 5). Values of p < 0.05 were considered as significant. The odds ratio and 95% confidence interval were calculated to evaluate the presence of associations between respiratory morbidity in the children and environmental variables. Data were analyzed using the Stata statistical package.

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RESULTS

We sent out 255 questionnaires, and 183 responses were returned by the parents or whoever was responsible for the children in the sample (a return rate of 71.8%). In 37.8% of the homes, the father and/or mother were smokers and in 47.2% there was another smoker in the house. Only in 15% of the houses were there no smokers.

Table 1 shows the different kinds of dwellings occupied by the families, in relation to occupation conditions, number of rooms, number of people living together and ventilation conditions. Most children shared their room with someone else (88.7%), and about 40% of them had pet animals at home, half of which were reported to be dogs.

In relation to the socioeconomic status of the children, according to the ABA/ABIPEME criteria, it was verified that most families were located in the B (35.2%) and C (50.6%) classes.

There was a history of breastfeeding in 92.3% of the responses, and 50% maintained it for at least the first four months.

With regard to the length of time spent at school each day, 76.1% of the children attended full-time, while only 23.8% attended part-time. Children who studied full-time were equally exposed to passive smoking at home, when compared with children that studied part-time. We did not find any statistical difference for the incidence of respiratory infections and asthma in relation to the length of time spent at school.

Eighty-eight skin tests for allergies (on 48.1% of the sample, of whom 57% were boys and 43% were girls) were performed with immediate reading for 6 inhaled allergens. From these tests, 53.4% did not exhibit a positive response to the tested antigens. The percentage of positive responses to the antigens, separately, were 29.5% for dog epithelium, 21.5% for dust, 17% for cotton, 15.8% for

| Table 1. Types of housing, housing conditions, number of rooms, number of people living there and ventilation |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Type                           | Occupation      | No. of rooms    | No. of people living there | Ventilation     |
|--------------------------------|-----------------|-----------------|-----------------|-----------------|
| House                          | own             | 2 to 4          | 2 to 4          | good ventilation |
| (65.0%)                        | (55.9%)         | (44.7%)         | (66.1%)         | (36.8%)         |
| Apartment                      | rented          | 5 or more       | 5 or more       | sunny           |
| (33.9%)                        | (26.3%)         | (55.3%)         | (33.9%)         | (35.2%)         |
| Other                          | other           | (17.8%)         |                 | musdy           |
| (1.1%)                         |                 |                 |                 | (28.0%)         |

| Table 2. Association between exposure to passive smoking in children and other variables |
|---------------------------------|-----------------|-----------------|-----------------|
| Passive smoking (%)             | Not Exposed     | Exposed         | p               |
| Damp, musty house               | 11.3            | 6.5             | 0.494           |
| Yes [n = 30]                    | 46.4            | 35.7            |                 |
| No [n = 138]                    |                 |                 |                 |
| Pet                             | 23.6            | 15.8            | 0.611           |
| Yes [n = 65]                    | 33.9            | 26.7            |                 |
| No [n = 100]                    |                 |                 |                 |
| Breastfeeding                   | 54.2            | 38.1            | 0.379           |
| Yes [n = 155]                   | 3.6             | 4.2             |                 |
| No [n = 13]                     |                 |                 |                 |
| Positive skin tests for allergies (2 or more) | 16.0 | 12.3 | 0.645 |
| Yes [n = 23]                    | 44.4            | 27.2            |                 |
| No [n = 58]                     |                 |                 |                 |
| Parents with atopic disorders   | 24.8            | 10.7            | 0.036           |
| Yes [n = 15]                    | 33.6            | 30.9            |                 |
| No [n = 106]                    |                 |                 |                 |
| Full time at school             | 41.3            | 34.8            | 0.397           |
| Yes [n = 118]                   | 14.8            | 9.0             |                 |
| No [n = 37]                     |                 |                 |                 |

Sao Paulo Med J/Rev Paul Med 2002;120(4):109-12.
tobacco, 14.8% for fungi and 12.5% for wood. Allergic respiratory symptoms in at least one parent were reported in 20.5% of the sample.

Table 2 shows the statistical associations between exposure to passive smoking and the presence of other variables studied. We found a statistically significant association between parents who had atopic disorders and children not exposed to passive smoking.

Table 3 draws attention to the presence or absence of respiratory problems and asthma attacks during the preceding three months in the studied sample, in relation to unhealthy dwelling places, presence of a pet at home, breastfeeding, presence of two or more positive tests for inhaled antigens, atopic disorders in parents, smoking parents, and the fact that the children attended school full-time. Statistical significance was demonstrated for the associations of atopic disorders in parents with asthma attacks and higher incidence of respiratory infections during the preceding three months.

Parents reported that 51% of the children had had one or more respiratory infections during the preceding 3 months (including pneumonia, rhinitis, otitis media, sinusitis or pharyngitis). They also reported that 25.7% of the children had asthma and 52.1% of the sample had one or more asthma attacks during the preceding three months.

Figure 1 shows the respiratory infections and asthma attacks in children exposed to tobacco smoke in comparison with those not exposed. However, no statistical significance could be found.

Table 3. Odds ratio (and 95% confidence interval) for the association between presence of either respiratory infections or asthma attacks over the preceding three months and environmental variables

| Environmental Variables                  | Respiratory Infections | Asthma |
|------------------------------------------|------------------------|--------|
| Damp, musty house                        | 0.91 [0.43-1.93]       | 1.59 [0.71-3.57] |
| Pet                                      | 1.20 [0.66-2.20]       | 0.54 [0.26-1.13] |
| Breastfeeding                            | 0.81 [0.27-2.40]       | 0.76 [0.23-2.46] |
| Positive skin tests for allergies (2 or more) | 1.06 [0.41-2.72]     | 0.37 [0.11-1.33] |
| Parents with atopic disorders            | 0.40 [0.20-0.79]       | 3.23 [1.59-6.6]  |
| Smoking parents                          | 0.87 [0.47-1.61]       | 1.20 [0.59-2.41] |
| Full time at school                      | 0.88 [0.43-1.84]       | 1.69 [0.66-4.31] |

Figure 1. Association between respiratory infections and asthma attacks among children over the preceding 3 months, according to exposure to environmental tobacco smoke.
of respiratory infections (OR = 0.40), even though the children had had higher episodes of asthma attacks (OR = 3.23) over the preceding three months (Table 2 and 3).

In this research, we did not find an increase in the incidence of respiratory infections and asthma attacks among children exposed to tobacco smoke. This can be explained by the fact that we were dealing with older children with a good socioeconomic status and satisfactory housing, who had been adequately breastfed. The fact that they were away from home for longer periods (76.1% were at school all day long) reduced their exposure to environmental tobacco smoke at home. Moreover, the population studied was small and the time period over which the incidence of respiratory infections and asthma attacks was investigated was limited to only three months, because the longer the period that the parents are asked about, the lower the fidelity of data is. In addition to this, the study was performed in a very polluted city (São Paulo), and this may have contributed to some confusion in the documentation of higher occurrence of respiratory infections and asthma attacks related to passive smoking exposure. Such problems could be clarified with a study conducted using a larger and more representative sample of the population, observed over a prolonged period of time.

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Sources of funding: None

Conflict of interest: None

Date of first submission: November 9, 2000

Last received: April 29, 2002

Accepted: April 30, 2002

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RESUMO

CONTATODE: Foi demonstrado que crianças de pais fumantes estão mais predispostas a infecções respiratórias e asma.

OBJETIVO: Estudar a associação de infecções respiratórias e crises de asma em crianças de quatro a nove anos de idade, matriculadas em uma escola que funciona como pré-escola e 1º grau em São Paulo, Capital, nos meses de maio a julho de 1996, com a presença de atopia, exposição ao fumo passivo e tempo de permanência na escola (parcial ou integral).

TIPO DE ESTUDO: Estudo descritivo.

LOCAL: Pré-escola e de primeiro grau da Universidade Federal de São Paulo.

CASUÍSTICA: 183 crianças, sendo 104 meninos e 79 meninas, entre 4 e 9 anos.

VARIÁVEIS ESTUDADAS: Foi administrado um questionário contendo 31 questões aos responsáveis pelas crianças e realizados 88 testes cutâneos de alergia para inalantes, na crianças cujos pais haviam fornecido consentimento prévio.

RESULTADOS: Do total de crianças, 51% tiveram infecções respiratórias nos últimos três meses e 25,7% eram asmáticas, sendo que 52,1% delas tiveram uma ou mais crises nos últimos três meses. As crianças expostas à fumaça de cigarro no domicílio não tiveram mais infecções respiratórias e crises de asma que as não-expostas. A positividade a dois ou mais testes cutâneos de alergia não se correlacionou significativamente à presença de infecções respiratórias e crises de asma nas crianças estudadas, embora tenha havido associação estatisticamente significante entre pais com história de atopia e filhos com mais infecções respiratórias e/ou crises de asma, assim como pais com história de atopia e filhos com menor exposição à fumaça de cigarro. As crianças com permanência em tempo integral na escola não vieram maior ocorrência de infecções respiratórias e crises de asma.

CONCLUSÃO: A presença de infecções respiratórias e crises de asma está associada à exposição passiva à fumaça de cigarro no domicílio e ao tempo de permanência na escola.

PALAVRAS-CHAVE: Infecções respiratórias, Asma, Crianças, Fumo passivo, Alergia.